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FAIRMODE Intercomparison Exercise - Dataset to Assess the Area of Representativeness of Air Quality Monitoring Stations

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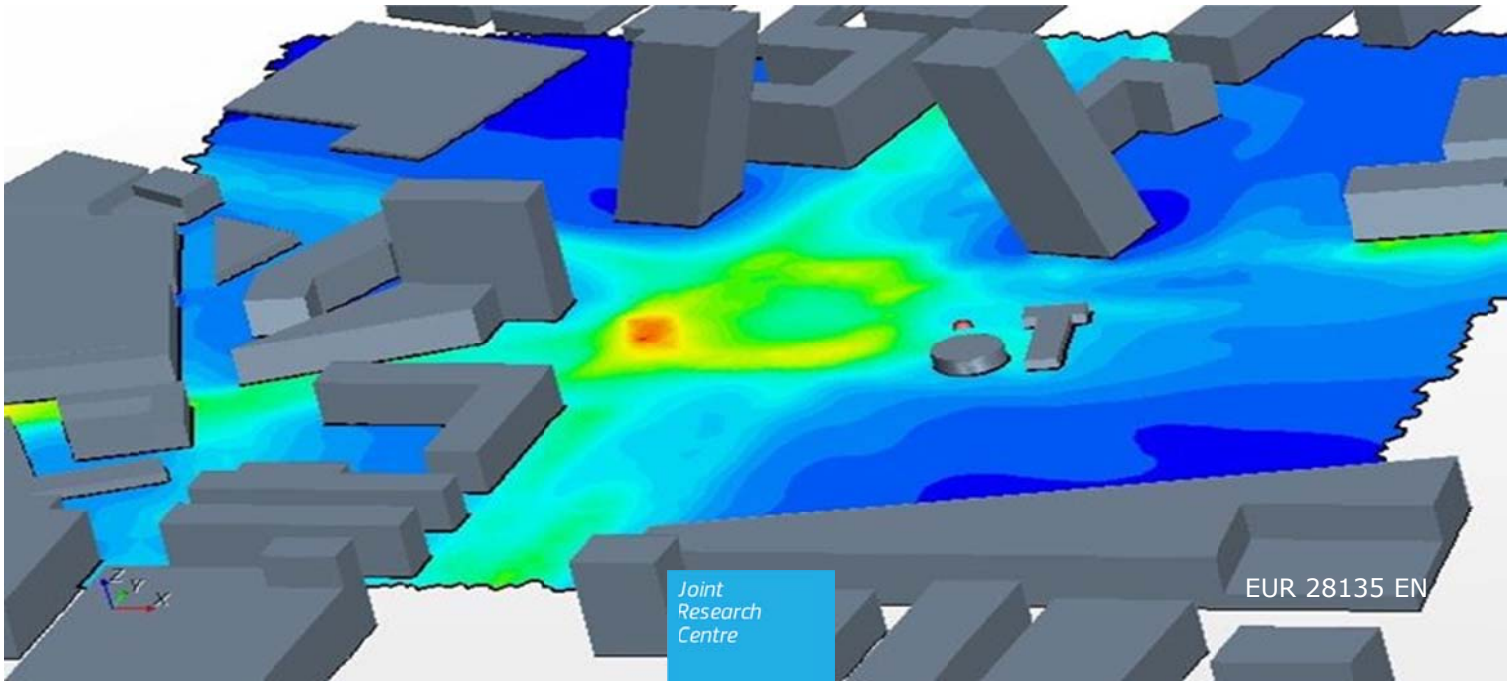

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FAIRMODE Intercomparison Exercise - Dataset to Assess the Area of Representativeness of Air Quality Monitoring Stations

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Abstract

A feasibility study for organizing an intercomparison exercise (IE) of the methods used for estimating of the area of representativeness of the Air Quality Monitoring Stations (SR) in Europe has been carried out. It showed that it should be possible to compare the extent of SR determined by the different methods. Moreover, at the FAIRMODE-Aveiro meeting in 2015, the participants agreed to carry out the intercomparison exercise assessing the SR estimates for PM_{10} and NO_2 at one traffic station, and for PM10, NO2 and O_3 at two urban background stations.

This report presents a dataset suitable for the FAIRMODE IE of the area of representativeness of Air Quality Monitoring Stations in the urban area of Antwerp (Belgium) for the year 2012. Three monitoring stations, Borgerhout-Straatkant, Antwerpen-Linkeroever and Schoten, have been selected for the evaluation. The dataset includes the model results for interpolated annual means on a fine regular grid, hourly time series at a number of 341 virtual receptor points to which random noise have been added, data from measurements of the Antwerp automatic monitoring stations, individual sampling campaigns, emissions, traffic, population density, building information, gridded CORINE land cover data, a short summary of PM_{10} speciated data and daily time profiles for traffic.

1 Introduction

Spatial representativeness of air quality monitoring stations has been investigated and discussed intensively in the past within FAIRMODE, the Forum for Air Quality Modelling in Europe and AQUILA, the network of National Reference Laboratory for Air Pollution. However, no well-established procedure for assessing spatial representativeness has been identified so far. Also in the scientific literature, there is no unified agreement to address this complex problem.

It is FAIRMODE's ambition to further explore this topic and make progress in the assessment procedure of spatial representativeness. As a next step into this direction, we proposed the organisation of an intercomparison exercise (IE) of methods for the assessment of the spatial representativeness of monitoring sites. The main objective of this exercise is to explore the strengths and weaknesses of the different contemporary approaches by applying them to a jointly used example case study. For this purpose, we intend to cover as much as possible of the total variety and diversity of procedures which are in use today - ranging from methods with moderate complexity, used for pragmatic purposes, to those which involve higher levels of data requirements and computational efforts. In consequence, this implies that we need to deliberately accept that for this first IE the pool of investigated methods will not necessarily share a strictly unique definition of spatial representativeness. It is also the aims of the study to investigate about the best way to compare the outcomes of the different spatial representativeness methods. The most obvious method consists in directing the intercomparison towards a comparison of methodologies rather than a validation of the method outputs since neither a general accepted reference method exists nor direct measurements of the spatial representativeness can be done.

From a regulatory point of view, directive 2008/50/EC stipulates several requirements for the siting of fixed monitoring stations, including considerations concerning their spatial representativeness. The Implementing Decision 2011/850/EU specifies in ANNEX II that information about spatial representativeness should be reported "where available", as part of the dataset for fixed measurement information. Reporting information on spatial representativeness is thus not yet strictly mandatory ("where available") and not harmonized (no reference method specified). We expect that the outcomes of the proposed intercomparison exercise will substantially support future endeavours towards a harmonized methodological framework to facilitate the reporting of spatial representativeness by the Member States. It is furthermore anticipated that increasing the harmonization, consistency and transparency of the methods will also serve as in important factor in motivating future reporting of spatial representativeness within the established exchange of information.

1.1 Legal Reference / Existing Regulations and Requirements:

Systematic monitoring and collection of meaningful datasets of ambient air quality is a mandatory requirement for efficient air pollution management and robust decision making. Since the entry into force of the Council Decision 97/101/EC, and the amendments stipulated in the Commission Decision 2001/752/EC, European Member States have been obliged to monitor and reciprocally exchange measurements of ambient air pollution. However, the collection of high quality datasets with suitable spatial coverage poses many challenges in terms of data quality and network configuration. In fact, the European Commission has worked intensively on the implementation of a harmonized programme for the monitoring of air pollutants. The harmonization program relies on the adopted European Directives 2008/50/EC and 2004/107/EC. These Directives endeavour to improve the quality of measurements and data collection, and to ensure that the information collected on air pollution is sufficiently representative and comparable across the Community. Directive 2008/50/EC furthermore points out the importance of using common criteria for the classification, number and location of measuring stations for the assessment of ambient air quality. Within this directive, different provisions concerning the siting of fixed monitoring

stations are given. Those include several considerations about the order of magnitude of the spatial representativeness. However, no detailed provisions on the methods for assessing the spatial representativeness are provided. In this context, the Commission Implementing Decision 2011/850/EU (IPR) lays down rules regarding the reciprocal exchange of information and reporting. The IPR stipulates that Member States shall also make available information on the quality and traceability of the air quality assessment methods. For fixed measurement stations, this shall include (where available): (i) the spatial extent of the representative area (geometric description), (ii) the evaluation of representativeness (interpretation of the representativeness area and constraints for using this information), and (iii) the documentation of representativeness. However, again no detailed information on the methods for assessing the spatial representativeness is specified. In fact the Guidance on the Commission Implementing Decision 2011/850/EU (provided by DG ENV in version of 15 July 2013) explains that "… there is as yet no definition of the spatial representativeness of monitoring stations in the AQ legislation and there is a need to develop tools for its quantitative assessment". It furthermore notes that "… the evaluation of representativeness will be further evaluated in the framework of the collaboration between AQUILA/FAIRMODE".

1.2 Links between Spatial Representativeness and Classification of Air Quality Monitoring Stations:

A consistent classification of AQ monitoring sites across Europe is an important condition for a meaningful interpretation of data and for a harmonized assessment of trends and evolutions. Furthermore, the spatial representativeness of air quality monitoring stations is often closely related to the site classification. In fact, knowledge about spatial representativeness is frequently required as a prerequisite for the decisions to be taken about the classification of a monitoring site. Example given, representativeness is one of the macroscale siting criteria for classifying and locating sampling points for the assessments of ozone concentrations stipulated in ANNEX VIII of the directive 2008/50/EU. It was thus decided that the proposed intercomparison study may also aim to evaluate the links effectively existing in current practice between spatial representativeness and the established monitoring site classification schemes.

1.3 Links between Spatial Representativeness and Area of Exceedances

The concept of spatial representativeness is furthermore related to - but not necessarily identical to - the area of exceedance (the Member States' obligation to provide the public with information about the location and area of the exceedances being stipulated in ANNEX XVI of EC/50/2008). In the current intercomparison exercise for spatial representativeness, we encouraged participants to include those methods that are directed to the estimation of the area of the exceedances.

1.4 Range of applications of spatial representativeness estimates

Methods for estimating the spatial representativeness can find their practical application in different fields and in different contexts, which basically are (i) station siting and network design, (ii) station classification, (iii) data assimilation, (iv) model evaluation, (v) air quality reporting, (vi) reporting of exceedances, and (vii) population exposure studies. From previous discussions (e.g. the SCREAM document[1]), we anticipated a

[1] Geiger J. and 14 authors more (2014). Assessment on siting criteria, classification and representativeness of air quality monitoring stations. JRC- AQUILA Position Paper. http://ec.europa.eu/environment/air/pdf/SCREAM%20final.pdf

significant variety of different types of spatial representativeness methods. For this study, we intended to include equally methods that are used for air quality management and regulatory purposes, methods that are used in the context of modelling and model benchmarking, as well as methods used in a research context. The set of methodologies that are included in the current intercomparison exercise consists of:

1. Methods which are immediately based on an estimate of the spatial distribution of pollutants to which a set of suitable statistical similarity criteria is then applied. The underlying estimate of the concentration field might basically be established in two different ways (or by a combination of them):

    a. Concentration fields derived from observed pollutant concentration, i.e. by using regular monitoring data and / or dedicated experimental campaigns

    b. Concentration fields derived from air quality modelling

2. Methods which are based on pollutant proxies and / or surrogate data (e.g. emissions, population density, land use) in combination with a set of statistical similarity criteria.

3. Methods which are linked to the classification of stations or sites

The output of the spatial representativeness assessments is expected to vary from:

1. Detailed geospatial descriptions of the area of representativeness (e.g. maps or a spatial polygons)

2. Quantifications in terms of simplified geometric concepts like a radius of the area or a length of the street for which a station is representative of

3. Characterisations by semi-quantitative estimates like the scale or the order of magnitude of the area of representativeness

4. An estimated spatial variance or other statistical parameters

5. Characterisations by surrogate categorical attributes (e.g. by different types of station classification schemes)

6. Other means of reporting, including qualitative descriptions

2 Review of existing methodologies

A feasibility study[2] has been carried out aiming at identifying prospective candidate methodologies to be considered in an intercomparison exercise, the requirements on shared datasets, the assessment of the comparability of the different types of SR results to be retrieved and the limitations to be expected of such an intercomparison exercise. In order to achieve these objectives, this study presented the results of a bibliographical review of the studies on spatial representativeness published in scientific journals or technical reports, a compilation of the definitions of the concept of SR found in the bibliographical review, the design of a survey based on a questionnaire to get technical information concerning the methodologies used to estimate the SR of air quality monitoring stations by the main expert groups in Europe, an analysis of the survey results and a discussion about the feasibility of an intercomparison exercise for SR methodologies.

A total of 22 groups from 14 different countries answered the questionnaire providing information on 25 methodologies. Most of them (18 groups with 20 methodologies) intended to participate in the intercomparison exercise. From the replies obtained from these groups, SR studies were mostly done for regulatory purposes (air quality reporting, station sitting or network design, station classification) but also for data assimilation or model evaluation and population exposure. Most of the groups used methodologies based on modelling but also on measurements, proxies and station classification and generally for annual concentrations (average or percentiles from daily or hourly data). SR studies were done for a wide range of pollutants but more frequently for NO_2/NO_x, PM_{10}, SO_2 and $PM_{2.5}$, but also for ozone at the regional scale. Most of the groups applied their methodologies to all type of stations. The most used input variables are air quality data from measurements and/or modelling, meteorological data, and emission inventory data. The outputs are usually maps delimiting the SR area and/or SR size parameters (e.g., surface areas or radius).

The responses of the questionnaire concerning methodology requirements and limitations showed that performing the intercomparison exercise is feasible with some conditions. In order to include as many participants and methodologies as possible, an open exercise was proposed provided that all input data needed for each methodology are available. Due to a similar number of groups applying their methodologies for the regional scale or for the local/urban scale, the exercise should cover both spatial scales. For the urban/local scale, input data are available from a proposed dataset for the city of Antwerp, and for the regional scale it was proposed to extend the domain according to the requirements of some methodologies.

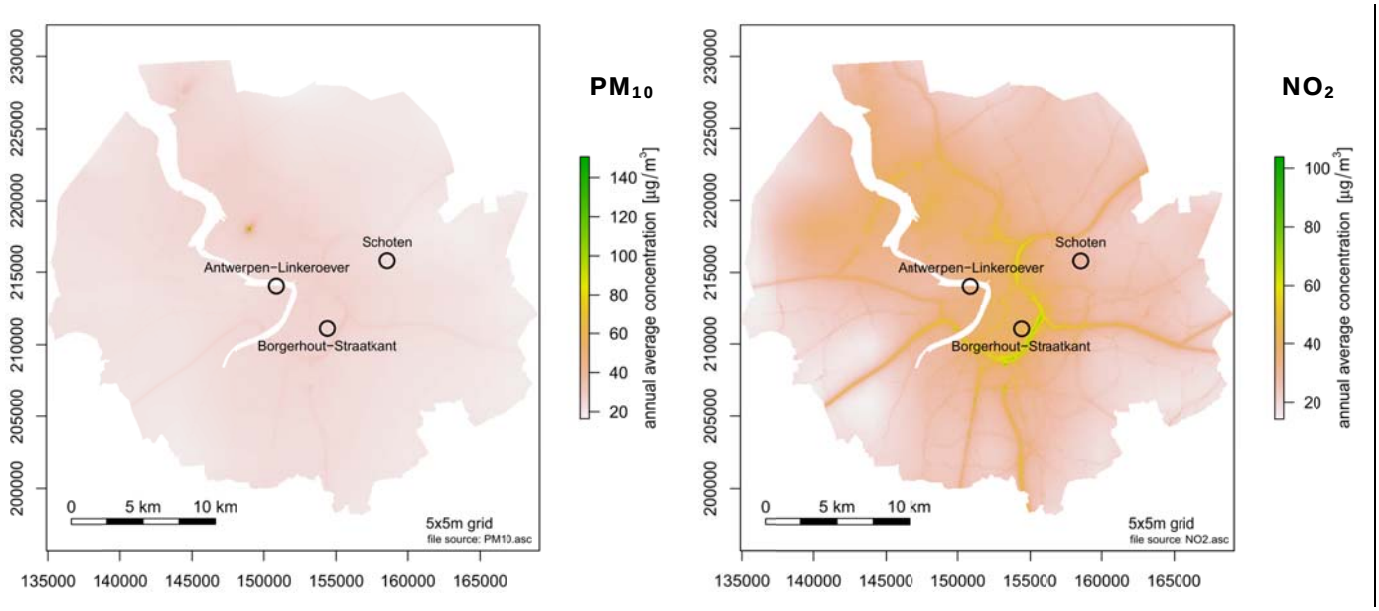
Hence, datasets are needed with features similar to those for the local/urban scale but with a coarser resolution. The types of input data required are: data from air quality monitoring, sampling campaigns, air quality modelling, emission inventories, meteorological or/and climatological data, and other surrogate data such as land use and land cover, traffic intensities, population density, building geometries or topography.

[2] Martin, F., Santiago, J.L., Kracht, O., Garcia, L. and Gerboles, M. (2015): FAIRMODE Spatial Representativeness Feasibility Study. 82 p. JRC Technical Reports 96827. EUR 27385 EN. EUR – Scientific and Technical Research Series. ISSN 1831-9424 (online), ISBN 978-92-79-50322-1 (PDF), DOI 10.2788/49487.

3 Scope of the Intercomparison Exercise

During the FAIRMODE meeting in Aveiro, 24-25 June 2015, Working Group 1 – Session 5, "cross-cutting activity (CCA) on spatial representativeness of monitoring stations", we discussed technical and organisational aspects in view of carrying out the intercomparison exercise (IE) for the evaluation of the area of spatial representativeness (SR) of monitoring stations. The following points were agreed between the WG participants during the session:

- The first objective of IE is to estimate the SR of Air Quality Monitoring Stations (AQMS) located in the urban area of the city of Antwerp. Three stations are within the Antwerp urban area where monitoring, emission, density and mobility data are known (see Figure 1). These stations are classified as following: 1 traffic station and 2 urban background stations.
- The second objective of the IE is to extend the comparisons to other stations. One possibility was to select one of the industrial stations located around the harbour of Antwerp. However, it was preferred to use a set of virtual stations, whose values were simulated by extraction of the existing output of a model. In the area of Antwerp there is no rural area. Consequently, no rural background station is proposed for the IE even within the simulated stations.
- The IE objective is the assessing the SR estimated for PM_{10} and NO_2 at the traffic station and for PM_{10}, NO_2 and O_3 at the two urban background stations.
- A few participants proposed to evaluate the effect of the concentration similarity threshold used to estimate the extent of SR by sensitivity analysis at a 2nd step of the data treatment.
- The possibility to compare the classification of AQMS was marginally cited for the methods that are able to estimate this classification.



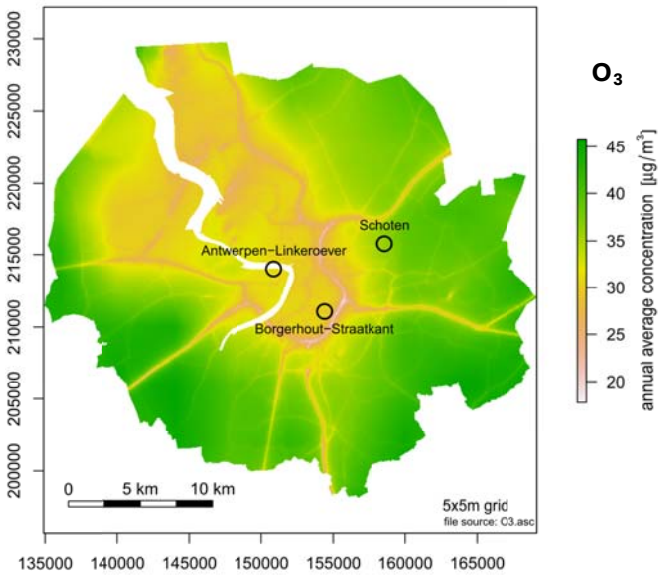


Figure 1: Position of the 3 Air Quality Monitoring Stations of the Antwerp domain used for the intercomparison exercise overlapped with the modeled value for PM_{10}, NO_2 and O_3

4 Contents of the dataset

The following overview describes the datasets prepared for the FAIRMODE intercomparison exercise. Detailed information about the dataset is given in appendix 1. The datasets was prepared by VITO-BE, it includes:

1. **Measurements of the automatic stations for the city of Antwerp and its regional area for the full year of 2012.**
    - All available measurements of the AQMS are included in the dataset. The measurements consist of hourly values for: $PM_{2.5}$, PM_{10}, O_3, NO/NO_2, CO, SO_2 and BTX and black carbon.
    - The file General_info.csv gives information about the stations: names, coordinates, classification, units, measurement methods and instruments. The percentage uncertainties of measurements are given.
    - Ancillary measurements including temperature, precipitation, wind velocity, wind direction and sun radiance are included at one station.
    - The data are provided in .csv format, separated with semi-colons ";".
2. **Measurements of the ATMOSYS campaign with passive samplers and mobile stations**

The dataset includes NO_2 measurements, 2-week averages in µg/m³, at 6 sampling sites between 29-06-2011 and 11-07-2012: PM_{10} with chemical speciation sampled every 4th day at 3 sites (measured parameters: PM_{10}, elemental carbon / organic carbon, levogluconsan, ions:, NO_3 ,Cl, SO_4, Na, NH_4, K, Mg, Ca and heavy metals: Al, As, Ba, Ca, Cd, Cr, Cu, Fe, K, Mn, Mo, Ni, Pb, Sb, Ti, V and Zn). All units are µg/m³.

- The files general_info_atmosysNO2.csv and general_info_atmosysPM.csv gives information about the sampling sites with names, address, classification, coordinates plus the temperature for the NO_2 measurements.
- Projection system: Lambert Belgium 72 (EPSG: 31370).

The data are provided in in .csv format, separated with semi-colons ";".

3. **Gridded model data**

The dataset includes annual mean gridded concentrations for 2012 on a 5x5 m² grid over a regional domain for $PM_{2.5}$, PM_{10}, black carbon, benzene, O_3 and NO_2.

- The measurements are µg/m³.
- Projection system: Lambert Belgium 72 (EPSG: 31370).
- The data is provided in a GIS compatible format (.asc-files).

Figure 2 to Figure 4 show the plots of the gridded model data.

4. **Virtual monitoring sites**
    - 341 virtual monitoring sites were simulated out of model data with hourly values for NO_2, black carbon, $PM_{2.5}$, PM_{10}, benzene and O_3.
    - These virtual monitoring sites can be used as input data by participants who need additional stations not included in the automatic network for their data treatment with hourly values. The virtual monitoring sites may simulate virtual diffusive samplers with to 2-week averages for NO_2 and O_3 and virtual monitoring stations with daily averages for PM_{10}. However, if virtual diffusive samplers or virtual monitoring stations are needed, participants are requested to use the time series given in points 9, in which the typical noise of indicative measurement methods has been added.

- Please note that no bias correction with the measurements of the automatic network has been applied to these data.
- A total number of 341 virtual monitoring sites were created out of the irregularly gridded model data. Among the virtual monitoring points, 100 sites are located in street canyons and the rest are located at urban background locations. VITO specified a first set of street canyon and non-street canyon locations at arbitrary positions of the underlying irregular model grid (source type "random"). In addition, 111 virtual monitoring points have been allocated in a field around the Borgerhout traffic station (47 at traffic sites in street canyons and 64 at arbitrary positions aligned along circles around this traffic station).
- Projection system: Lambert Belgium 72 (EPSG: 31370).
- The data is provided in digital format (.csv-files). The file virtual_stations.csv gives the numbered labels of the virtual monitoring sites, their coordinates, information about the type of site, the distance to stations (for the station type circlesBorgerhout and SC Borgerhout) or the distance to roads (for the station type "perpendicular").

5. Emission inventories

- The dataset includes 1x1km² gridded emission files for CO, NH_3, NMVOCs, NOx, $PM_{10,}$ $PM_{2.5}$ and SO_2 containing all the emissions in the domain (including point sources and road traffic emissions re-gridded to the 1x1km² resolution). In addition, some extra files are added to further downscale the emissions to a higher resolution with hourly traffic, annual average of road emissions and point sources. Please refer to the detailed information given in appendix to use the emission data.

6. A grid of population density for the great Antwerp area

- The dataset includes a grid of population density with a high resolution of 100x100 m.
- Projection system: Lambert Belgium 72 (EPSG: 31370).
- The data is provided in a GIS compatible raster format (pop_antw_100m.asc).

7. A cadaster of the building height of the city of Antwerp

- The dataset includes building information for all buildings in the domain. Every building is represented as a polygon with altitude being its altitude in cm provided in shapefile format.

8. CORINE land use/cover classification within for the domain

- The dataset includes the Corine land cover classification 2012 version (CLC2012) in the domain gridded on a 100x100 m² grid with an overview of the different classes. Geographic projection is Belgium Lambert 72 (EPSG: 31370).

9. Virtual station dataset

For the participants that need additional indicative measurements (e. g. diffusive samplers), 2-week averages for NO_2 and O_3, and daily averages of PM_{10} were computed. It is generally expected that indicative measurements have more scattering than reference values. However, we observed that the virtual monitoring sites presented lower relative standard deviations than the reference values of the Air Quality Monitoring Stations of the automatic network. Therefore, random noise was added to the NO_2 and

2-week O_3 averages and to the PM_{10} daily values. We used previous studies[3],[4],[5] to estimate the variance function versus the reference values. We did not take into consideration the bias between the modelled virtual monitoring stations and stations and the existing stations of the Antwerp monitoring network. Details on the calculation are given in the next section.

Appendix 2 shows all the time series plots with hourly raw data, NO_2 and 2-week O_3 averages and PM_{10} daily averages plus the same data series with noise added.

Participants are kindly requested to use the time series with added noise for their SR estimation which are given in files:

- NO2_timeseries_modJRC_14d-avg+noise.csv
- NO2_timeseries_modJRC_14d-avg+noise.csv
- PM10_timeseries_modJRC_1d-avg+noise.csv)

These csv files use the same type of metadata as in point 4:

- Unit: µg/m3.
- The results for the virtual stations are provided in the columns of the files. Detailed lay-out:
    - The first row provides the label of the virtual monitoring station (which matches with the label provided in the file virtual_stations.csv of point 4).
    - The second and third row provide the coordinates in Belgium Lambert 72 (EPSG: 31370).
    - Rows 4 – 29 provide the concentration for the 2-week periods of the year 2012 for NO_2 and O_3 and the rows 4 -369 provide the concentration for each day of the year 2012 for PM_{10}. The first column indicates the hour or day of the year, in the other columns the concentrations can be found.

For information the 2-weeks and daily averages without noise are also given (files: NO2_timeseries_modJRC_14d-avg.csv, NO2_timeseries_modJRC_14d-avg.csv and PM10_timeseries_modJRC_1d-avg.csv).

10. PM_{10} data (speciation)

A pdf file presents a short summary of a study of PM_{10} speciation including the city of Antwerp between mid 2011 and mid 2012.

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[3] Gerboles M., Detimmerman F., Amantini L., De Saeger E., Validation of Radiello diffusive sampler for monitoring NO2 in ambient air, Commission of the European Communities, EUR 19593 EN, 2000

[4] Detimmerman, F., Gerboles, M., Amantini, L, de Saeger, E,, Validation of Radiello diffusive sampler for monitoring ozone in ambient air, Commission of the European Communities, EUR 19594 EN, 2000

[5] F. Lagler, C. Belis and A. Borowiak, A Quality Assurance and Control Program for $PM_{2.5}$ and PM_{10} measurements in European Air Quality Monitoring Networks, EUR 24851 EN, ISBN 978-92-79-20481-4, ISSN 1831-9424, DOI 10.2788/31647, 2011

11. Daily traffic

The file timefactors.xlsx includes 3 worksheets:

- "Daily" gives the daily traffic profiles for the three types of roads contained in the dataset (highway, rural, urban)
- "Monthly" gives the monthly traffic profiles for the three types of roads contained in the dataset (highway, rural, urban)
- "Weekly" gives the weekly traffic profiles

These profiles are based on traffic counts and composed by the Flemish Traffic Agency (VVC).

Finally, the whole dataset (data.zip and a pdf instruction file) can be downloaded at:

ftp://srv-ies-ftp.jrc.it/uploads/Fairmode_CCA1/

The datasets is deleted after one month, it might be necessary to contact JRC in order to upload again the dataset if it disappears. The password to extract the compressed archive is given by mail.

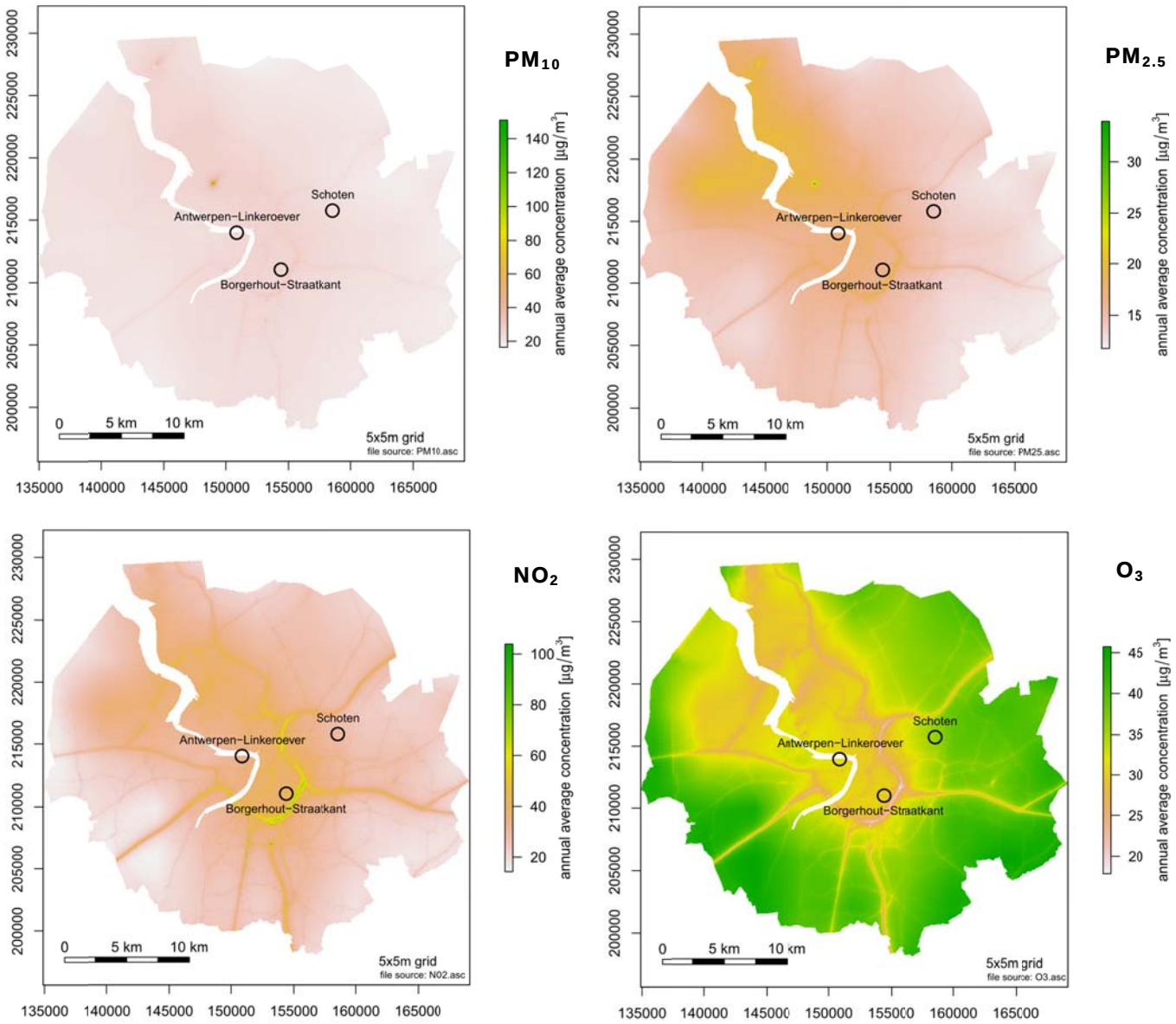

Figure 2: Gridded model data plotted on the Antwerp domain for PM_{10}, $PM_{2.5}$, NO_2 and O_3 with the position of the 3 Air Quality Monitoring Stations used for the intercomparison exercise

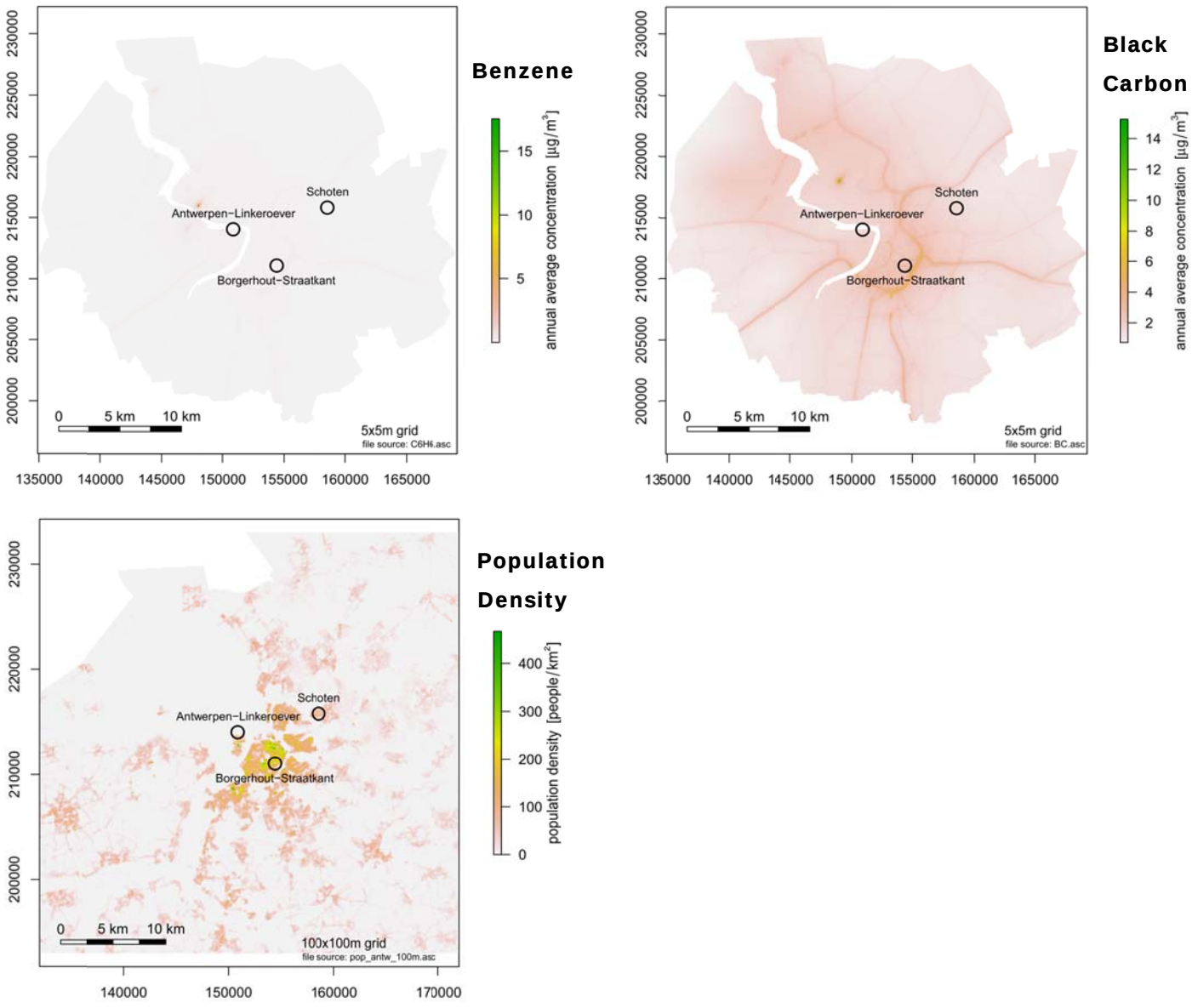

Figure 3: Gridded model data plotted on the Antwerp domain for benzene, black carbon, and population density with the position of the 3 Air Quality Monitoring Stations used for the intercomparison exercise

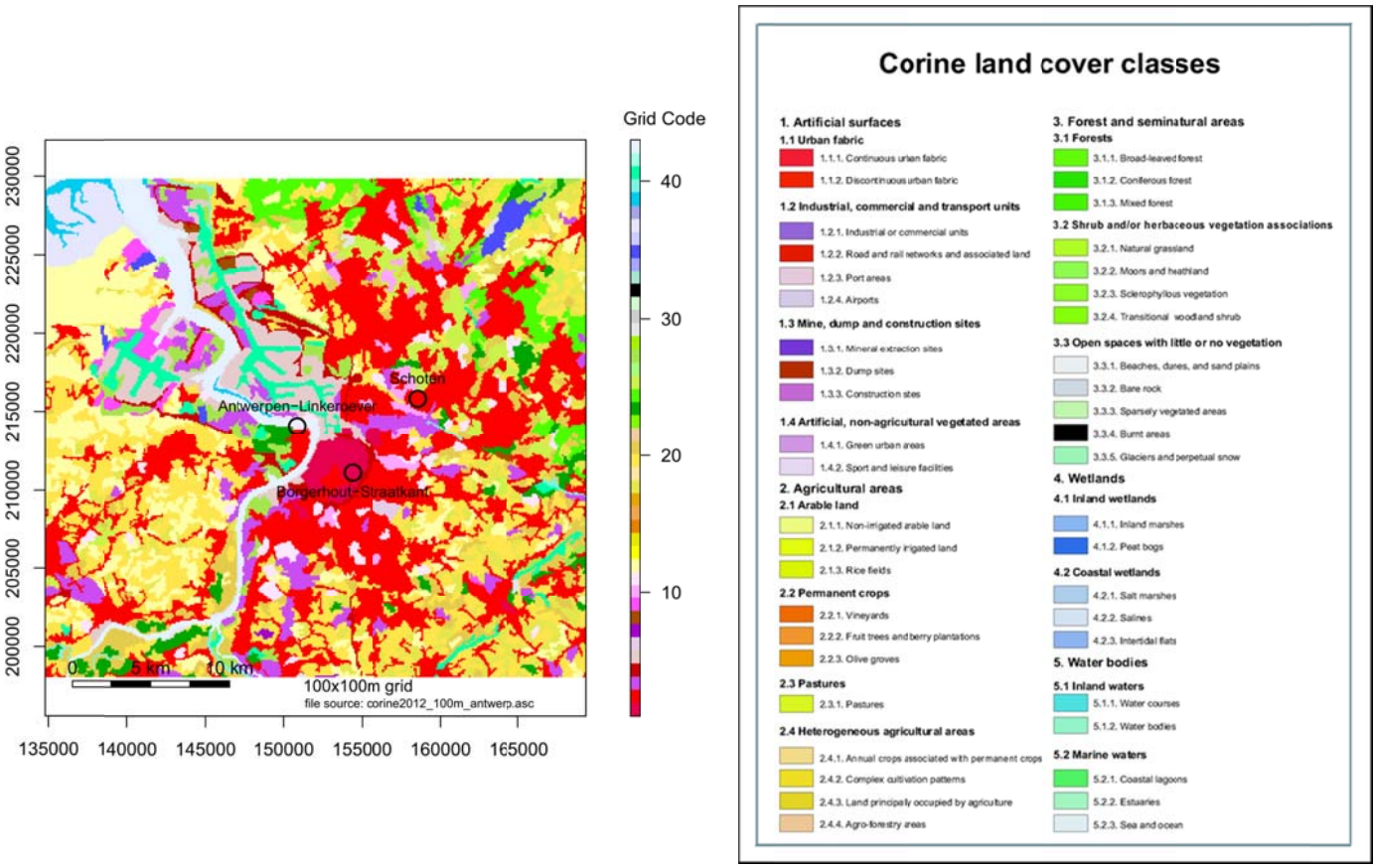

Figure 4: Corine Land Cover for the Antwerp domain with the position of the 3 Air Quality Monitoring Stations used for the intercomparison exercise. Legend with Corine Land Cover classes from the European Environment Agency[6].

6 European Environment Agency: www.eea.europa.eu/data-and-maps/figures/corine-land-cover-2006-by-country/legend

5 Statistical Evaluation, Pre-conditioning and Artificial Noise for the Virtual Monitoring Points Time Series

5.1 Statistical evaluation and temporal aggregation of the time series

A set of 341 virtual monitoring points time series with hourly data has been extracted from the RIO-IFDM-OSPM model chain outputs. The aim of these time series is to simulate virtual monitoring stations with daily averages for PM_{10}, and virtual diffusive samplers with to 2-weeks averages for NO_2 and O_3.

Table 1 compares the temporal variability of these virtual monitoring points time series to the temporal variability of the time series of the existing monitoring stations in Antwerp (pooled standard deviation and pooled relative standard deviation of hourly time series data for the year 2012). Note that the data for the existing stations can be broken down into the station-types (i) industrial, (ii) traffic and (iii) background, whereas the data for the virtual monitoring points can be broken down into stations (i) located within the street canyon and (ii) stations located outside of the street canyon. In a simplified approach, "within the street canyon" can be related to the station-type "traffic", and "outside of the street canyon" can be related to the station-type "background".

Table 1: Comparison of summary statistics for the year 2012 time series of existing monitoring stations in Antwerp (hourly data) and the year 2012 time series of 341 virtual monitoring stations with hourly data obtained from the RIO-IFDM-OSPM model chain outputs. Breakdown of values for the existing stations into station-types "industrial", "traffic" and "background". Breakdown of values for the virtual stations into stations located within the street canyon ("SC") and outside the street canyon ("noSC").

Filter	**Existing Stations**				**Virtual Stations**			
		PM_{10}	**NO_2**	**O_3**		**PM_{10}**	**NO_2**	**O_3**
Number of Stations	all	15	18	3	all	341	341	341
	industrial	8	12	1				
	traffic	2	2	1	SC	100	100	100
	background	5	4	1	noSC	241	241	241
Grand Mean of raw hourly data	all	26.7	35.3	33.8	all	24.7	40.0	31.2
	industrial	27.8	35.2	33.8				
	traffic	28.6	47.4	30.9	SC	26.0	49.4	30.1
	background	24.2	29.7	36.8	noSC	24.1	36.1	31.7
Pooled Standard Deviation of raw hourly data	all	17.3	18.5	27.5	all	15.8	18.2	25.0
	industrial	17.4	18.3	27.6				

	traffic	18.7	22.7	26.6	SC	16.1	18.9	24.8
	background	16.5	16.7	28.2	noSC	15.6	18.0	25.0
Pooled Relative Standard Deviation of raw hourly data	all	0.65	0.53	0.82	all	0.64	0.47	0.81
	industrial	0.63	0.53	0.82				
	traffic	0.65	0.48	0.86	SC	0.62	0.39	0.83
	background	0.68	0.56	0.77	noSC	0.65	0.50	0.80

It can be observed that the temporal variability within the simulated virtual monitoring points time series tends to be slightly lower than the temporal variability within the time series of the existing stations. This observation can consistently be made for all three parameters (PM_{10}, NO_2 and O_3) and for all station types with the exception of O_3 at background stations for which the low number existing stations does not allow computing significant stations. We thus conclude that the simulations with the RIO-IFDM-OSPM model chain did not exaggerate the temporal variability, as it could have been the case for example by the unwanted effect of numerical noise.

In a next preparatory step, the hourly time series for the existing monitoring stations and for the simulated virtual monitoring points have been aggregated within the time domain to form new sets of time series of daily averages and 14-days averages (*Table 2*). Again it can be seen that the temporal variability within the individual simulated virtual monitoring points time series tends to be slightly lower than the temporal variability within the time series of the existing stations for NO_2 and O_3. For the case of PM_{10} the variability within the individual virtual monitoring points time series is now slightly higher than the variability within the times series of existing stations.

Table 2: Pooled Standard deviations of the time series of daily and fortnight averages (aggregated data from the existing Antwerp monitoring stations and from the 341 virtual monitoring stations time series obtained with the RIO-IFDM-OSPM model chain).

Filter	**Existing Stations**				**Virtual Stations**			
		PM_{10}	**NO_2**	**O_3**		**PM_{10}**	**NO_2**	**O_3**
Pooled Standard Deviation of daily averages	all	14.4	13.3	19.4	all	14	12.9	18.2
	industrial	14.7	13.3	19				
	traffic	15.5	15.5	19.8	SC	14.3	12.8	18.2
	background	13.5	12	19.5	noSC	13.9	13.0	18.2
Pooled Standard Deviation of 14-days averages	all	9.3	6.9	14.5	all	9.7	7.1	13.1
	industrial	9.8	7.0	13.9				

	traffic	10.2	7.8	15.2	SC	9.8	6.9	13.1
	background	8.3	6.1	14.3	noSC	9.6	7.2	13.1
Pooled Relative Standard Deviation of daily averages	all	0.54	0.38	0.58	all	0.57	0.34	0.59
	industrial	0.53	0.38	0.56				
	traffic	0.54	0.33	0.64	SC	0.55	0.27	0.61
	background	0.55	0.41	0.53	noSC	0.58	0.37	0.58
Pooled Relative Standard Deviation of 14-days averages	all	0.35	0.20	0.44	all	0.39	0.19	0.42
	industrial	0.35	0.20	0.42				
	traffic	0.36	0.17	0.50	SC	0.38	0.15	0.44
	background	0.34	0.21	0.40	noSC	0.40	0.21	0.42

5.2 Conceptual considerations for adding the noise component

In order to reproduce a realistic situation for the purpose of simulating time series from virtual monitoring stations with daily averages for PM_{10}, and of time series from virtual diffusive samplers with 2-weeks averages for NO_2 and O_3, we decided to add a certain amount of additional random noise to these aggregated data. This also reflects the general consideration that in real world situation indicative measurements have more scattering than reference values.

The ISO 13752[7] standard treats the uncertainty evaluation of a candidate method by direct comparison to a reference method under field conditions. In this ISO standard it is assumed that there is a linear relationship between the concentrations obtained by the reference method (*x*-method) and the concentrations obtained by the method to be tested (*y*-method):

$$\hat{y} = \beta_0 + \beta_1 \cdot x$$

Thereby the values from the reference method (*x*-method) are considered as true values. The difference between the values of a measurement pair *x* and *y* is attributed to the measurement deviation of the test method (*y*-method).

The values of the coefficients β_0 and β_1 are an estimate of the bias of the *y*-method. However, both β_0 and β_1 themselves are as well uncertain with uncertainties $u(\beta_0)$ and $u(\beta_1)$. $u(\beta_0)$ can be considered as a fluctuation of the intercept value, whereas $u(\beta_1)$ describes a fluctuation of the slope.

The standard deviation *s* of the test method associated with $u(\beta_0)$ is estimated by:

[7] Air quality - Assessment of uncertainty of a measurement method under field conditions using a second method as reference, ISO 13752: 1998 (E).

$$s^2 = \alpha_0{}^2 \quad \text{or} \quad s = \alpha_0$$

Likewise, the standard deviation associated with $u(\beta_1)$ is estimated by:

$$s^2 = \alpha_2{}^2 \cdot \mathrm{x}^2 \quad \text{or} \quad s = \alpha_2 \cdot \mathrm{x}$$

In an extension of this first two concepts, the ISO standard 13752 introduces a general variance function that accounts not only for the variability of intercept and slope but also for a statistical noise component with a standard variation proportional to the square root of the concentration value itself (thus approximately proportional to the square root of the x-value). The complete general variance function model (GVM) can then be described by the following equation where α_0, α_1 and α_2 are parameters to be defined, e.g. by fitting the model against experimental data (see hereafter):

$$s^2 = \alpha_0{}^2 + \alpha_1{}^2 \cdot \mathrm{x} + \alpha_2{}^2 \cdot \mathrm{x}^2$$

5.3 Parameterisation of the noise model

For the scope of this FAIRMODE intercomparison exercise it was decided to not take into account the bias between the modelled virtual monitoring stations and the existing stations of Antwerp monitoring network. Parameters β_0 and β_1 are thus considered to be:

$$\beta_0 = 0$$

and

$$\beta_1 = 1$$

Parameter values for α_0, α_1 and α_2 have been chosen by using information obtained from previous studies:

For NO_2 the α_0, α_1 and α_2 values have been taken from a study conducted by Gerboles et al. (2000)3 for the validation of the Radiello diffusive sampler for NO_2 measurements as an indicative technique. The field tests for this study were conducted at the EMEP Monitoring Station at the JRC site in Ispra (Italy) between January and May 2000. For each measurement a set of 6 Radiello samplers were exposed for 1 week. The uncertainty calculations have been performed on 20 pairs of measurements using a logarithmic likelihood method for fitting the parameters values with a linear model for β_0 and β_1 and a second order polynomial model for α_0, α_1 and α_2.

For O_3 the α_0, α_1 and α_2 values have been taken from a study conducted by Detimmermann et al. (2000)4 for the validation of the Radiello diffusive sampler for O_3 measurements as an indicative technique of measurement. The field tests for this study were conducted at the EMEP Monitoring Station at the JRC site in Ispra (Italy) between June and September 1999. Each measurement used a set of 6 Radiello samplers. The exposure times varied from 8 hours to 10 days. The uncertainty calculations have been performed on 39 pairs of measurements using a logarithmic likelihood method for fitting the parameters values with a linear model for β_0 and β_1 and a second order polynomial model for α_0, α_1 and α_2.

For PM_{10} we performed an evaluation based on a dataset obtained in the course of the 2015 Field Comparison Exercise for PM_{10} and $PM_{2.5}$[5]. This exercise has been carried out with 24 participating national reference laboratories at the JRC site in Ispra (Italy) between February and April 2015 (gravimetric measurements with 19 low volume and 5 high volume samplers). For the uncertainty calculations 56 reference measurements of hourly PM_{10} concentrations have been paired with the measurements results of the 24 participants (1245 pairs of gravimetric PM_{10} measurements in total). We then applied an orthogonal regression technique for fitting the parameters values of β_0 and β_1 with a

linear model. In a second step, parameters values for α_0^2 and α_1^2 have been obtained by applying an ordinary linear regression to the squared residuals.

Table 3 summarizes the parameter values used for the general variance function model (GVM) and for the generation of artificial random noise. A graphical illustration of the GVM and of the noisy data simulations is presented in Figure 5.

All random number generation was based on Gaussian probability distributions.

In addition to the general variance function described in ISO 13752 a threshold for a minimum variance value has been introduced that corresponds to the square of one third of the detection limit. This approach was based on the assumption that the detection limit estimates correspond to the threefold value of the uncertainty expressed in standard deviations. However, this feature of the model was in fact not effectively called in the simulations because the concentration range that would be concerned was actually not covered by the x-values contained in the Antwerp datasets (solid lines in rows 1 and 2 of Figure 5:

Furthermore, a rule has been introduced to substitute simulated noisy concentration values that fall below the detection limit by a value equal to the detection limit divided by 2.

Table 3: Parameter values used for the general variance function model (GVM) and for the generation of artificial random noise.

	PM_{10}	**NO_2**	**O_3**
Integration Time Scale	1-day averages	14-days averages	14-days averages
α_0	0	0	0
α_1	0.4668 µg/m^3	0	0.5979 µg/m^3
α_2	not applied	0.0941 µg/m^3	0.1441 µg/m^3
Detection Limit	2.5 µg/m^3	1.1 µg/m^3	2.6 µg/m^3
Minimum Variance	$\left(\frac{2.5\,\mu g/m^3}{3}\right)^2$	$\left(\frac{1.1\,\mu g/m^3}{3}\right)^2$	$\left(\frac{2.6\,\mu g/m^3}{3}\right)^2$
Substitute for Values below the Detection Limit	$\frac{2.5\,\mu g/m^3}{2}$	$\frac{1.1\,\mu g/m^3}{2}$	$\frac{2.6\,\mu g/m^3}{2}$
Random Function Type	Gausssian	Gausssian	Gausssian

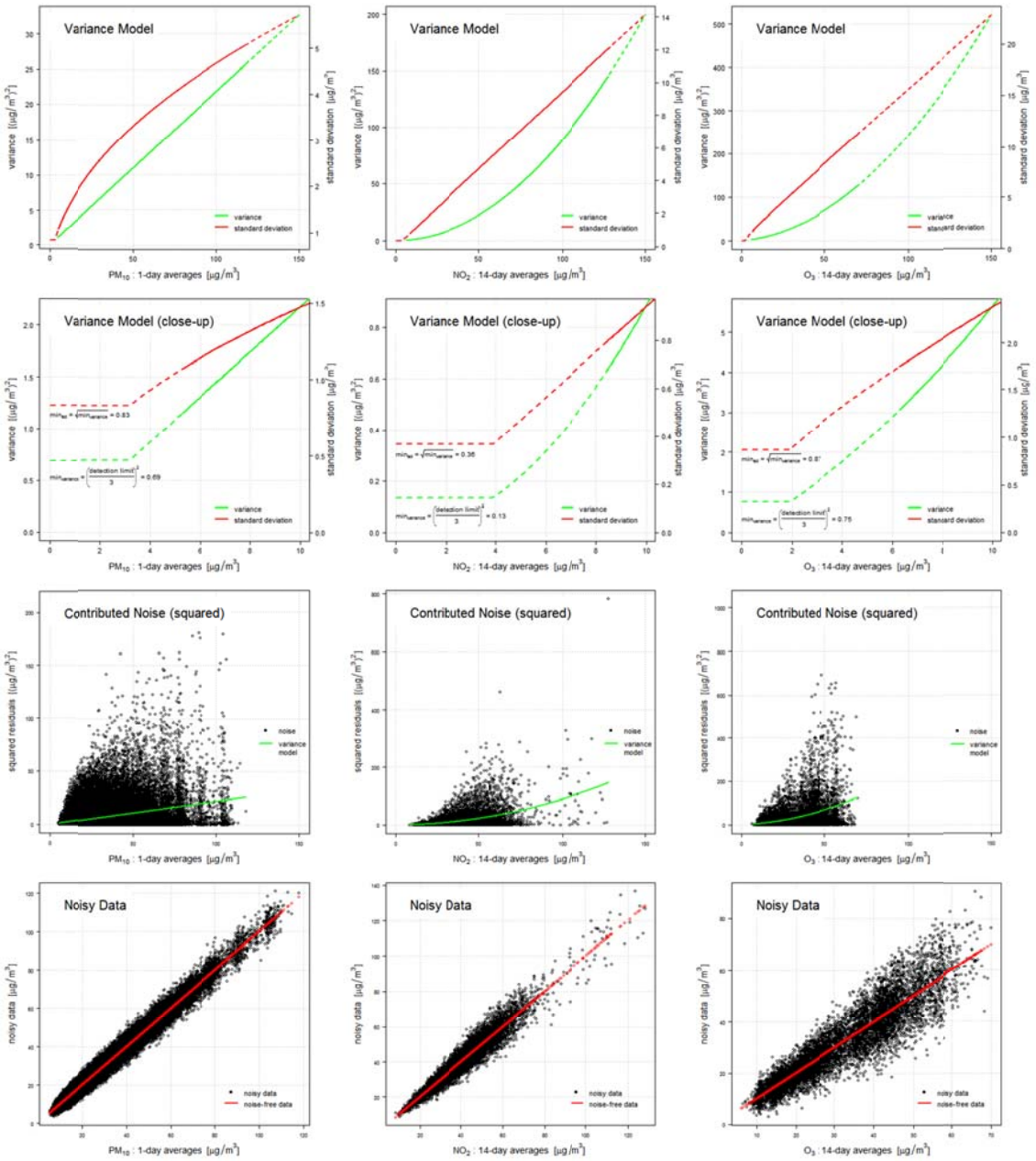

Figure 5:

rows 1 and 2: General variance function models (GVM) used for the generation of artificial random noise for the simulation of virtual monitoring point time series for PM_{10}, NO_2 and O_3. Dashed lines illustrate the evolution of the GVM model as a function of concentration. Solid lines depict the part of the GVM that is actually covered by x-values contained in the Antwerp datasets.

row 3: Evaluation of the contributed noise component expressed as the squared residuals between noisy and noise-free data.

row 4: Comparison of noisy data with noise-free data.

5.4 Simulation of virtual monitoring points time series with added noise.

Table 4 summarizes the temporal variability of the finally simulated virtual monitoring points time series with added noise. Graphical representations of all individual times series for each of the 341 virtual monitoring points are provided in the Appendix 2.

Table 4: Pooled Standard deviations of the time series of daily and fortnight averages with added noise (using aggregated data from the 341 virtual monitoring stations time series obtained with the RIO-IFDM-OSPM model chain).

Filter	**Virtual Stations**			
		PM_{10}	**NO_2**	**O_3**
Pooled Standard Deviation of daily averages with normal noise	all	14.2	13.5	19.2
	SC	14.5	13.7	19.1
	noSC	14.1	13.5	19.2
Pooled Standard Deviation of 14-days averages with normal noise	all	10.0	8.1	14.4
	SC	10.2	8.5	14.3
	noSC	9.8	7.9	14.3
Pooled Relative Standard Deviation of daily averages with normal noise	all	0.58	0.35	0.62
	SC	0.56	0.29	0.64
	noSC	0.59	0.38	0.62
Pooled Relative Standard Deviation of 14-days averages with normal noise	all	0.41	0.21	0.46
	SC	0.39	0.18	0.48
	noSC	0.41	0.22	0.46

6 Deliverables requested to participants

For the FAIRMODE-CCA1 intercomparison exercise, the participants are requested to estimate the area of representativeness for NO_2 and PM_{10} at one traffic site (Borgerhout-Straatkant), and for NO_2, O_3 and PM_{10} at two urban background sites (Antwerpen-Linkeroever and Schoten) with their own method.

<u>For the traffic site</u>

Borgerhout-Straatkant (42R802):

- Belgium Lambert 72 coordinates: 154396 / 211055
- corresponding to virtual station 216 of the modelled datasets

<u>For the urban background sites</u>

Antwerpen-Linkeroever (40AL01):

- Belgium Lambert 72 coordinates: 150865 / 214046
- corresponding to virtual station 7 of the modelled datasets

Schoten (42R8011):

- Belgium Lambert 72 coordinates: 158560 / 215807
- corresponding to virtual station 17 of the modelled datasets

The table below lists the type of output data expected as reported in the antecedent feasibility study[2]. In addition to a description of the methods, participants are requested to report their results following the indications given in the 3rd column of the table. A few methods may fall under several output data categories (table rows). In this case, the participants are kindly requested to report their results following the requirements of each possible category.

Table 5. Types of output of the method of determination of the area of representativeness (results from the antecedent feasibility study[2])

Nº	Output Data (see 1.4)	Number of Methodologies	Output requested: method description and …
1	SR Maps	18	Where possible, shape files shall be reported. Please give also your concentration similarity threshold used to estimate the extent of SR. In addition please answer to other rows (2 to 6) if possible
2	Simplified metrics	11	Metrics definition, metrics values. Please report the concentration similarity threshold if relevant
3	Scale	9	Scale definition, scale description and values if any. Please report the concentration similarity threshold, if relevant
4	Similarity of locations	6	Gives the characteristics used to evidence similarity, their values and

			where possible report shape files. Please report the concentration similarity threshold if relevant
5	Spatial variance	1	Variance values. If relevant give the concentration similarity threshold
6	Other statistical means	3	Description of statistical method and values (e. g. pattern recognition, index of representativeness and other statistics). Please report the used concentration similarity threshold if relevant
7	Others	5	Description of the method photos with qualitative description and station categorization
8	No answer	3	

Additionally, the area of representatives of a subset of the virtual monitoring sites can be determined. This was already proposed at the meeting in Aveiro last year. In Figure 6, we propose a list of 8 virtual stations, presented at the Zagreb meeting in June 2016, selected to ensure a wide range of NO_2, O_3 and PM_{10} concentration levels, geographical locations and type of emissions.

Moreover, the scope of the IE can be extended to the comparison of the classification of a subset of virtual stations, as already proposed for the comparison of the area of representativeness. We will propose a list of virtual stations and check if sufficient participants are interested at the next meeting in Zagreb.

Participants are expected to upload their estimate by 30 November 2016. On request, the delivering of results can be slightly postponed.

Participants should upload their file results at ftp://srv-ies-ftp.jrc.it/H02/fairmode_cca1. A software equivalent to Filezila (see Appendix 3) can be used for transferring the files. The password will be provided by mail.

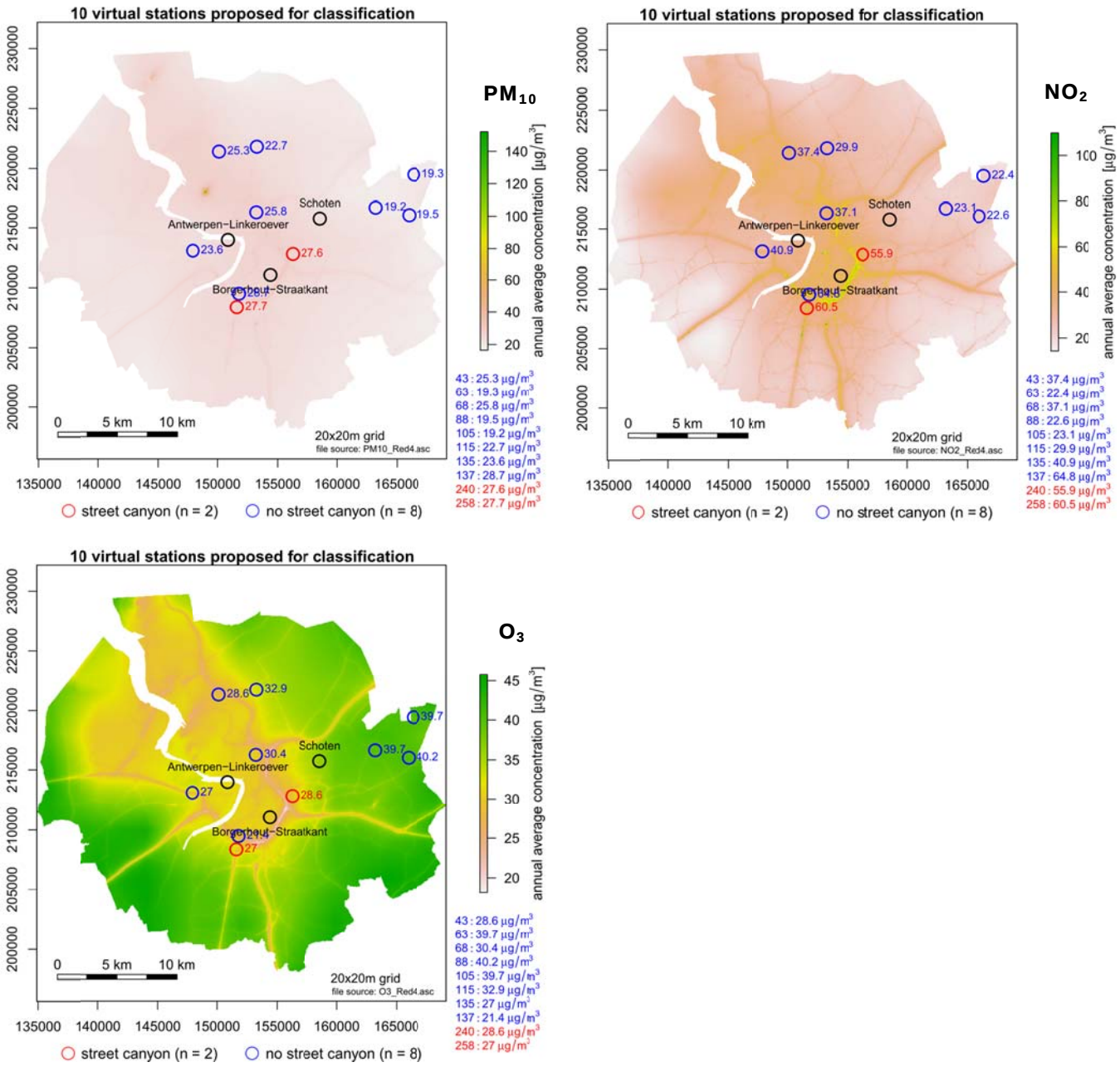

Figure 6: Gridded model data plotted on the Antwerp domain for PM_{10}, NO_2 and Ozone with the position of the 3 Air Quality Monitoring Stations used for the intercomparison exercise. 10 additional virtual stations are shown, 8 of them (in blue font) have been proposed for classification.

7 Towards data treatment of results

The data treatment of the results of the IE will focus on the comparison of the area of SR of AQMS estimated by all methods of participants. This will include quantitative estimations (as for example maps of continuous or non-continuous areas) and qualitative estimates. In order to simplify the data treatment of the results of the IE, the participants agreed that for those methods whose output consist of a contour map of the area of SR, a consensus reference area of SR can be computed using the intersection of all the SR maps.

The output variables to be used in the intercomparison exercise would be SR maps, dimensions of the SR area (surface area, radius) and intermediate maps (where applicable) such as concentration fields. It may be easier to derive an index for these parameters in order to ease the comparisons.

A few participants proposed to test the threshold parameter defining the extent of the area of SR using sensitivity analysis at a 2nd step of the data treatment. The possibility to compare the classification of AQMS was marginally cited for the methods that are able to estimate this classification.

It is proposed to do two types of comparisons:

1. To compare the outputs from methodologies with the same definitions within subgroups, in order to analyse the variability in the SR area estimates obtained from similar methodologies or based on similar definitions. However, it may be difficult to perform this type of comparisons and the results may be statistically insignificant in case there would be a lack of sufficient participants in the IE.

2. To compare the outputs from all methodologies(analyse the variability of the SR area estimates provided by different methodologies or SR definitions) in order to obtain more information about a general definition of SR

8 Conclusion

This report presents a datasets suitable for the FAIRMODE Intercomparison Exercise (IE) of the area of spatial representativeness (SR) of the air quality monitoring stations in the urban area of the city of Antwerp (Belgium) for the year 2012. Three monitoring stations (Borgerhout-Straatkant, Antwerpen-Linkeroever, Schoten) have been selected for the evaluation. The dataset includes the model results for interpolated annual means on a fine regular grid, hourly time series at a number of 341 virtual receptor points to which random noise have been added, data from measurements of the regular Antwerp monitoring stations, individual sampling campaigns, emissions, traffic, population density, building information, gridded CORINE land cover data, a short summary of PM_{10} speciated data, and daily time profiles for traffic intensities.

At the FAIRMODE meeting in Zagreg (27-29 June 2016), the objectives of the intercomparison exercise have been slightly amended and include:

- determining the area of representativeness of the NO_2 and PM_{10} measurements of station Borgerhout-Straatkant (traffic site, code 42R802)
- determining the area of representativeness of the NO_2, O_3 and PM_{10} measurements of the background stations Antwerpen-Linkeroever (code 40AL01) and Schoten (code 42R8011)
- the scope of the IE was extended by adding the determination of the area of representativeness for 8 virtual stations (stations nº 43, 63, 68, 88, 105, 115, 135 and 137)

Additionally, we added the comparison of the classification of these 8 virtual stations to the scope of the IE (determining the classifications is not mandatory). During the discussion in Zagreb, participants expressed their interest for the classification of the virtual stations, in particular for the "tricky" classification of 2 sites at the north of Antwerp (virtual stations 43 and 115) between the industrial area, highways and at the border of background areas.

During this discussion, it was agreed that all participants shall report their estimated area of spatial representativeness with quantitative values (surface area in km^2) and that the areas shall be identified with shape files or raster files. The density of inhabitants and the standard deviations of pollutant values within the area of representativeness shall be computed and reported. Even for the qualitative methods that are essentially descriptive, quantitative values shall be provided for comparison purposes. The results that participants have to deliver will be more clearly defined within a template form that will be sent to the participants in September 2016.

The deadline for sending the SR outcomes was set to 30 October 2016 with a few possibilities to postpone to the end of November on request.

During the discussion, there was a general interest in the conclusions of the IE, also expressed by those FAIRMODE members that do not currently actively participate in this action. In particular, the attending FAIRMODE members proposed the development of guidelines together with a cost-benefit analysis, showing what improvement can be expected by increasing the type of input data supplied to the methods of determination of SR.

Appendix 1: Description of data delivered in the framework of the FAIRMODE exercise on spatial representativeness methods

Distribution: General

Final report

Description of data delivered in the framework of the FAIRMODE exercise on spatial representativeness methods

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Study accomplished under the authority of JRC
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PREFACE

Within FAIRMODE, the Forum for Air Quality Modelling in Europe, the cross-cutting activity group on spatial representativeness (FAIRMODE CCA-1, coordinated by Oliver Kracht) is planning to organize an intercomparison exercise (IE) of methods for the assessment of the spatial representativeness (SR) of air quality monitoring sites. The main objective of this activity will be to evaluate the possible variety of spatial representativeness results obtained by applying the range of different contemporary approaches to a jointly used example case study.

As a first preparatory step for this intercomparison exercise, to be organized by JRC, a feasibility study has been conducted by CIEMAT (Spain) in the course of the first half of 2015 (Martin et al. 2015). This feasibility study comprised the evaluation of a detailed questionnaire which had beforehand been circulated amongst prospective participants within the FAIRMODE and AQUILA community.

Based on the outcomes of this feasibility study, the CCA-1 group agreed during the FAIRMODE meeting in Aveiro (24-25 June 2015) that the scope of the example case study will be to estimate the SR of selected air quality monitoring stations located in the urban area of the city of Antwerp. As a first objective, it was decided that the IE would aim at assessing the participants SR estimates for PM_{10} and NO_2 at one traffic station, and for PM_{10}, NO_2 and O_3 at two urban background stations. As a second objective, the participants agreed that an additional number of virtual stations may be extracted from the output of modelled air quality data and could be subject to the same data treatment of the IE as for the 3 other stations mentioned before. Subsequently, the year 2012 has been identified as the most suitable one with regards to data availability, and the three monitoring stations (Borgerhout II, Antwerpen-Linkeroever, Schoten) have been selected for the evaluation.

The following report describes the preparation of datasets to be used within the FAIRMODE intercomparison exercise. The model results, comprising gridded annual means and timeseries for a number of 341 virtual receptor points, have been prepared by VITO (Belgium) by applying the RIO-IFDM-OSPM model chain. Furthermore, the dataset compiled by VITO includes data from measurements of the regular Antwerp monitoring stations, individual sampling campaigns, emissions, traffic, population density, building information, and gridded CORINE land use data. For the next step, these data can now serve as the common basis for the FAIRMODE spatial representativeness exercise.

CHAPTER 1 INTRODUCTION

Eight datasets were delivered to JRC for use in the FAIRMODE intercomparison exercise of spatial representativeness methods. This report describes these datasets, which deal both with air quality measurements and air quality modelling for the city of Antwerp in Flanders, Belgium. The reported measurements originate from the telemetric system, mobile measurements and campaigns with passive samplers. The model results are obtained by applying the RIO-IFDM-OSPM model chain. In this model chain, the RIO-model, a land-use regression model based on the data of the official monitoring network in Belgium, provides the regional background concentration. The local increment due to traffic and industrial emissions is calculated using IFDM, a bi-Gaussian plume model designed to simulate non-reactive pollutant dispersion at a local scale. To avoid double-counting of the sources, a special coupling between the regional model (RIO) and the urban-scale model (IFDM) is applied. Finally, to calculate street level concentrations in street canyons, the RIO-IFDM chain is coupled to the OSPM box model. More details on the models and the coupling between them is provided in the appendix.

Within the framework of the FAIRMODE intercomparison exercise, the following three stations are foreseen to be selected for closer evaluation. This selection has also influenced the positioning of the 341 virtual receptor points.

<u>For the traffic site</u>
Borgerhout II

- Belgium Lambert 72 coordinates: 154396 / 211055
- corresponding to virtual station 216 of the modelled datasets

<u>For the urban background sites</u>
Antwerpen-Linkeroever:

- Belgium Lambert 72 coordinates: 150865 / 214046
- corresponding to virtual station 7 of the modelled datasets

Schoten:

- Belgium Lambert 72 coordinates: 158560 / 215807
- corresponding to virtual station 17 of the modelled datasets

CHAPTER 2 DATASETS

2.1. MEASUREMENTS OF THE ANTWERP MONITORING STATIONS FOR THE YEAR 2012

A list of files is presented:

- General_info.csv: A file with general information on the measurements. The list of measurement locations is given on lines 7-32, where column B is the measurement location code, column C the full name, column G the X-coordinate in Belgium Lambert 72 (EPSG: 31370), column H the Y-coordinate in Belgium Lambert 72 (EPSG: 31370), column I the height above sea level and column K the classification of the station. Information on the pollutants is given in lines 37-61. The classification of the stations is based on the official classification of the Belgian Interregional Environment Agency, which can be found at http://www.irceline.be/en/air-quality/measurements/monitoring-stations.
- bc.csv: Measurements of BC in 0.01 µg/m³. Row 2: measurement location; Row 3: measurement principle; Row 5: maximum measured value. Row 6: Average measurement. Row 7: Minimum measured value. Row 8: Number of valid measurements. Row: 10-8793: hourly averaged measurements. Column A: date. Column B: Time. Other columns: measurement values. Values lower than 0 are missing values.
- btx.csv: Measurements of different VOCs in 0.01 µg/m³. Row 2: measurement location; Row 3: measurement principle; Row 5: maximum measured value. Row 6: Average measurement. Row 7: Minimum measured value. Row 8: Number of valid measurements. Row: 10-8793: hourly averaged measurements. Column A: date. Column B: Time. Other columns: measurement values. Values lower than 0 are missing values.
- co.csv: Measurements of CO in 0.01 mg/m³. Row 2: measurement location; Row 3: measurement principle; Row 5: maximum measured value. Row 6: Average measurement. Row 7: Minimum measured value. Row 8: Number of valid measurements. Row: 10-8793: hourly averaged measurements. Column A: date. Column B: Time. Other columns: measurement values. Values lower than 0 are missing values.
- meteo.csv: Measurements of meteorological parameters at one location (M802). Row 1: meteorological parameter (DD = wind direction in 0.1°; VM = Vectoral wind speed in 0.01 m/s; FF = scalar wind speed in 0.01 m/s; T1 = Temperature at 2m height in 0.1°C; RH = relative humidity in %; RR = precipitation in 0.1 mm; Gr is solar radiation in W/m²). Row 5: maximum measured value. Row 6: Average measurement. Row 7: Minimum measured value. Row 8: Number of valid measurements. Row: 10-8793: hourly averaged measurements. Column A: date. Column B: Time. Other columns: measurement values. Values lower than -8000 are missing values. The meteo-mast is located slightly north of the city centre of Antwerp, at the location of the Antwerp-Luchtbal measurement station. Lambert-72 coordinates: (153884, 216790).
- no.csv: Measurements of NO in µg/m³. Row 2: measurement location; Row 3: measurement principle; Row 5: maximum measured value. Row 6: Average measurement. Row 7: Minimum measured value. Row 8: Number of valid measurements. Row: 10-8793: hourly averaged measurements. Column A: date. Column B: Time. Other columns: measurement values. Values lower than 0 are missing values.
- no2.csv: Measurements of NO_2 in µg/m³. Row 2: measurement location; Row 3: measurement principle; Row 5: maximum measured value. Row 6: Average measurement. Row 7: Minimum measured value. Row 8: Number of valid measurements. Row: 10-8793:

hourly averaged measurements. Column A: date. Column B: Time. Other columns: measurement values. Values lower than 0 are missing values.

- ozon.csv: Measurements of O_3 in µg/m³. Row 2: measurement location; Row 3: measurement principle; Row 5: maximum measured value. Row 6: Average measurement. Row 7: Minimum measured value. Row 8: Number of valid measurements. Row: 10-8793: hourly averaged measurements. Column A: date. Column B: Time. Other columns: measurement values. Values lower than 0 are missing values.
- pm10.csv: Measurements of PM_{10} in µg/m³. Row 2: measurement location; Row 3: measurement principle; Row 5: maximum measured value. Row 6: Average measurement. Row 7: Minimum measured value. Row 8: Number of valid measurements. Row: 10-8793: hourly averaged measurements. Column A: date. Column B: Time. Other columns: measurement values. Values lower than 0 are missing values.
- pm25.csv: Measurements of $PM_{2.5}$ in µg/m³. Row 2: measurement location; Row 3: measurement principle; Row 5: maximum measured value. Row 6: Average measurement. Row 7: Minimum measured value. Row 8: Number of valid measurements. Row: 10-8793: hourly averaged measurements. Column A: date. Column B: Time. Other columns: measurement values. Values lower than 0 are missing values.
- so2.csv: Measurements of SO_2 in µg/m³. Row 2: measurement location; Row 3: measurement principle; Row 5: maximum measured value. Row 6: Average measurement. Row 7: Minimum measured value. Row 8: Number of valid measurements. Row: 10-8793: hourly averaged measurements. Column A: date. Column B: Time. Other columns: measurement values. Values lower than 0 are missing values.

Time is in universal time (UTC). In winter, this is local time -1 hour; in summer, this is local time -2 hour.
Detailed meta information on the VMM measuring stations can be found in the appendices of the overview report of the Flemish Environmental Agency (VMM, 2014) [only available in Dutch].

2.2. MEASUREMENTS OF SAMPLING CAMPAIGNS WITH PASSIVE SAMPLERS AND MOBILE STATIONS

5 files are present here:

- general_info_atmosysNO2.csv: A file with general information on the NO_2-measurements. The list of measurement locations is given on lines 45-50, where column B is the measurement location code, column C the city, column D the address, column E the classification, column F the X-coordinate in Belgium Lambert 72 (EPSG: 31370), column G the Y-coordinate in Belgium Lambert 72 (EPSG: 31370) and column H the height above sea level. The measurement periods are given in lines 14-40, with column B denoting the name of the measurement period, column C the beginning of the measurement period, column D the end of the measurement period and column E the average temperature during the measurement period.
- measurements_atmosysNO2.csv: A file with the measurements. Three columns are present per measurement location (row 1) and measurement period (column A) as three passive samplers were always present at one location. Rows 2-28 show the measurements at these locations. Rows 32-58 show the average, the standard deviation and the ratio between those values.
- general_info_atmosysPM.csv: A file with general information on the PM_{10}-measurements. The list of measurement locations is given on lines 14-19, where column B is the measurement location code, column C the city, column D the address, column E the classification, column F the X-coordinate in Belgium Lambert 72 (EPSG: 31370), column G

the Y-coordinate in Belgium Lambert 72 (EPSG: 31370) and column H the height above sea level. Some explanation about the measurements is given in lines 8 and 9.

- dataPart1_atmosysPM.csv: A file with the measurements. Column A denotes the measurement period, row 1 denotes the pollutant (vol = volume of sampler, PM(net) = total PM10, EC = elementary carbon, OC = Organic carbon, levo = levoglucosan, rest = ions). All data is in µg/m³ except for volume. Averages are given in row 97.
- dataPart2_atmosysPM.csv: A file with the measurements. Column A denotes the measurement period, row 1 denotes the pollutant (heavy element concentrations). All data is in µg/m³ except for volume. Averages are given in row 97.

2.3. GRIDDED YEARLY MEAN CONCENTRATION DATA FROM THE RIO-IFDM-OSPM MODEL

Annual mean gridded concentrations for 2012 on a 5x5 m² grid as calculated by the RIO-IFDM-OSPM model chain, provided in ArcGis ASCII-format. A detailed description of the model chain is provided in the appendix.

Metadata:

- Unit: µg/m3.
- Included emissions in the IFDM-modelling: traffic (line sources, see section 0) and industrial point sources (local point source data set, see the discussion in the appendix). Other emissions are contained in the background concentration as modelled by the land use regression model RIO (except for benzene, see below).
- Geographic projection: Belgium Lambert 72 (EPSG: 31370)
- File naming is based on the pollutant.
    - NO2.asc: Nitrogen Dioxide
    - BC.asc: Black Carbon
    - PM25.asc: Particulate matter with a diameter of 2.5 micrometres
    - PM10.asc: Particulate matter with a diameter of 10 micrometres
    - C6H6.asc: benzene. Due to the lack of benzene measuring stations, there is no RIO-background concentration. Hence, the benzene maps only show the local contribution of traffic and industrial point sources. Measurements at the Borgerhout measuring station indicate that the annual mean background concentration is approximately 0.7 µg/m^3.
    - O3.asc: Ozone. Note that the RIO-IFDM-OSPM model has no output for O_3 concentrations within the street canyon, hence the RIO-IFDM results (without street canyon contribution) are reported. More details here over are reported in the appendix.

2.4. VIRTUAL MONITORING POINTS

A list of the virtual monitoring points is provided in virtual_stations.csv:

- Column A: Label of the virtual monitoring station.
- Column B and C: coordinates in Belgium Lambert 72 (EPSG: 31370)
- Column D: streetcanyon ("SC") or non-streetcanyon ("no SC"). In total 341 points are presented, distributed over 241 non-streetcanyon and 100 streetcanyon points.
- Column E: source of the virtual station. There are 6 different types:
    - ATMOSYS: measurement locations of the ATMOSYS-campaign (see 2.2)
    - Telemetric: locations of the monitoring stations of the telemetric network (see 2.1)
    - Random: randomly chosen locations that represent the gradient of the concentrations in the Antwerp area

  - Random_SC: randomly chosen street canyon locations that represent the gradient of the concentrations in the Antwerp area
  - Tunnel exit: locations chosen close to tunnel exits
  - Circles Borgerhout: non-streetcanyon locations located on four concentric circles around the streetcanyon measurement station of Borgerhout (100m, 200m,300m and 500m distance to the station)
  - SC Borgerhout: streetcanyon locations around the Borgerhout station (taxicab driving distance to the station varying between 100m and 750m)
  - Perpendicular: virtual stations located perpendicular to roads in the neighborhood of the measuring stations of Borgerhout and Schoten. The roads are chosen according to their varying traffic intensity (with three categories: major, middle and minor).
- Column F: For the non-streetcanyon locations around the Borgerhout station: distance to the Borgerhout station
- Column G: For the streetcanyon locations around the Borgerhout station: taxicab distance to the Borgerhout station (following only roads in streetcanyons)
- Column H: For the stations perpendicular to the roads: distance to the road under consideration
- Column I: For the stations perpendicular to the roads: road type (major, middle or minor).

The location of the virtual stations is visualized in Figure 1.

The time series of the concentrations at these point are provided in 5 CSV-files (one per pollutant).
Metadata:

- Unit: µg/m3.
- File naming is based on the pollutant.
  - NO2.asc: Nitrogen Dioxide
  - BC.asc: Black Carbon
  - PM25.asc: Particulate matter with a diameter of 2.5 micrometres
  - PM10.asc: Particulate matter with a diameter of 10 micrometres
  - C6H6.asc: benzene. Due to the lack of benzene measuring stations, there is no RIO-background concentration. Hence, the benzene maps only show the local contribution of traffic and industrial point sources. Measurements at the Borgerhout measuring station indicate that the annual mean background concentration is approximately 0.7 µg/m^3.
  - O3.asc: Ozone. Note that the RIO-IFDM-OSPM model has no output for O_3 concentrations within the street canyon, hence the RIO-IFDM results (without street canyon contribution) are reported. More details here over are reported in the appendix.

- The results for the virtual stations are provided in the columns of the file. Detailed lay-out:
  - The first row provides the label of the virtual monitoring station (which matches with the label provided in the file virtual_stations.csv).
  - The second and third row provide the coordinates in Belgium Lambert 72 (EPSG: 31370)
  - Rows 4 – 8787 provide the concentration for the 8784 hours of the year 2012. The first column indicates the hour of the year, in the other columns the concentrations can be found.

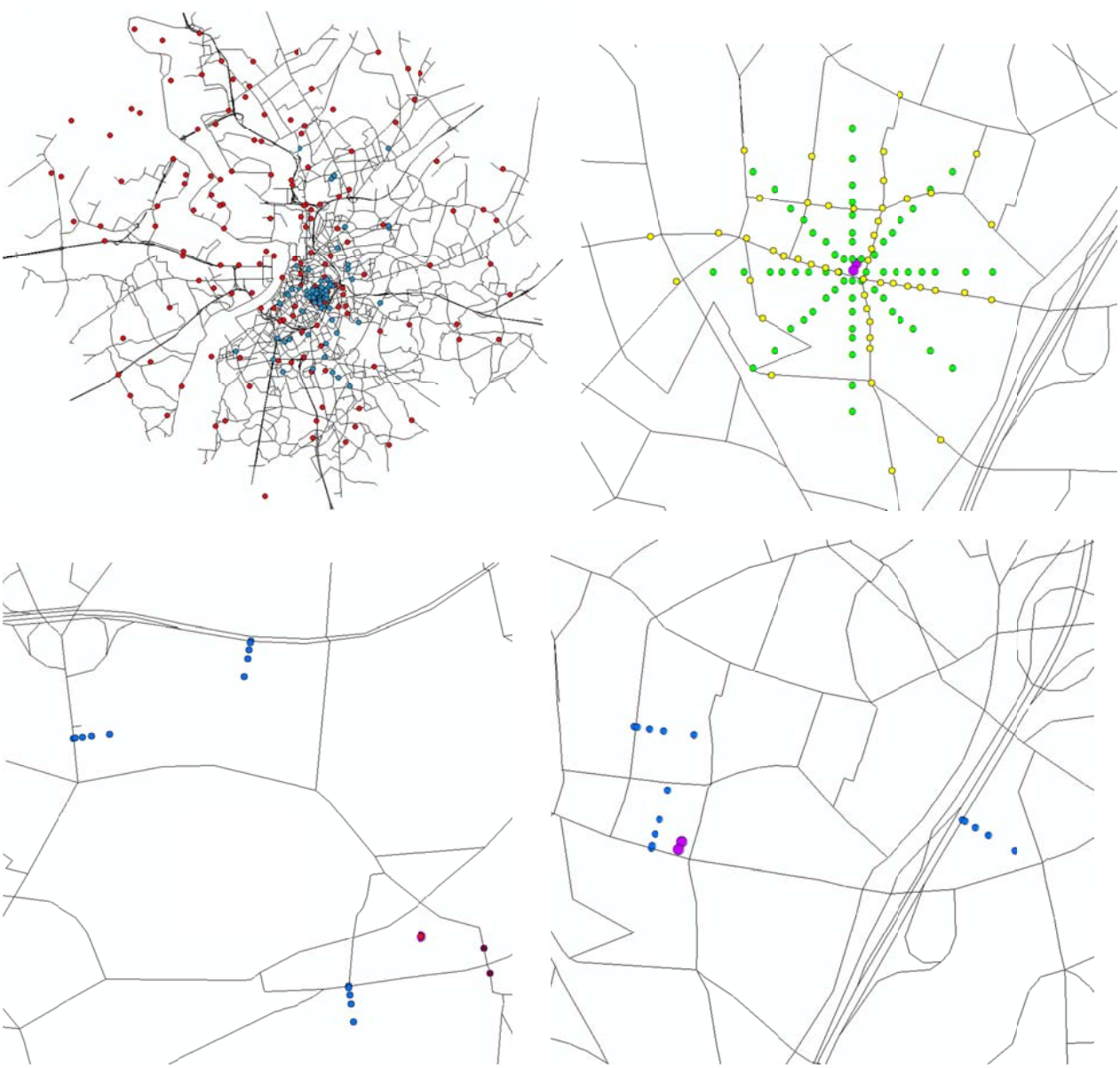

Figure 1: Location of the virtual monitoring stations. Upper left: entire domain (red: non-streetcanyon, blue: streetcanyon). Upper right: zoom around the measurement stations at Borgerhout (stations: purple, non-streetcanyon: green, streetcanyon: yellow). Lower left: locations of the stations in series perpendicular to the roads around the Borgerhout street canyon station (station:purple, virtual points: blue). Lower Right: locations of the stations in series perpendicular to the roads around the Schoten urban background station (station:purple, virtual points: blue).

2.5. EMISSION DATASETS IN THE REGION

A list of files with gridded emission data on 1x1km² are presented:

- CO_OPS_2012_0.csv: gridded emissions at a 1x1km² grid for CO. Column A and B are respectively the X- and Y-coordinate of the center of the 1x1 km² grid cells in Belgium Lambert 72 (EPSG: 31370). The other columns are emissions (in g/s) for the different snap-sectors and (last column) the total of the snap sectors. Missing snap sectors denote snap sectors without emissions. Last row = total per snap sector. A list of the snap sectors is provided in Table 1.
- NH3_OPS_2012_0.csv: as CO_OPS_2012_0.csv but for NH_3.
- NMVOS_OPS_2012_0.csv: as CO_OPS_2012_0.csv but for NMVOS.
- NOx_OPS_2012_0.csv: as CO_OPS_2012_0.csv but for NO_x, expressed in NO_2-equivalents.
- PM10_OPS_2012_0.csv: as CO_OPS_2012_0.csv but for PM_{10}.
- PM25_OPS_2012_0.csv: as CO_OPS_2012_0.csv but for $PM_{2.5}$.
- SOx_OPS_2012_0.csv: as CO_OPS_2012_0.csv but for SO_2.

These 1x1km² gridded emission files contain all the emissions in the domain (including point sources and road traffic emissions regridded to the 1x1km² resolution). In addition, some extra files are presented to further downscale the emissions to a higher resolution:

- traffic_meanhour.csv: average traffic at one hour on line segments. Column A: ID. Column B-E: X- and Y-coordinates of begin and end of line segment in Belgium Lambert 72 (EPSG: 31370). Column F: length of line segment in km. Column G: number of heavy duty vehicles. Column H: number of passenger cars. Column I: road type (1 = highway, 2 = rural road, 3 = urban road). Column J: Free-flow speed (in km/h).
- Road_emissions.csv: Annual average emissions (in kg/km/year) per line segment for different pollutants.
    - The data file is formatted as following:
        - Column A: ID-number.
        - Column B-E: X- and Y-coordinates of begin and end of line segment in Belgium Lambert 72 (EPSG: 31370).
        - Columns F-M: emissions in kg/km/year.
    - Note that these emissions are also included in the 1x1km² gridded emissions, this file denotes how these emissions are spread across the roads in the grid cells. There are hence two modelling options. One could use the area sources from the gridded emissions data set and model on a 1km resolution. Alternatively, one could eliminate the traffic emissions from the area sources (SNAP sector 7), and use the line sources instead to model on a much higher resolution. No procedure to avoid double counting of the sources is needed in this second case, since the line emissions match the SNAP sector 7 area emissions.
    - Tunnels are not yet eliminated from this dataset.
- Point_sources.csv: Annual total point source emissions for 2010 reported by the Belgian government in the scope of the CLRTAP-agreement (The 1979 Geneva Convention on Long-range Transboundary Air Pollution).
    - The data file is formatted as followed:
        - The top two rows provide the header, including the column title (first row) and unit (second row). The following rows provide the data:
            - Column A: Name of plant
            - Column B: category

- Column C: Height class: 1 (h < 45m), 2 (45m < h < 100m), 3 (100m < h < 150m), 4 (150m < h < 200m), 5 (h > 200m), 0 (unknown)
- Column D and E: latitude and longitude coordinates
- Column F and G: coordinates in Belgian Lambert (in m)
- Column H – V: emissions per year (unit is provided in the second row).

▪ The last row provides the total emissions per pollutant. Source of the data: http://cdr.eionet.europa.eu/be/un/UNECE_CLRTAP_BE/envt0_dfa.

o In the modelling exercise, a different (local) point source dataset has been used. Due to confidentiality agreements, VITO is not allowed to disclose this (high resolution) dataset, but the emissions of this dataset are included in the 1x1km² gridded emissions. A comparison between the CLRTAP dataset and the (confidential) local point source data is provided in the appendix.

o Since the point source data included in the 1x1km² gridded emissions differ slightly form the point source data in this file, one must take care in combining both datasets and apply a suited double counting procedure. More information on the coupling can be found in the appendix and in Lefebvre, 2011b.

Snap sector	Sector Description
1	Combustion in energy production and transformation
2	Non-industrial combustion plants
3	Combustion in manufacturing industry
4	Production processes
5	Extraction and distribution of fossil fuels and geothermal energy
6	Solvent use and other product use
7	Road transport
8	Other mobile sources and machinery
9	Waste treatment and disposal
10	Agriculture

Table 1: List of snap sectors.

2.6. POPULATION DENSITY IN THE DOMAIN

pop_antw_100m.asc: Population in the domain gridded on a 100x100 m² grid. Geographic projection is Belgium Lambert 72 (EPSG: 31370).

2.7. BUILDING INFORMATION

Buildings.* : Building information for all buildings in the domain. Every building is represented as a polygon with altitude being its altitude in cm.

2.8. CORINE LAND USE DATA

- corine2012_100m_antwerp.asc: Corine land cover classification 2012 version (CLC2012) in the domain gridded on a 100x100 m² grid. Geographic projection is Belgium Lambert 72 (EPSG: 31370).
- Legend.csv: overview of the different classes
- Source: http://land.copernicus.eu/pan-european/corine-land-cover

Appendix: Analysis of point source data sets

Comparison between CLRTAP dataset and VITO point sources

The CLRTAP-point source dataset provided in §0 differs from the local dataset that has been used in the RIO-IFDM-OSPM model chain, since VITO is not allowed to disclose the latter data due to confidentiality agreements[1]. Instead, the point sources reported by the Belgian government in the scope of the CLRTAP (The 1979 Geneva Convention on Long-range Transboundary Air Pollution) agreement are provided (data source: http://cdr.eionet.europa.eu/be/un/UNECE_CLRTAP_BE/envt0_dfa). There are several differences between both datasets. However, as reasoned in the following, these do not significantly influence the modelled concentrations. Partners can therefore as well start their modelling exercise using the CLRTAP dataset.

Firstly, the data reported in the CLRTAP dataset contains emissions for the year 2010, while the emissions in the VITO model are for 2012. However, the evolution in industrial emissions between 2010 and 2012 is more or less comparable with the interannual variability (PM10: 10% increase between 2010 and 2012, PM2.5: 10% increase, NO_x: 8% decrease [source: VMM,2014]). Secondly, the CLRTAP dataset contains less sources than the local data, since only the large point sources are reported. Table 2 shows the total yearly emissions included in both datasets. For NO_x the total yearly concentration is almost the same in both datasets (even being a little higher, which is probably related to the difference between the 2010 and 2012 emissions), and hence the CLRTAP provides a good alternative for the confidential dataset. On the other hand, all point sources are missing for particulate matter. These missing sources however contain a limited fraction of the total emissions in the domain, as shown in Table 3. Anew, the CLRTAP constitutes an acceptable alternative for the confidential dataset. Thirdly, the spatial spread of both datasets differ. Whereas the local data provides actual location of the stacks, the CLRTAP coordinates usually point to the location of the official address of the company. Especially for some large industrial plants in the port of Antwerp, this provides a limitation (with inaccuracies up to 2km). There is however no better dataset available.

Finally, since a substantial part of the industrial emissions occur at height, their influence on the surface concentrations is rather limited. Hence it is crucial to know the height of the stacks. Table 4 shows that the height information in CLRTAP is far from perfect, but for most height categories the order of magnitude of the total emissions matches the one contained in the local dataset, and the total emission in the lowest layer correspond to those in the local dataset.

Ton/year	**NO_x**	**PM_{10}**	**$PM_{2.5}$**
Local dataset (2012)	12488	425	219
CLRTAP (2010)	12589	0	0
E-PRTR (2012)	11422	106	0

Table 2: Comparison of the total yearly concentrations (in ton) contained in the three datasets under consideration.

[1] Note, however, that the point sources of the local dataset are included in the gridded 1x1km² emission datasets.

	PM_{10}	$PM_{2.5}$
Total emissions in domain (ton/year)	5517	4496
Total emissions in local point sources (ton/year)	425	219
Fraction emissions in point sources	8%	5%

Table 3: Analysis of the fraction of emissions that is contained in point sources for PM.

Height category	Local dataset	CLRTAP
1 (h > 45m)	6125	6100
2 (45m < h < 100m)	5530	4590
3 (100m < h < 150m)	700	135
4 + 5 (h > 200m)	60	0
Unknown		1765

Table 4: Analysis of the height of the NO_x-emissions (in ton/year) for both datasets.

Alternative: E-PRTR data

As an alternative to the CLRTAP dataset, also the E-PRTR data for 2012 (available on-line at http://www.eea.europa.eu/data-and-maps/data/member-states-reporting-art-7-under-the-european-pollutant-release-and-transfer-register-e-prtr-regulation-10) could be used. VITO however preferred the CLRTAP data-set, because the latter dataset also provides estimates for the height of the stacks (albeit grouped in five different height categories), which is crucial information for modelling local air quality. Moreover, all the stacks covered in the CLRTAP set are also covered in the E-PRTR data, as can be inferred from Table 2 and Figure 2.

Figure 2:Point sources in the region of Antwerp contained in the CLRTAP (purple circles) and E-PRTR (green circles) data. The extent of the figure (line segments) shows the complete domain, the green shaded area indicates the extent of the city of Antwerp as a guideline.

Appendix: Description of model chain

RIO

RIO (Hooyberghs et al., 2006; Janssen et al., 2008) is a land use regression model for the interpolation of hourly pollutant concentrations as measured by the official monitoring networks in Belgium. The model is based on a residual kriging interpolation scheme using a land use (CORINE) derived covariate. A polynomial regression determines the statistical relationship (trend functions) between the long term averaged concentrations at each hour of the day and the underlying land use parameter. In addition, a distinction is made between week and weekend days to account for the obvious difference in traffic/industry related emissions. As a result, RIO produces hourly concentration maps for the pollutants BC, PM10, PM2.5, SO2, NO2 and O3 on a 4x4 km² grid. Based on those results, annual statistics (annual mean, number of exceedances) can be derived. RIO has been shown to be very accurate in estimating the pollutant concentrations over Belgium (Janssen et al., 2008).

IFDM

The IFDM (Immission Frequency Distribution Model) model is a bi-Gaussian plume model, designed to simulate non-reactive pollutant dispersion at a local scale. As IFDM is a receptor model, it can be used for both regular and irregular grids. A non-regular grid was built so that the major gradients were well represented. This approach is similar to the methodology used by Lefebvre et al. (2011a; 2011b) and ensures that more receptor points are available where the largest concentration gradients are expected.

For the current exercise, the grid is set-up such that the minimal distance between the points is 8m. In total there are 159746 points, while the domain-size is 713.848 km^2. Since the largest gradients are located close to the major roads and industrial point sources, most of the raster points are located in the vicinity of line sources and point sources. Raster points in the vicinity of the roads are placed in lines parallel to the road. The closest points are located at 25m of the middle of the road (on both sides), the furthest points are at 2.4km of the road. Both the distance between the parallel lines and the distance between the points on the line increases gradually, according to the details given in Table 5. The result of this procedure is illustrated in Figure 3. Around the point sources, points are place in 4 concentric circles of 6 points. The closest points are located at 50m from the point source, the furthest at 1km from the point source. The result of the procedure is visualized for two point sources in Figure 4, which shows the two concentric circles the closest to the point sources.

In a postprocessing step, the IFDM-results at the raster locations are gridded to a 5m by 5m grid using Delaunay Triangulation (https://en.wikipedia.org/wiki/Delaunay_triangulation).

Distance of line from middle of the road (in m)	Distance between the points on the line (in m)
25	70
50	100
80	130
120	200
200	280
400	360
800	440
1200	520
2400	600

Table 5: Details of the line source following grid.

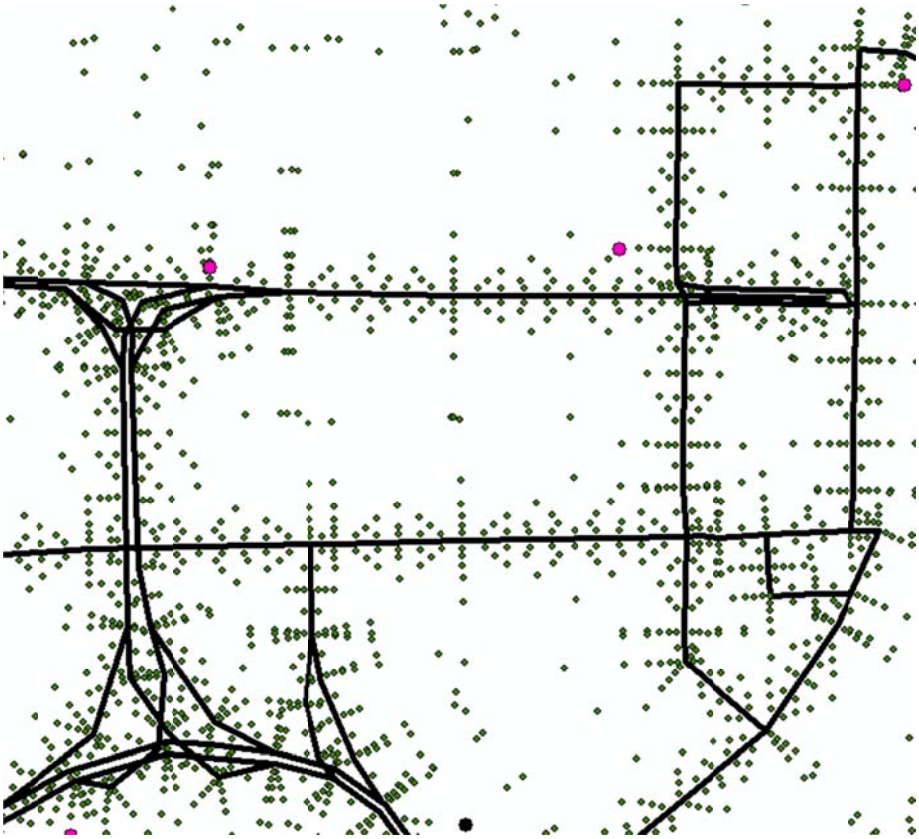

Figure 3:Illustration of the raster points in the vicinity of the line sources.

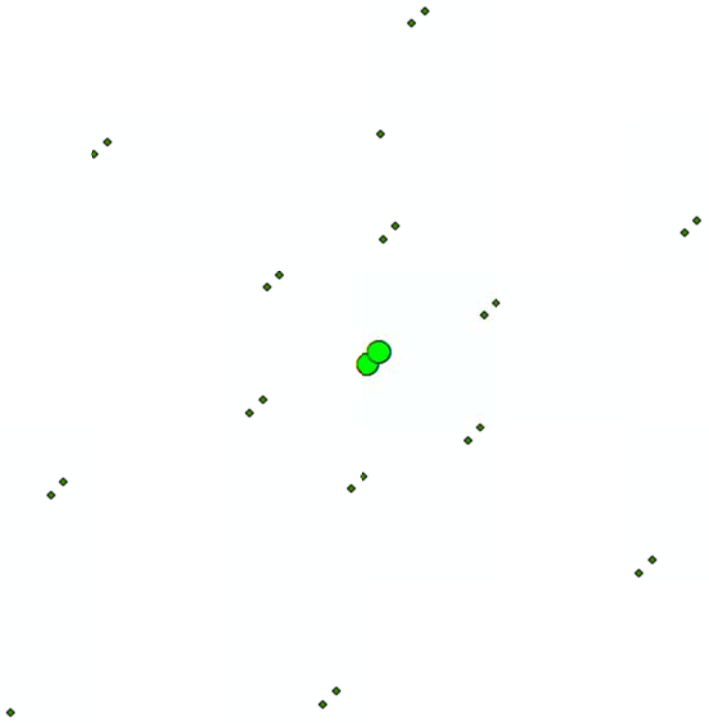

Figure 4: Illustration of the raster points in the vicinity of the two point sources. The figure only shows the two nearest concentric circles.

More information on the IFDM model can be found in the European Model Database (http://air-climate.eionet.europa.eu/databases/MDS/index_html). IFDM takes into account the differences in NO_x-split per street, resulting from differences in the traffic segmentation in passenger cars and heavy duty vehicles. The chemical equilibrium in the NO_x-O_3 reaction is determined on the basis of temperature and the solar height and is based on the scheme proposed by Berkowicz (1997).

COUPLING BETWEEN RIO AND IFDM

To avoid double-counting of the sources, a special coupling between the regional model (RIO) and the urban-scale model (IFDM) has been developed at VITO. This procedure assures that sources are counted only once, and it provides a way to downscale the 4x4 km^2 RIO-results to the resolution of the IFDM-grid. More information on the coupling can be found in Lefebvre, 2011b.

OSPM

To calculate the streetlevel concentration in street canyons, the IFDM model is coupled to the OSPM-module (Berkowicz, 1997). The OSPM-module is simplified by assuming :

- The height of the buildings in the street is chosen to be equal to the average of the left side and the right side of the street.

- If buildings are only present at one side of the street, the street canyon effect is supposed to be equal to 0.
- The concentration in the street canyon is the average of the concentration at both sides of the street canyon. Thus, we neglect the leeward versus windward asymmetry inside the street canyon.
- A grid point is placed every 20m. For each grid point, the module automatically decides whether it is located in a street canyon or not. Only the raster points in the street canyons are retained for the OSPM calculation.

In addition, the chemistry is made consistent with the chemistry module of the IFDM model (see §3.4, thus eliminating the need for UV-radiation data.

In a postprocessing step, the OSPM-results in at the street canyon locations are gridded to a 5m by 5m grid (only existing within the street canyon) using Delaunay Triangulation (https://en.wikipedia.org/wiki/Delaunay_triangulation). Furthermore, the gridded results of OSPM and IFDM are coupled. For the locations within the street canyons, the OSPM results are used, while the IFDM results are used at the other locations.

Note that the RIO-IFDM-OSPM model has no output for O_3 concentrations within the street canyon, hence the IFDM results are reported for this pollutant.

VALIDATION

The RIO-IFDM-OSPM model chain has been validated in several campaigns. Validation campaigns have, amongst other, focused on a city-wide validation for the city of Antwerp (Lefebvre et al. 2013), and a gradient validation using gradient measurements close to a major highway. Moreover, within the ChemKar project, the Flemish Environmental Agency (VMM) has regularly conducted a validation of the modeled particulate matter concentrations (see the list of ChemKar reports in the publication list).

SOURCE APPORTIONMENT

In the scope of the ChemKar project, the Flemish Environmental Agency (VMM) has regularly conducted a source apportionment based on chemical speciation of PM samples. The results are published in a series of reports (see list of reports in the publication list). The reports are in Dutch, but they contain an English summary.

A SHORT WORD ON PM_{10}-CONCENTRATIONS IN STREET-CANYONS

It should be noted that the RIO-IFDM-OSPM model significantly underestimates the PM10-concentrations in street canyons (see reports of the ChemKar study). This is due to the underestimation of the coarse fraction as the results for the PM2.5-fraction are compatible with the measurements. The underestimation of the PM10-concentrations is probably due to the inaccurate capture of the re-re-suspension phenomenon. Resuspension is taken into account in the simulations. However, whereas on an open road, thanks to the wind the resuspended dust probably settles next to the road, this is not true in the street canyon. As a result, the dust that resettles on the road is resuspended again and will be measured again. This higher resuspension for PM-coarse is not taken into account in the model.

A SHORT WORD ON OZONE-CONCENTRATIONS

The ozone-concentrations maps provided in these data sets are calculated by the RIO-IFDM model chain, i.e. without the use of the OSPM street canyon module as our RIO-IFDM-OSPM chain has no output for it. Also for the virtual monitoring stations located in street canyons, the street canyon effect is neglected and RIO-IFDM results are reported.

The monitoring stations of Antwerpen-Linkeroever, Schoten and Borgerhout are foreseen for the JRC intercomparison exercise. Of these stations, the former two stations (corresponding to virtual stations 7 and 17) are urban background stations, and here the modeled O_3-concentrations are certainly suitable for the intercomparison exercise. The situation is a bit more complicated for Borgerhout, since there are actually two stations close to each other: Borgerhout road side (a street canyon station at 20m of the road corresponding to virtual station 216) and Borgerhout (an urban background station at 50m from the road, corresponding to virtual station 16). For the latter, RIO-IFDM ozone concentrations are probably OK, while for the former the ozone concentrations will probably be overestimated a little, as the street canyon effects are not taken into account (and the NO_x concentration is thus underestimated).

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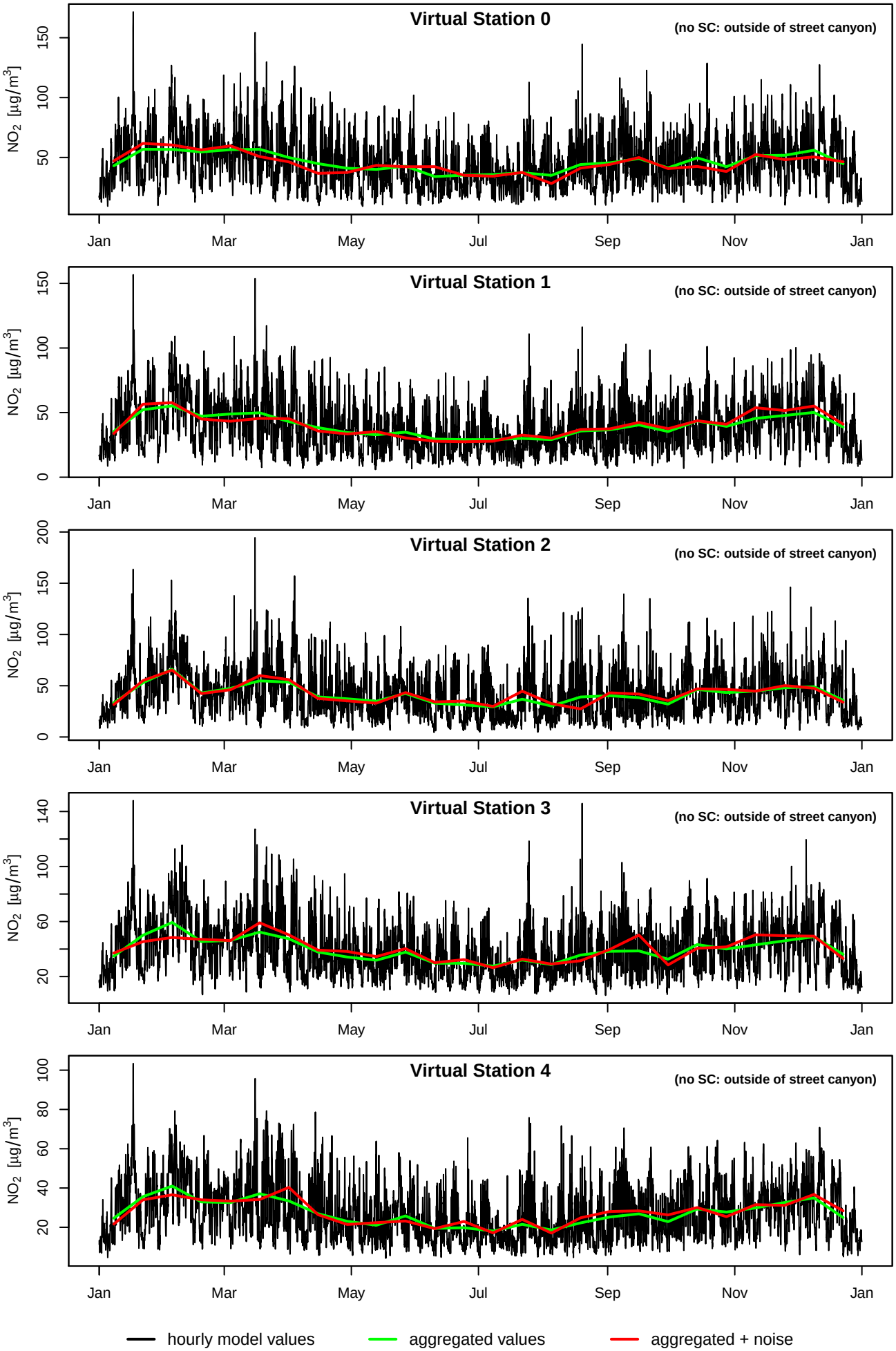
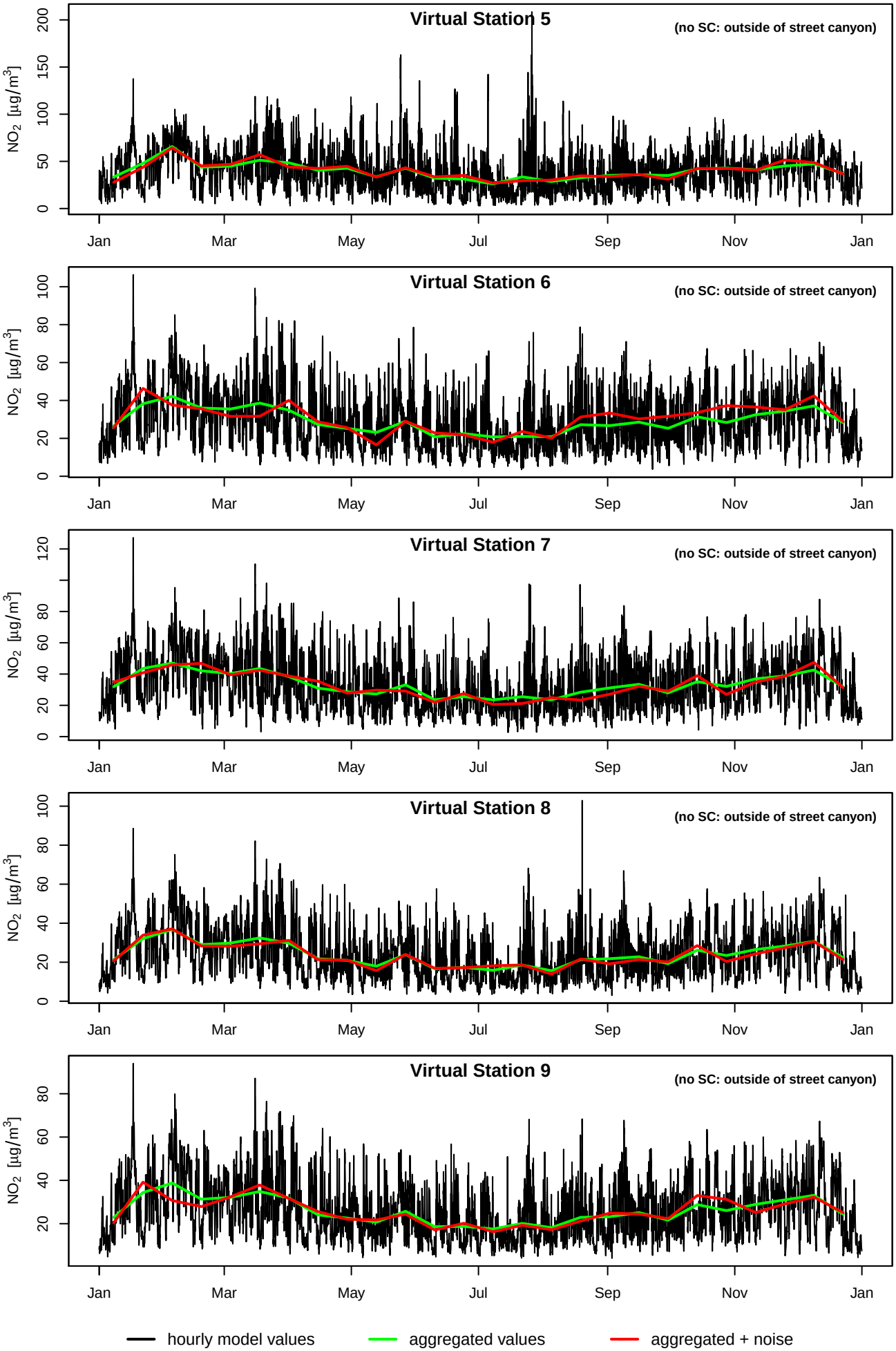
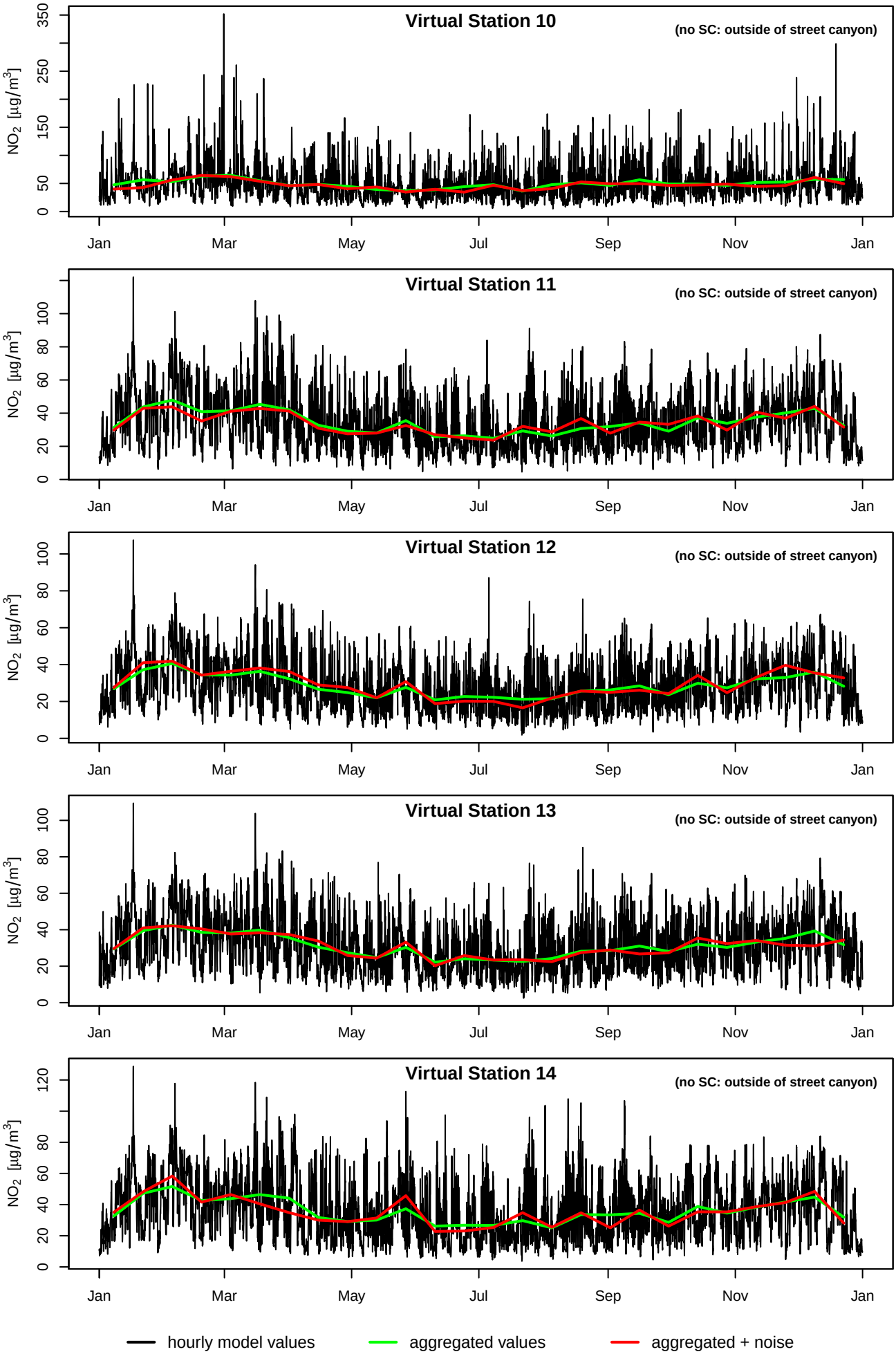
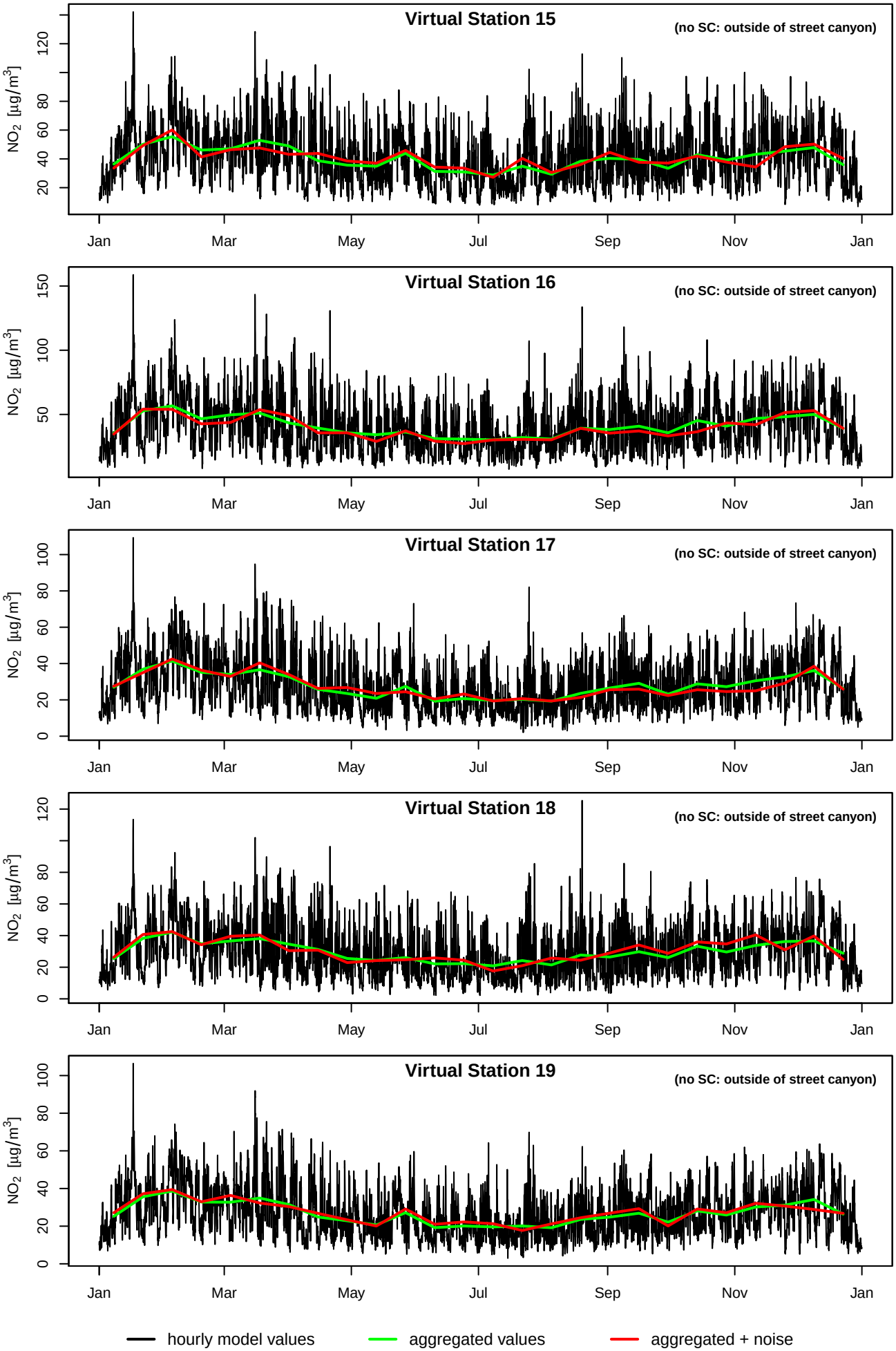
VMM. Lozingen in de lucht (2000 – 2013). Online available at https://www.vlaanderen.be/nl/publicaties/detail/lozingen-in-de-lucht-2000-2013 (in Dutch), 2014

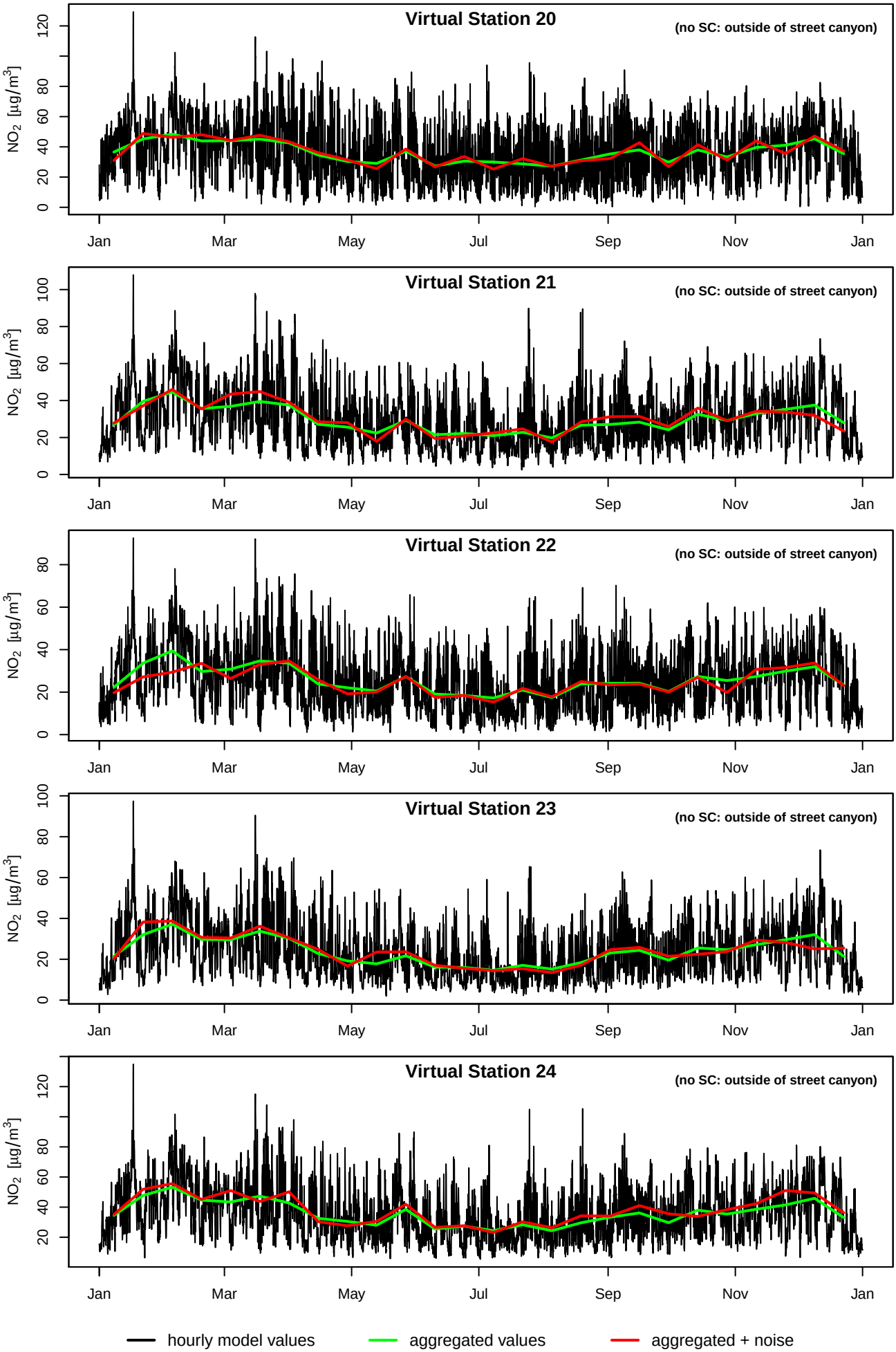
Appendix 2: NO_2, O_3 and PM_{10} times series with added noise to be used as indicative measurements

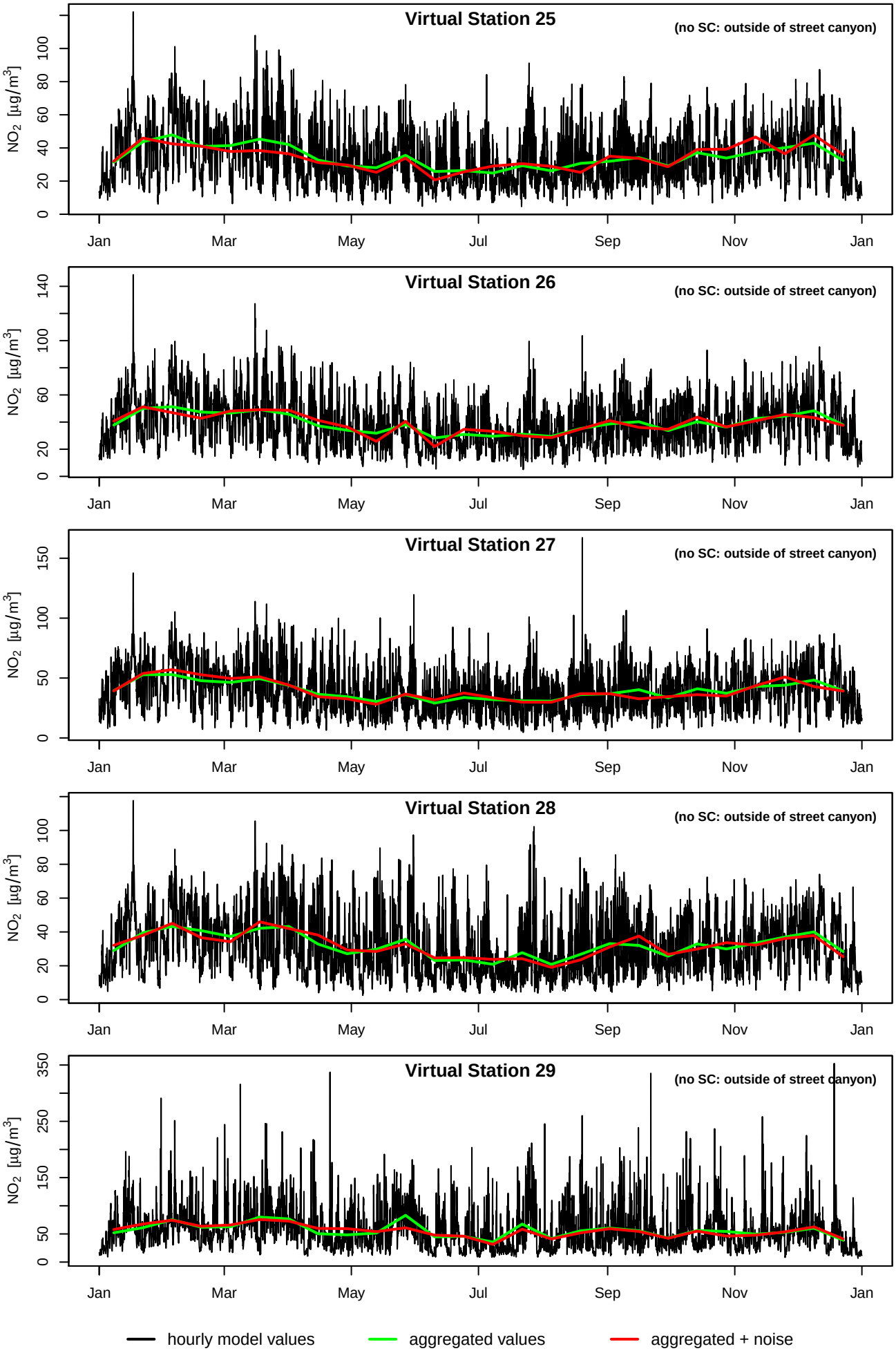

Virtual Station 0
(no SC: outside of street canyon)
NO2 [µg/m3]
Virtual Station 1
(no SC: outside of street canyon)
NO2 [µg/m3]
Virtual Station 2
(no SC: outside of street canyon)
NO2 [µg/m3]
Virtual Station 3
(no SC: outside of street canyon)
NO2 [µg/m3]
Virtual Station 4
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

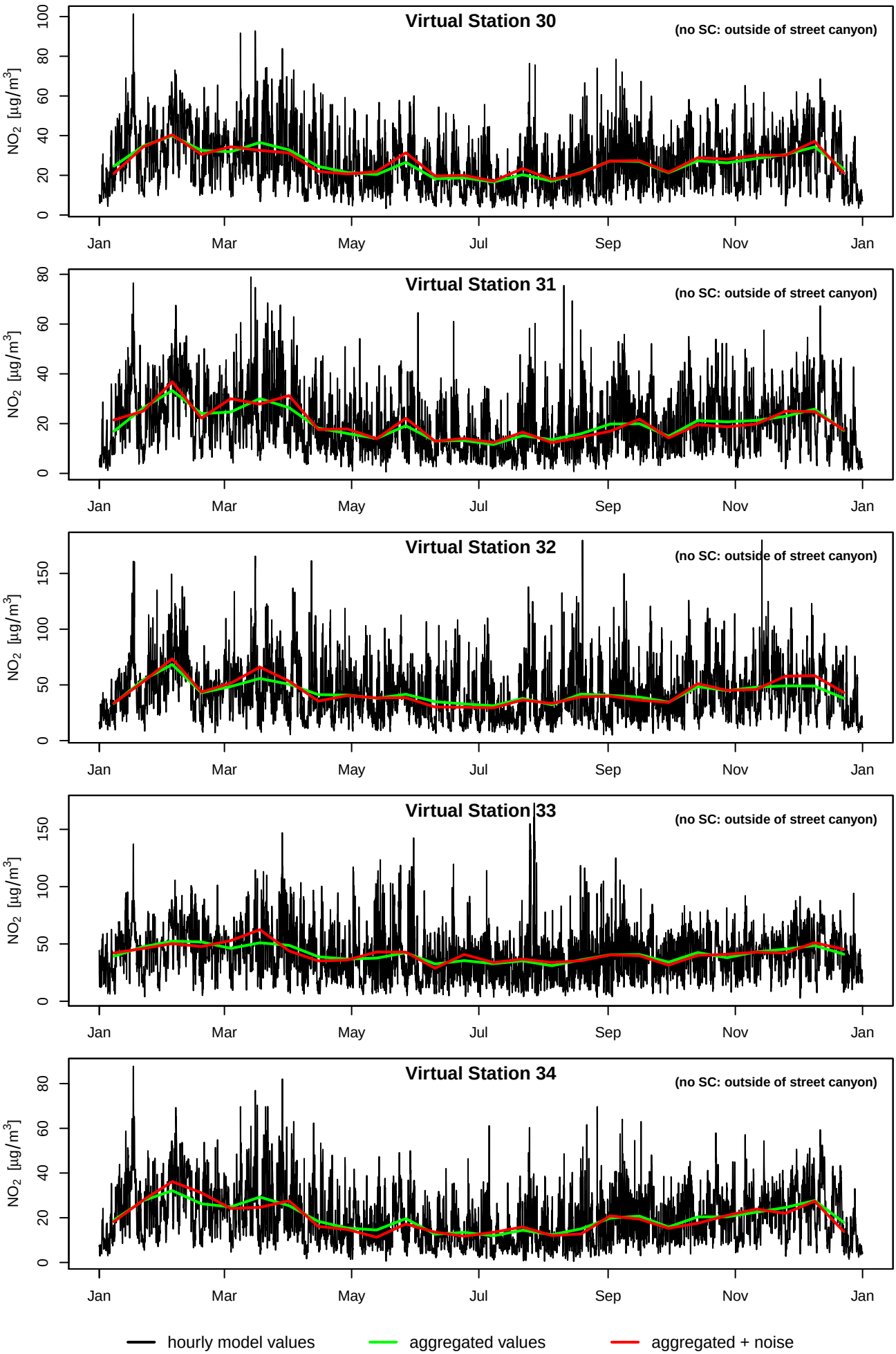

Virtual Station 5
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 6
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 7
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 8
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 9
(no SC: outside of street canyon)
NO2 [µg/m3]
20
40
60
80
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

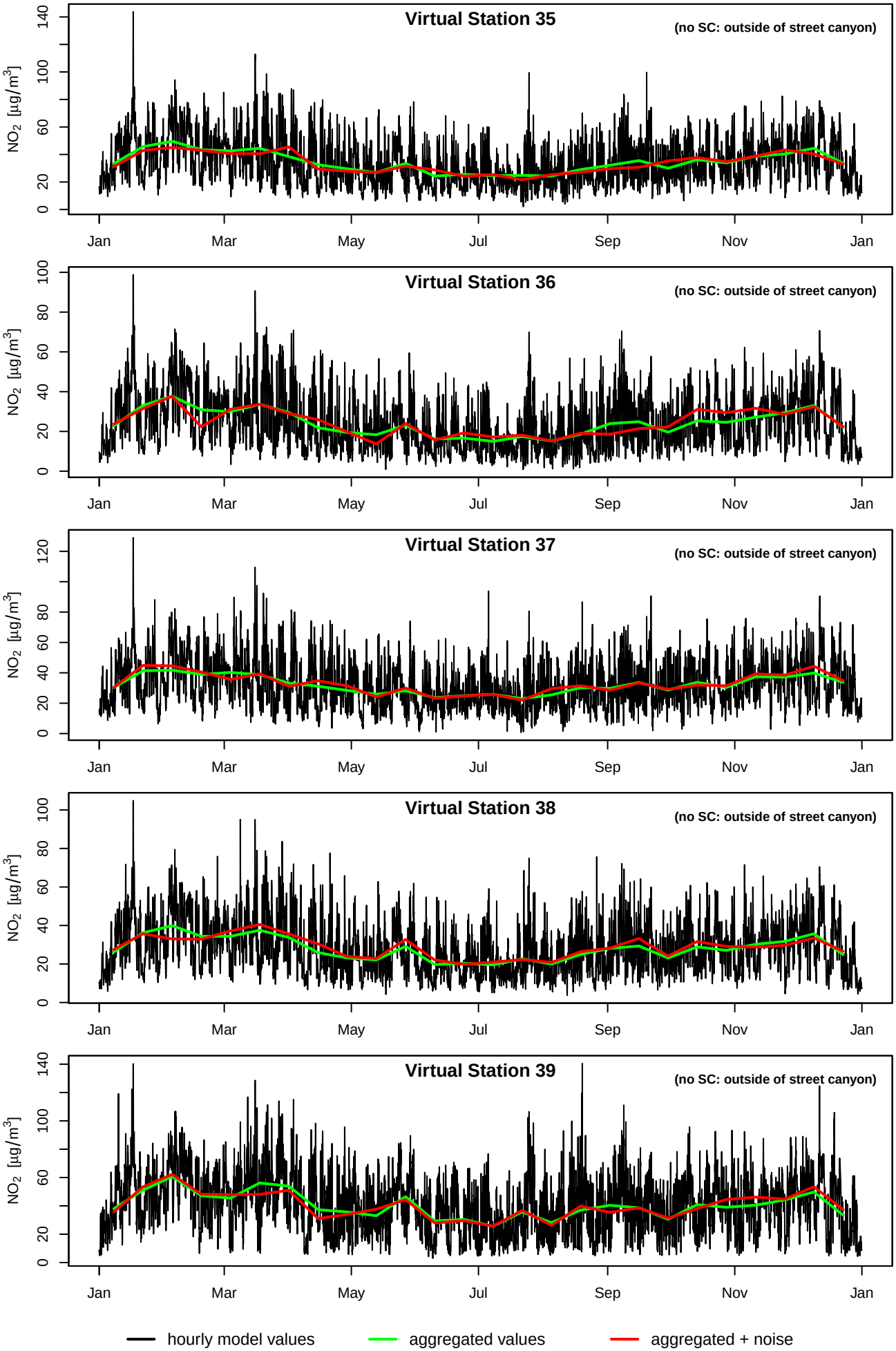

Virtual Station 10
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
150
250
350
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 11
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 12
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 13
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 14
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

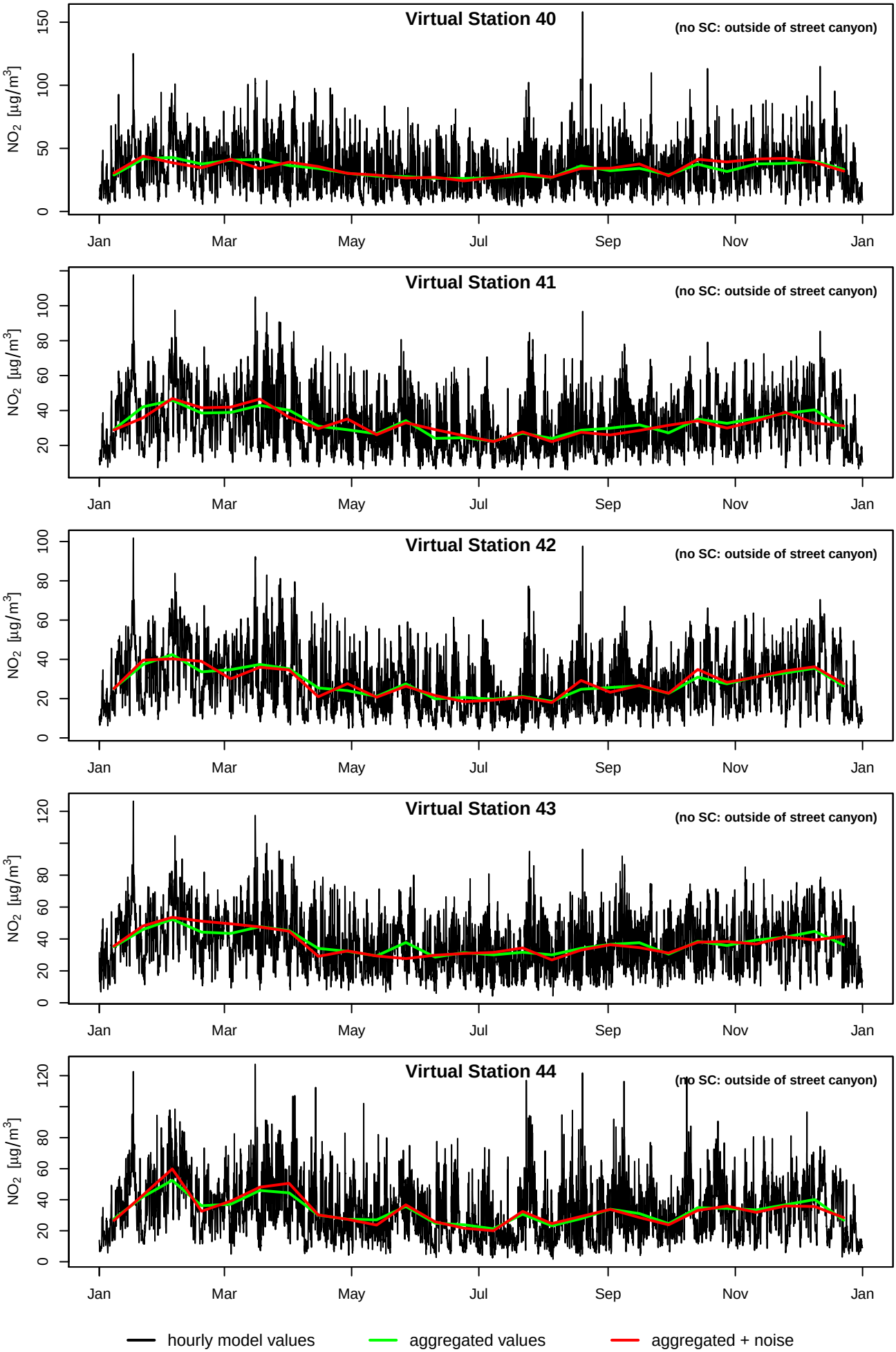

Virtual Station 15
(no SC: outside of street canyon)
NO2 [µg/m3]
20 40 60 80 120
Jan Mar May Jul Sep Nov Jan
Virtual Station 16
(no SC: outside of street canyon)
NO2 [µg/m3]
50 100 150
Jan Mar May Jul Sep Nov Jan
Virtual Station 17
(no SC: outside of street canyon)
NO2 [µg/m3]
0 20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 18
(no SC: outside of street canyon)
NO2 [µg/m3]
0 20 40 60 80 120
Jan Mar May Jul Sep Nov Jan
Virtual Station 19
(no SC: outside of street canyon)
NO2 [µg/m3]
0 20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
hourly model values
aggregated values
aggregated + noise

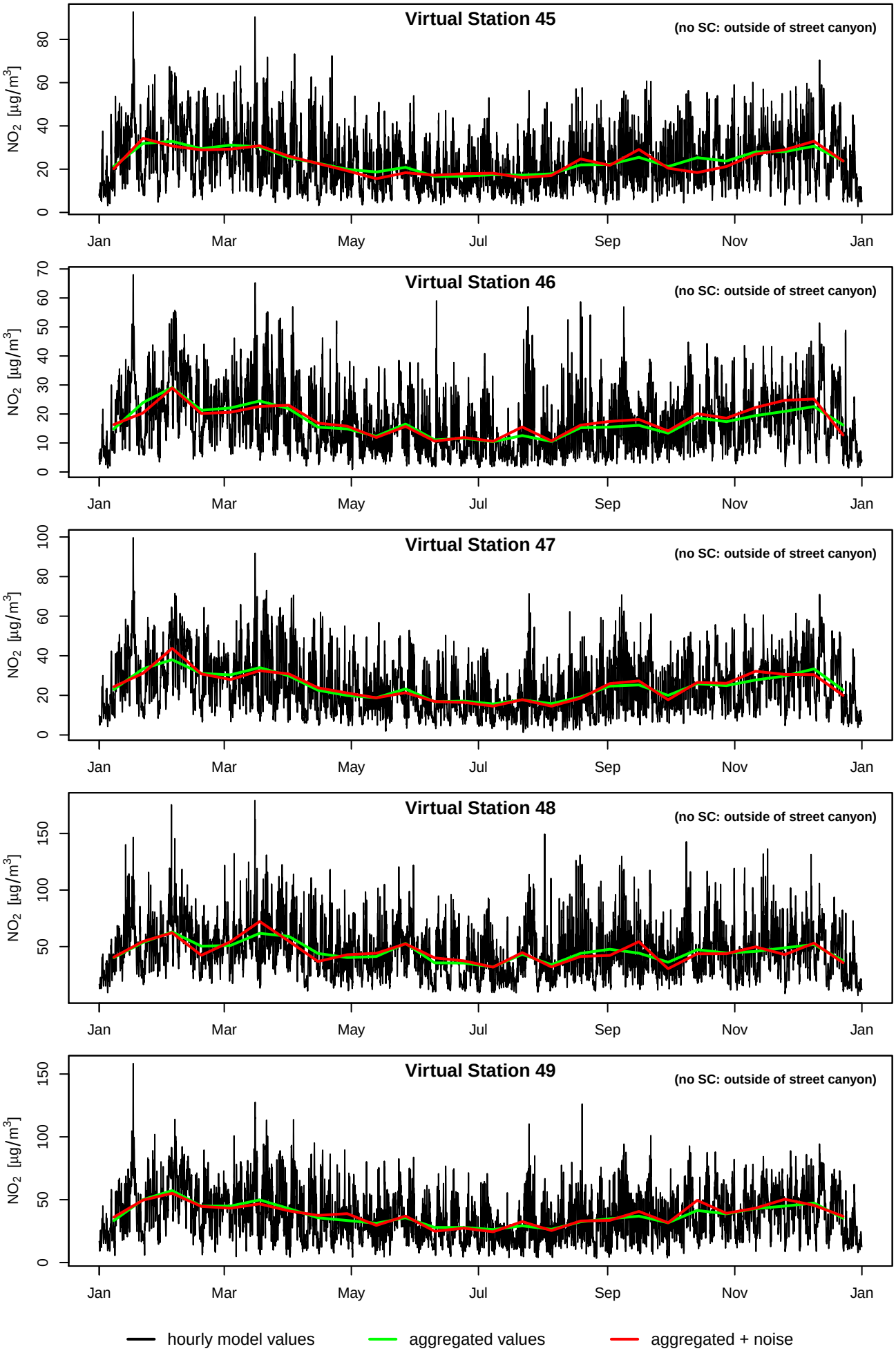

Virtual Station 20
(no SC: outside of street canyon)
Virtual Station 21
(no SC: outside of street canyon)
Virtual Station 22
(no SC: outside of street canyon)
Virtual Station 23
(no SC: outside of street canyon)
Virtual Station 24
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

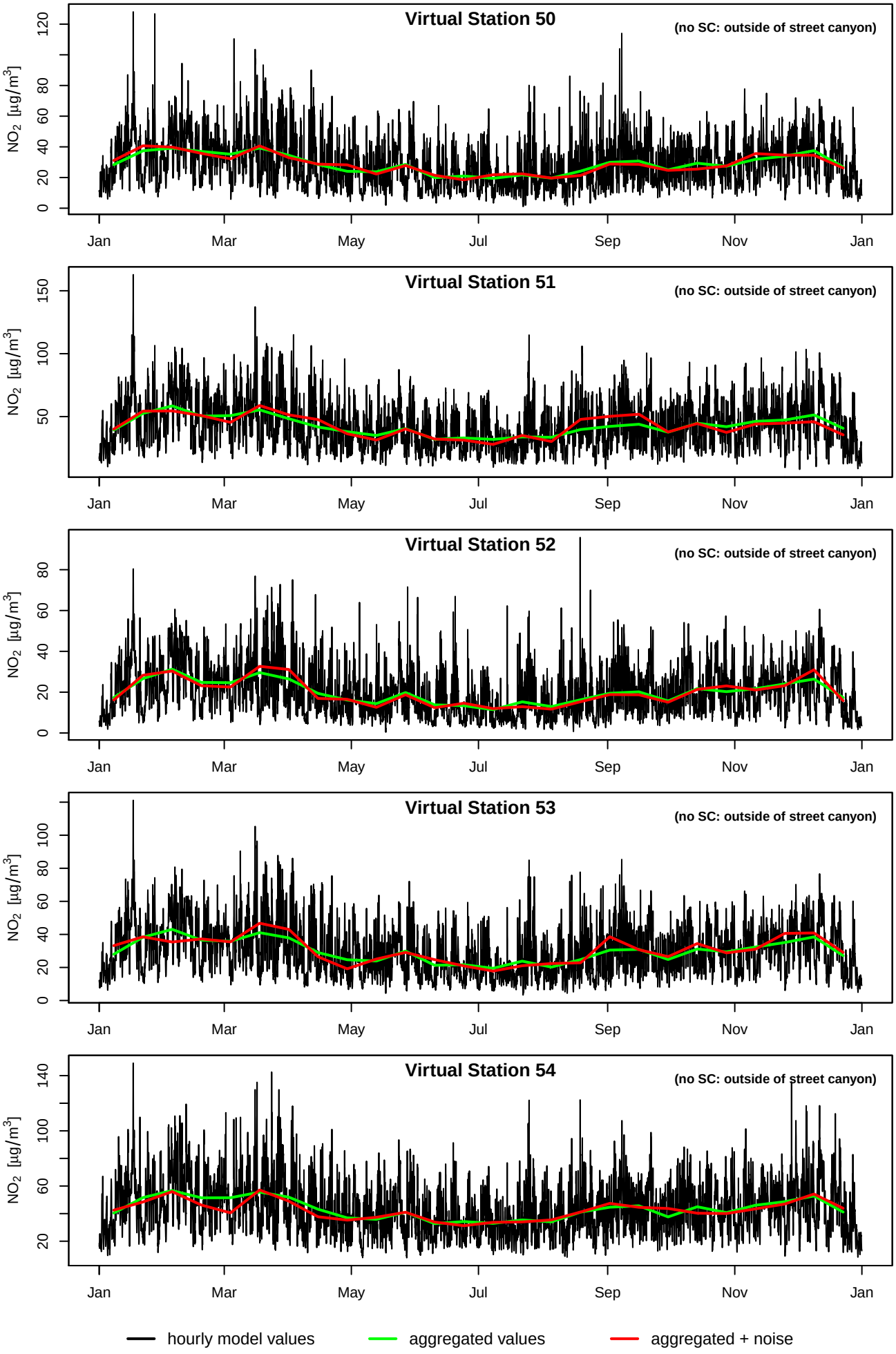

Virtual Station 25
(no SC: outside of street canyon)
NO2 [µg/m3]
0 20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 26
(no SC: outside of street canyon)
NO2 [µg/m3]
0 20 60 100 140
Jan Mar May Jul Sep Nov Jan
Virtual Station 27
(no SC: outside of street canyon)
NO2 [µg/m3]
0 50 100 150
Jan Mar May Jul Sep Nov Jan
Virtual Station 28
(no SC: outside of street canyon)
NO2 [µg/m3]
0 20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 29
(no SC: outside of street canyon)
NO2 [µg/m3]
0 50 150 250 350
Jan Mar May Jul Sep Nov Jan
hourly model values
aggregated values
aggregated + noise

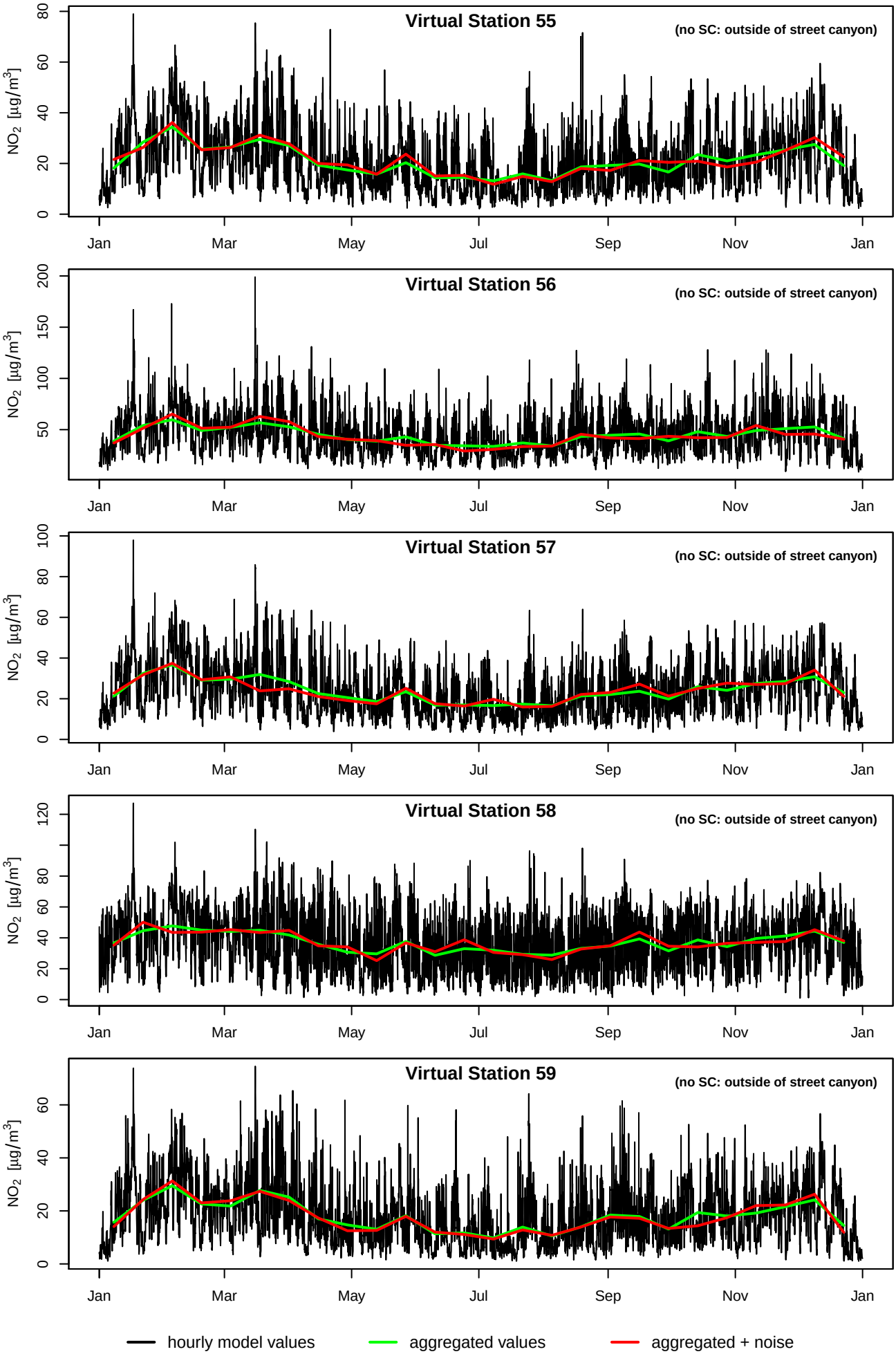

Virtual Station 30
(no SC: outside of street canyon)
Virtual Station 31
(no SC: outside of street canyon)
Virtual Station 32
(no SC: outside of street canyon)
Virtual Station 33
(no SC: outside of street canyon)
Virtual Station 34
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

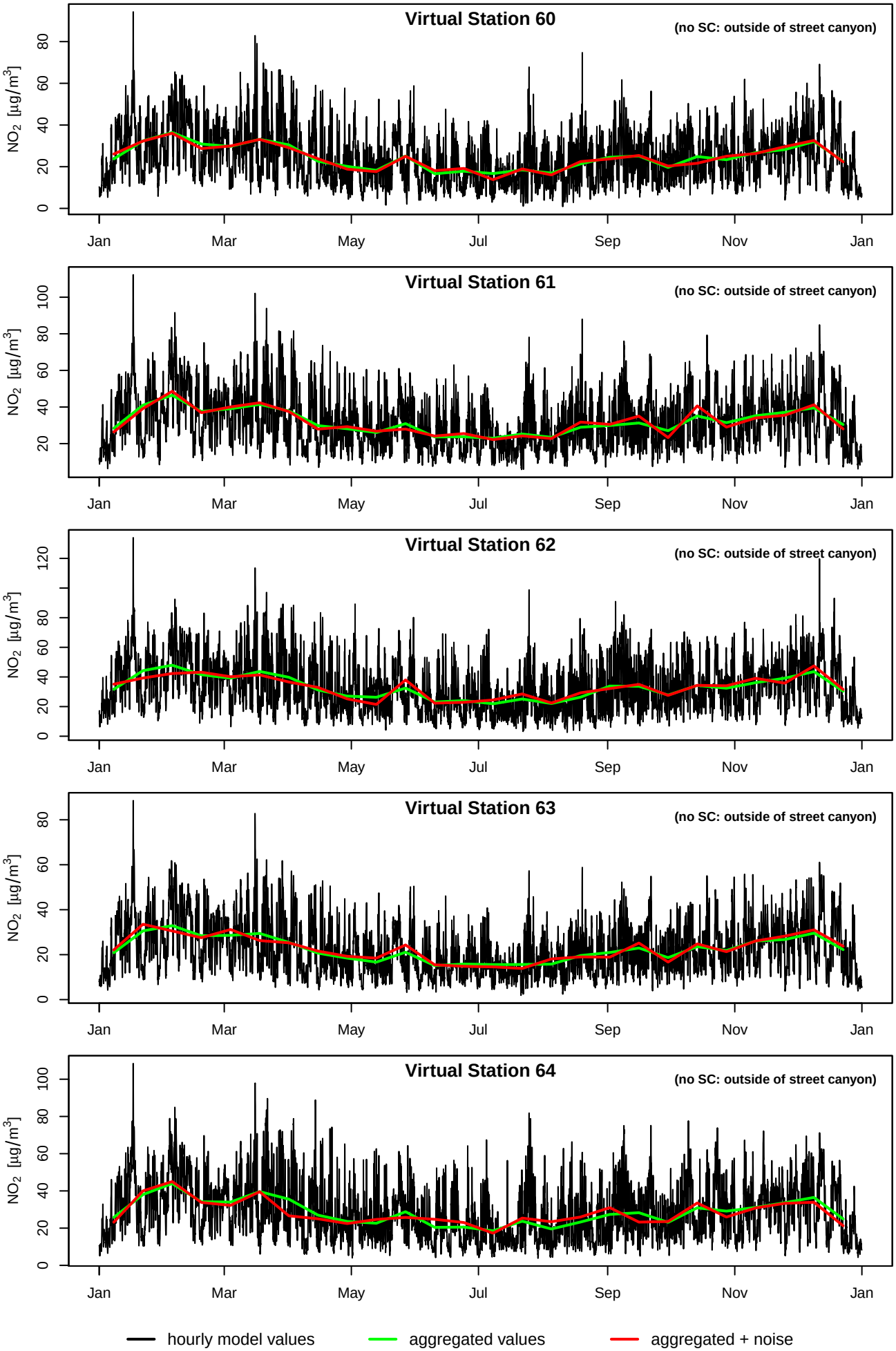

Virtual Station 35
(no SC: outside of street canyon)
Virtual Station 36
(no SC: outside of street canyon)
Virtual Station 37
(no SC: outside of street canyon)
Virtual Station 38
(no SC: outside of street canyon)
Virtual Station 39
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

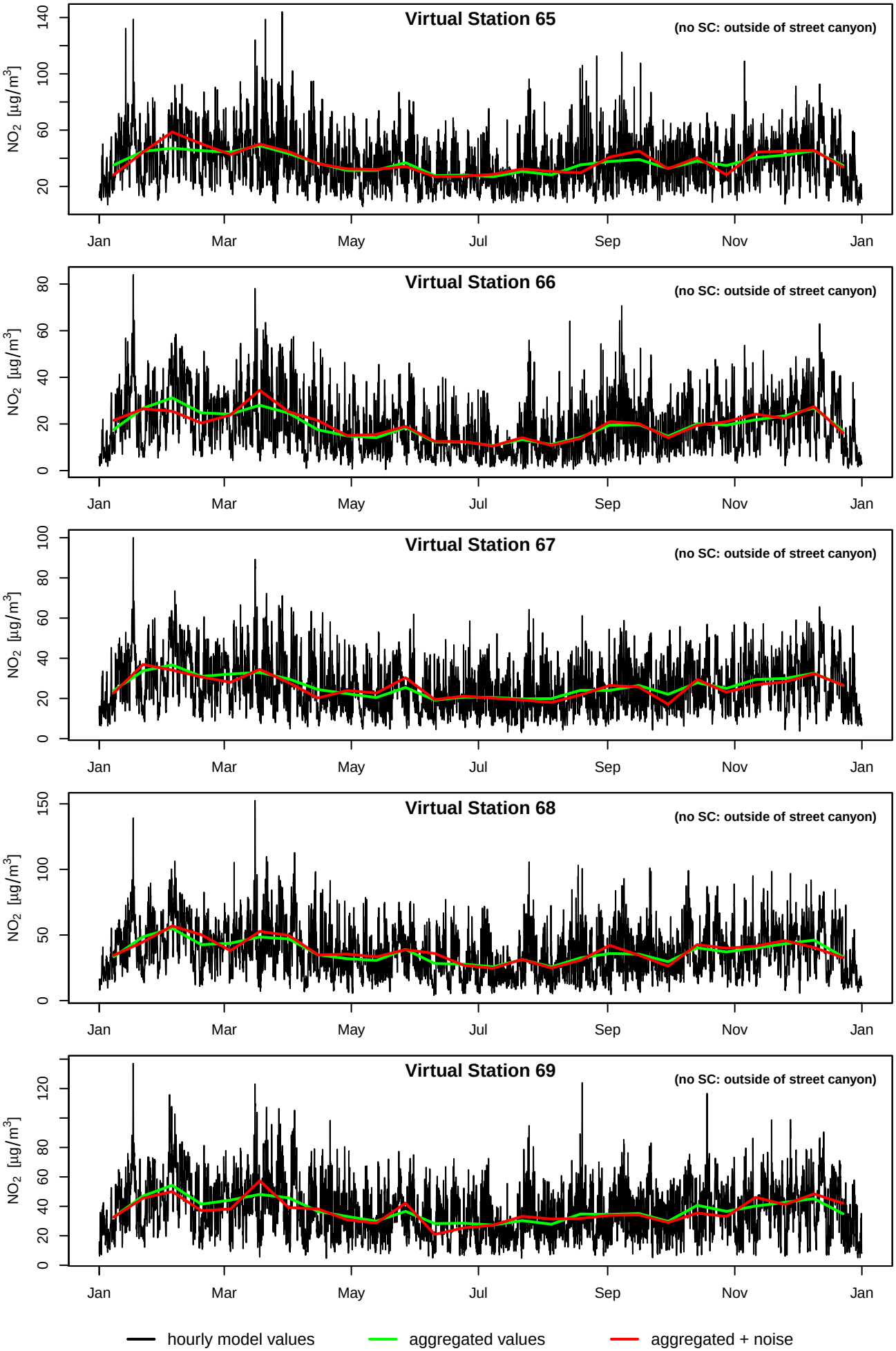

Virtual Station 40
(no SC: outside of street canyon)
Virtual Station 41
(no SC: outside of street canyon)
Virtual Station 42
(no SC: outside of street canyon)
Virtual Station 43
(no SC: outside of street canyon)
Virtual Station 44
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

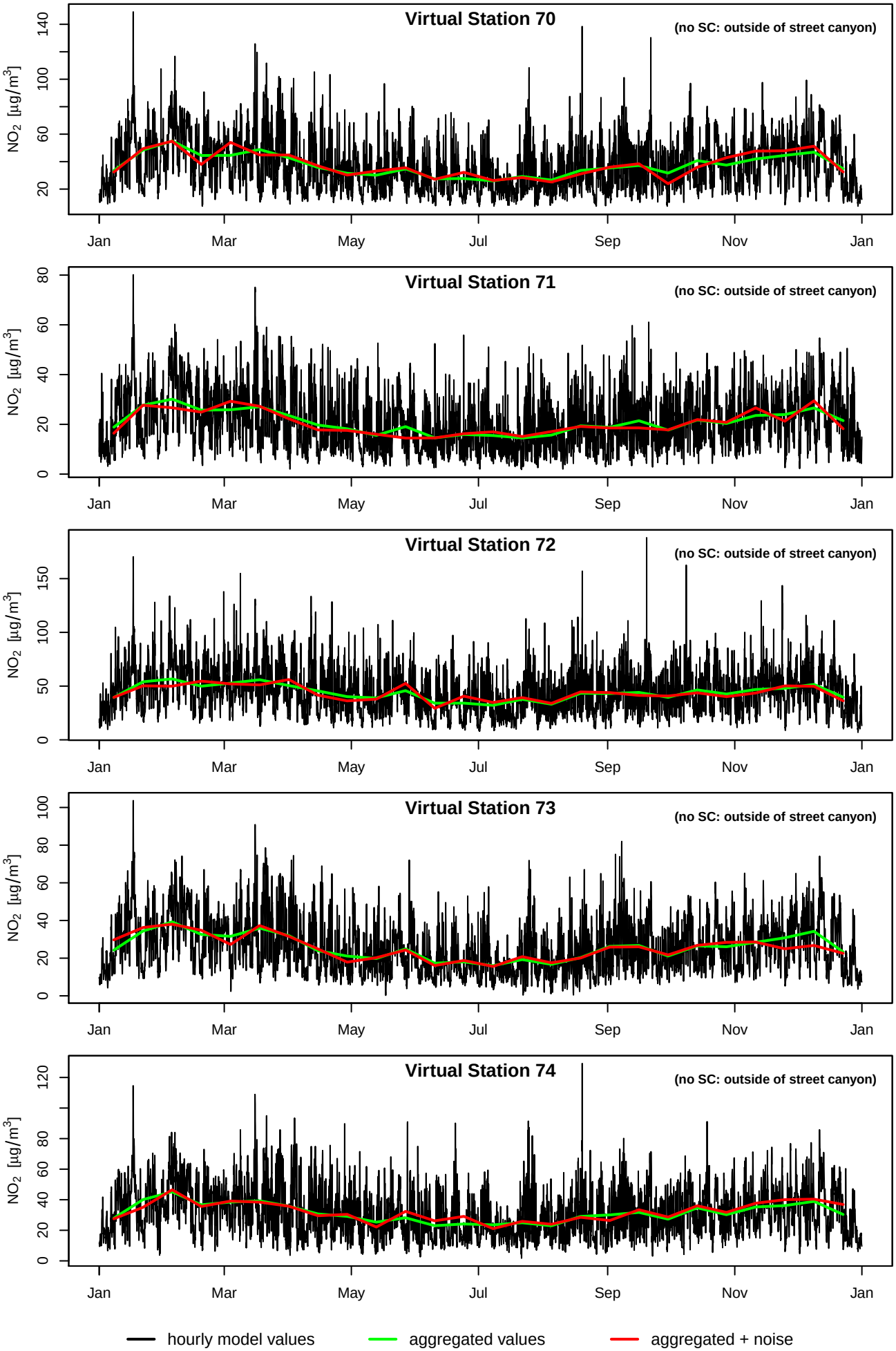

Virtual Station 45
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 46
(no SC: outside of street canyon)
NO2 [µg/m3]
0
10
20
30
40
50
60
70
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 47
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 48
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 49
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

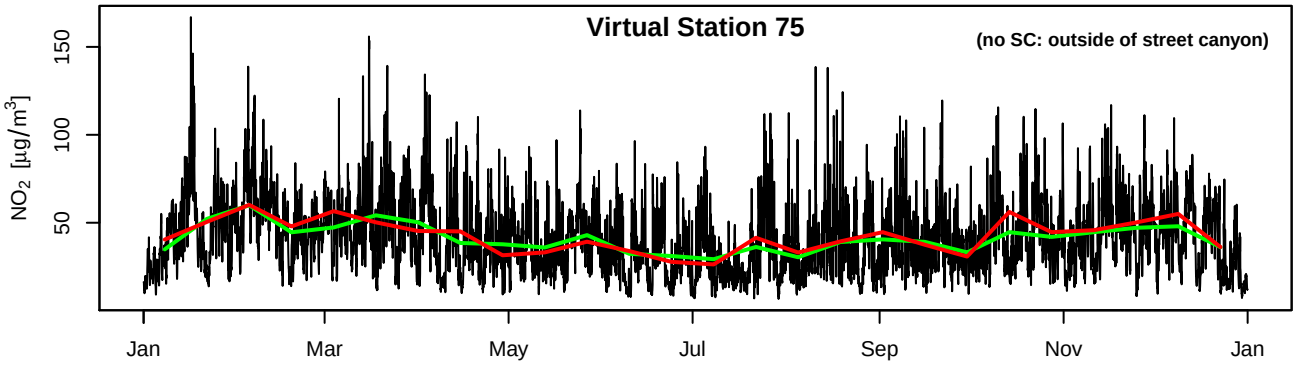

Virtual Station 50
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 51
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 52
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 53
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 54
(no SC: outside of street canyon)
NO2 [µg/m3]
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

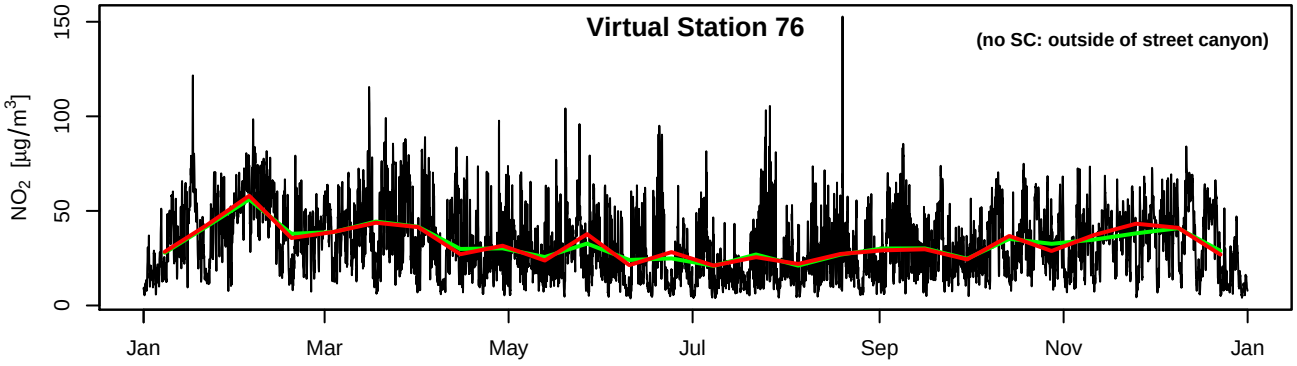

Virtual Station 55
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 56
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 57
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 58
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 59
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

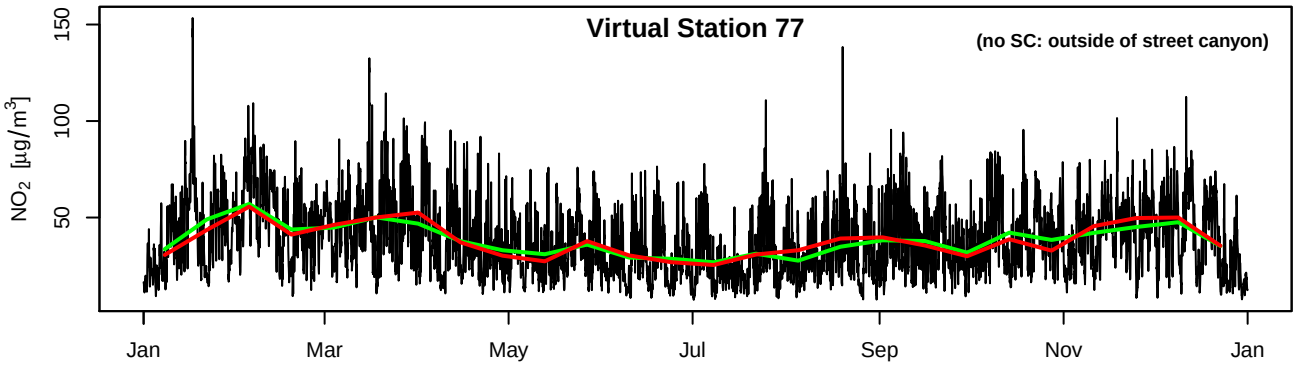

Virtual Station 60
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 61
(no SC: outside of street canyon)
NO2 [µg/m3]
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 62
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 63
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 64
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

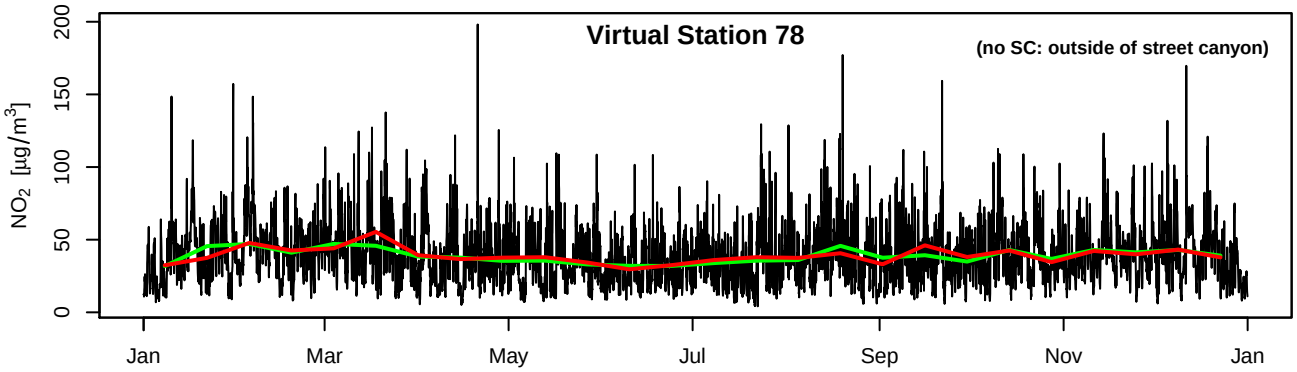

Virtual Station 65
(no SC: outside of street canyon)
NO2 [µg/m3]
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 66
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 67
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 68
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 69
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

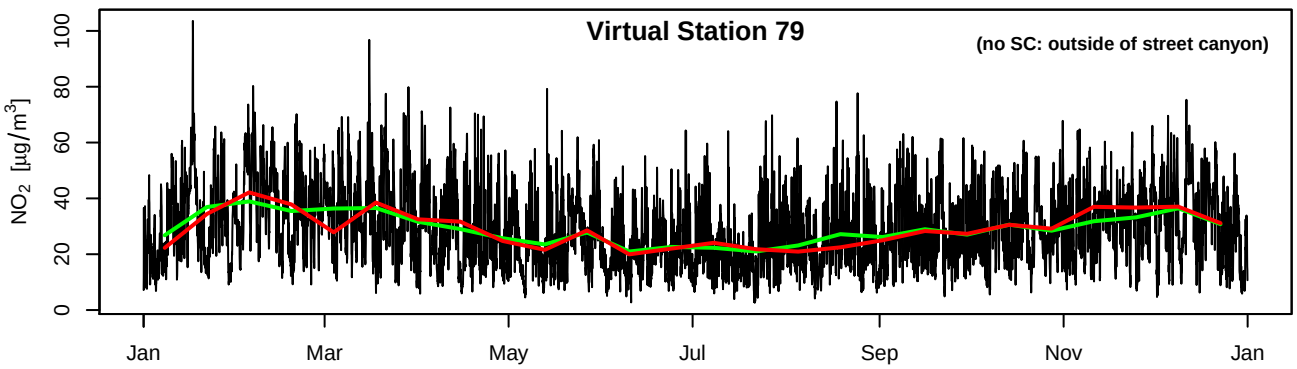

Virtual Station 70
(no SC: outside of street canyon)
NO2 [µg/m3]
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 71
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 72
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 73
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 74
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

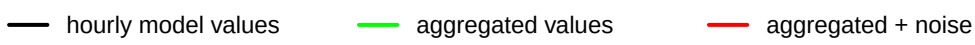

Virtual Station 75
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan

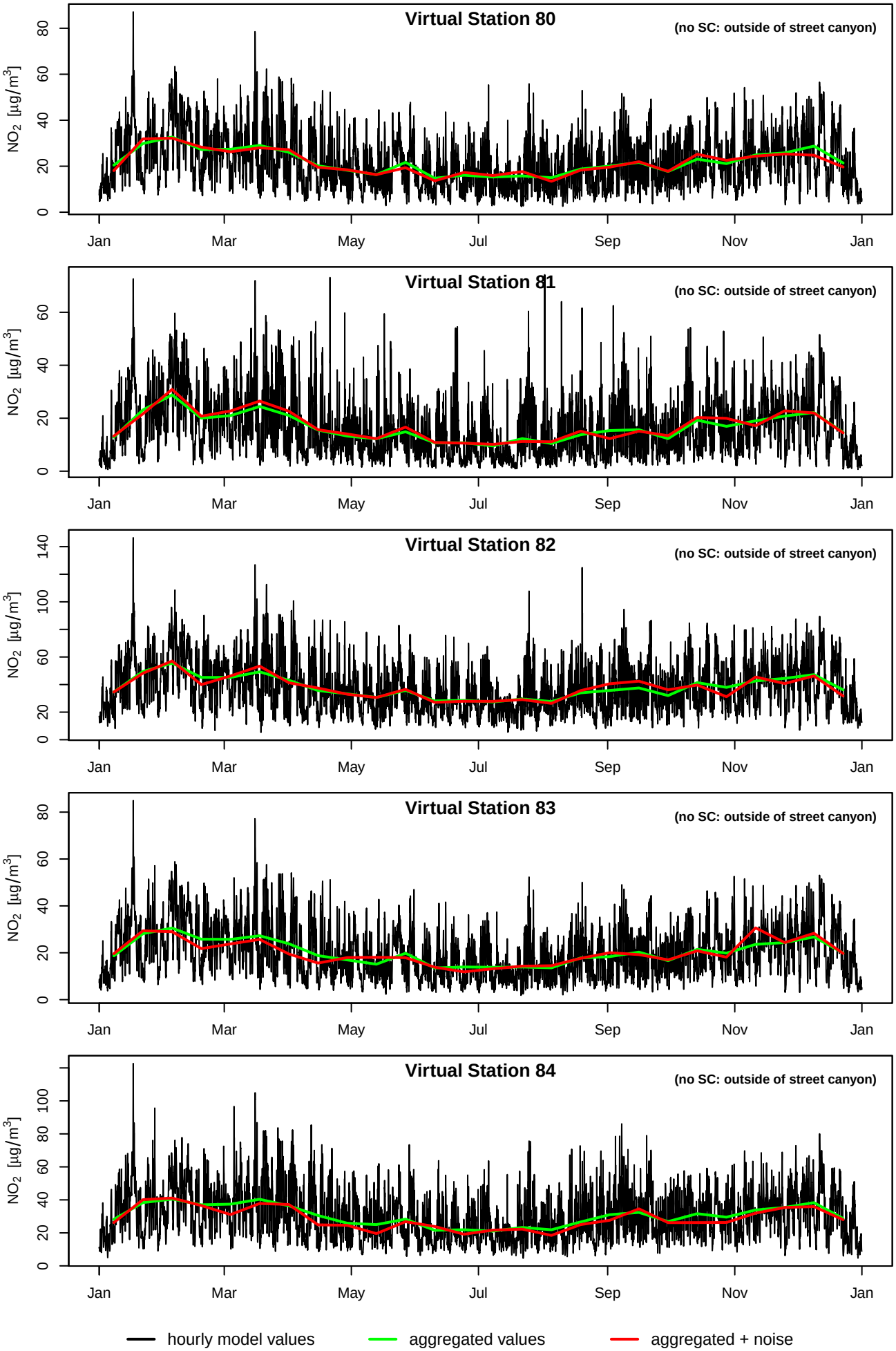

Virtual Station 76
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan

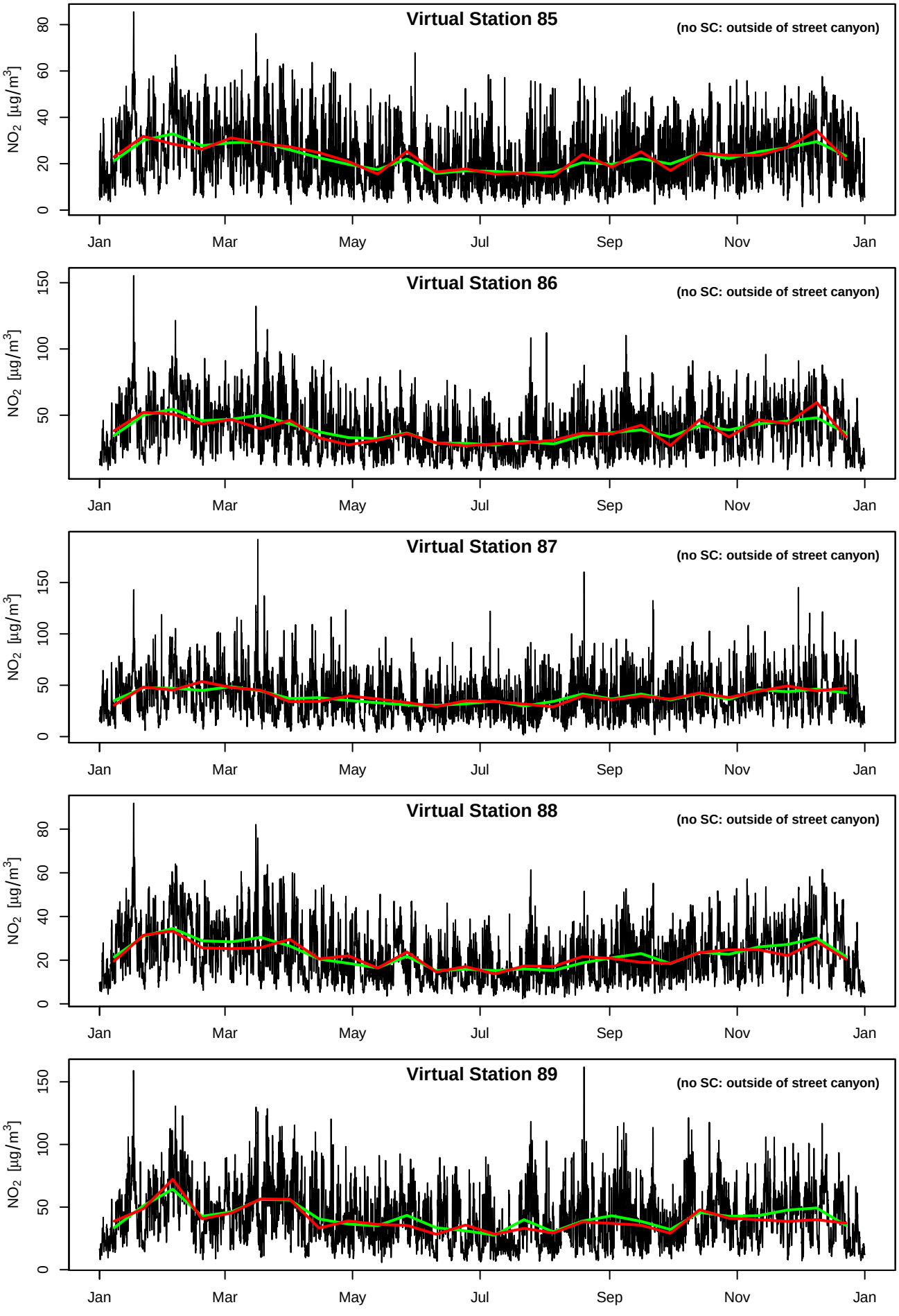

Virtual Station 77
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan

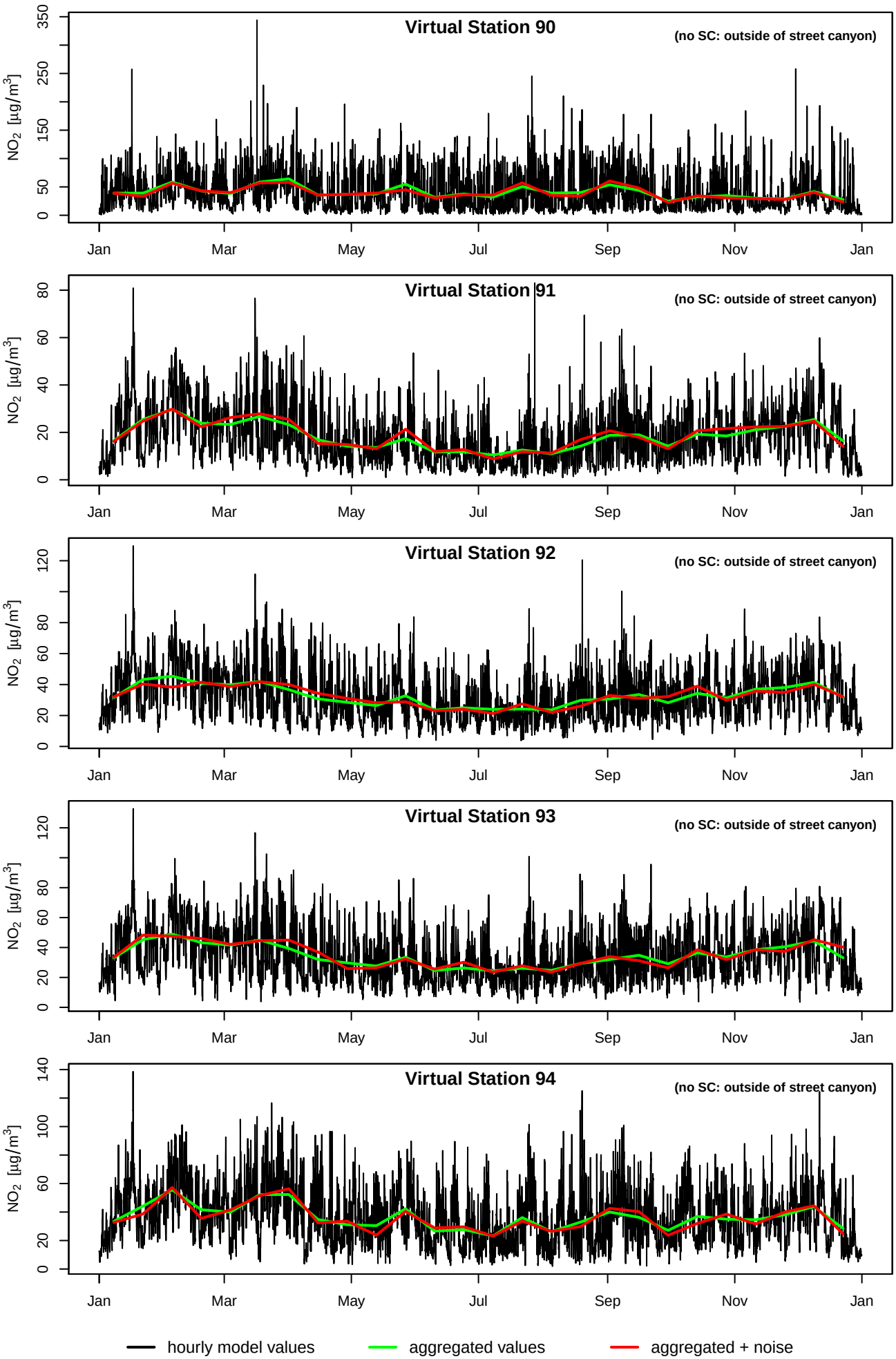

Virtual Station 78
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan

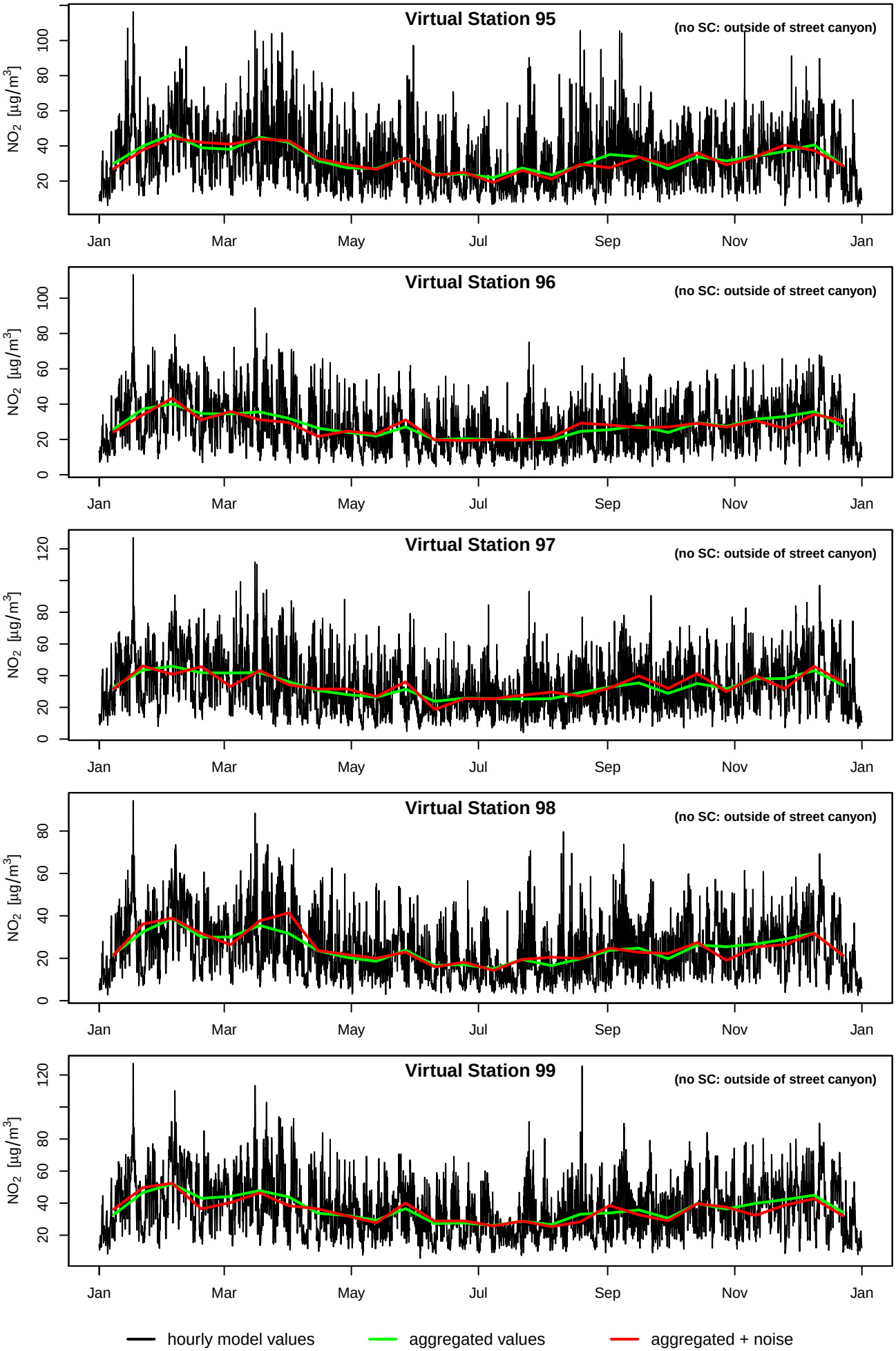

Virtual Station 79
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan

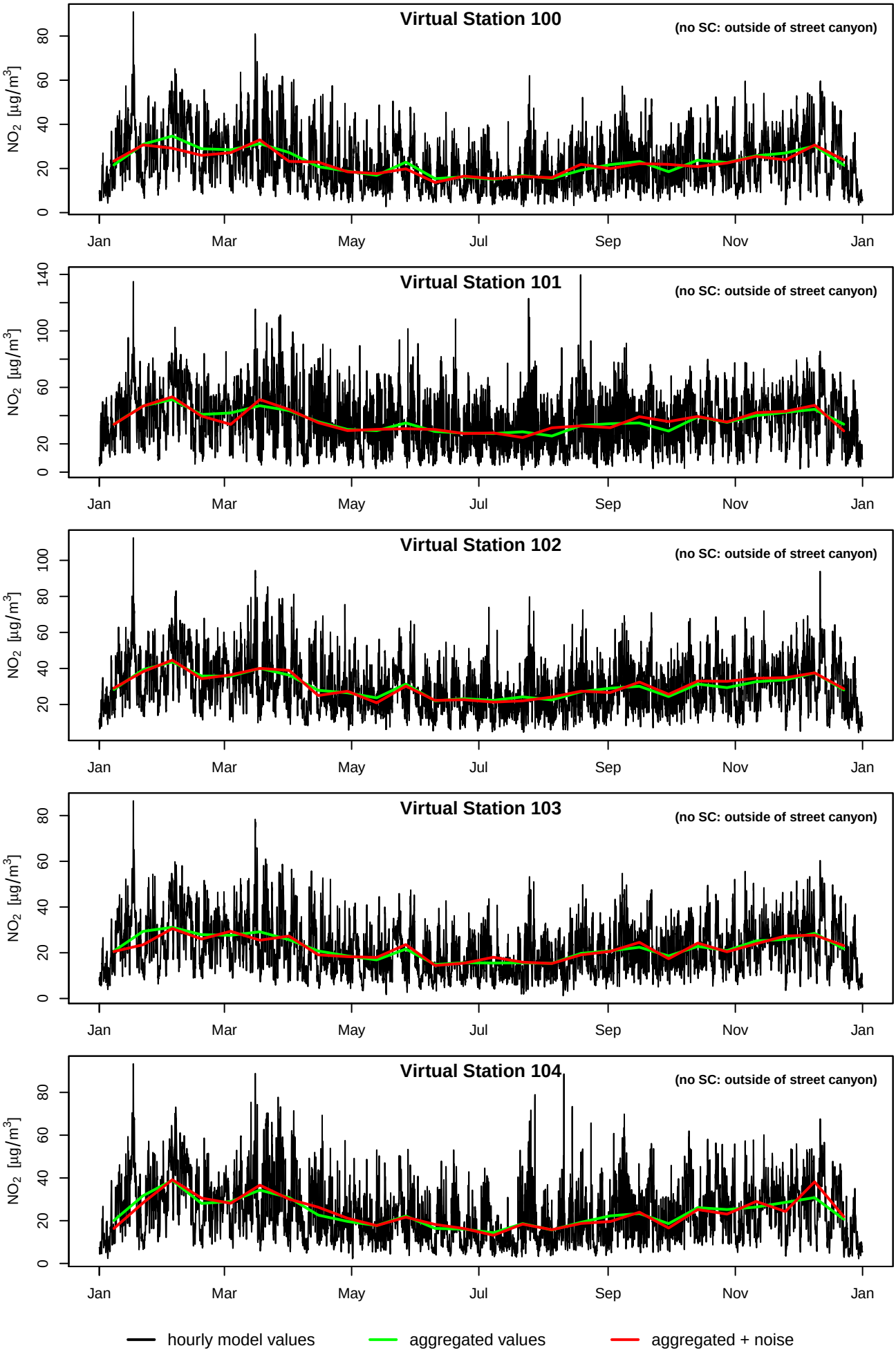

hourly model values
aggregated values
aggregated + noise

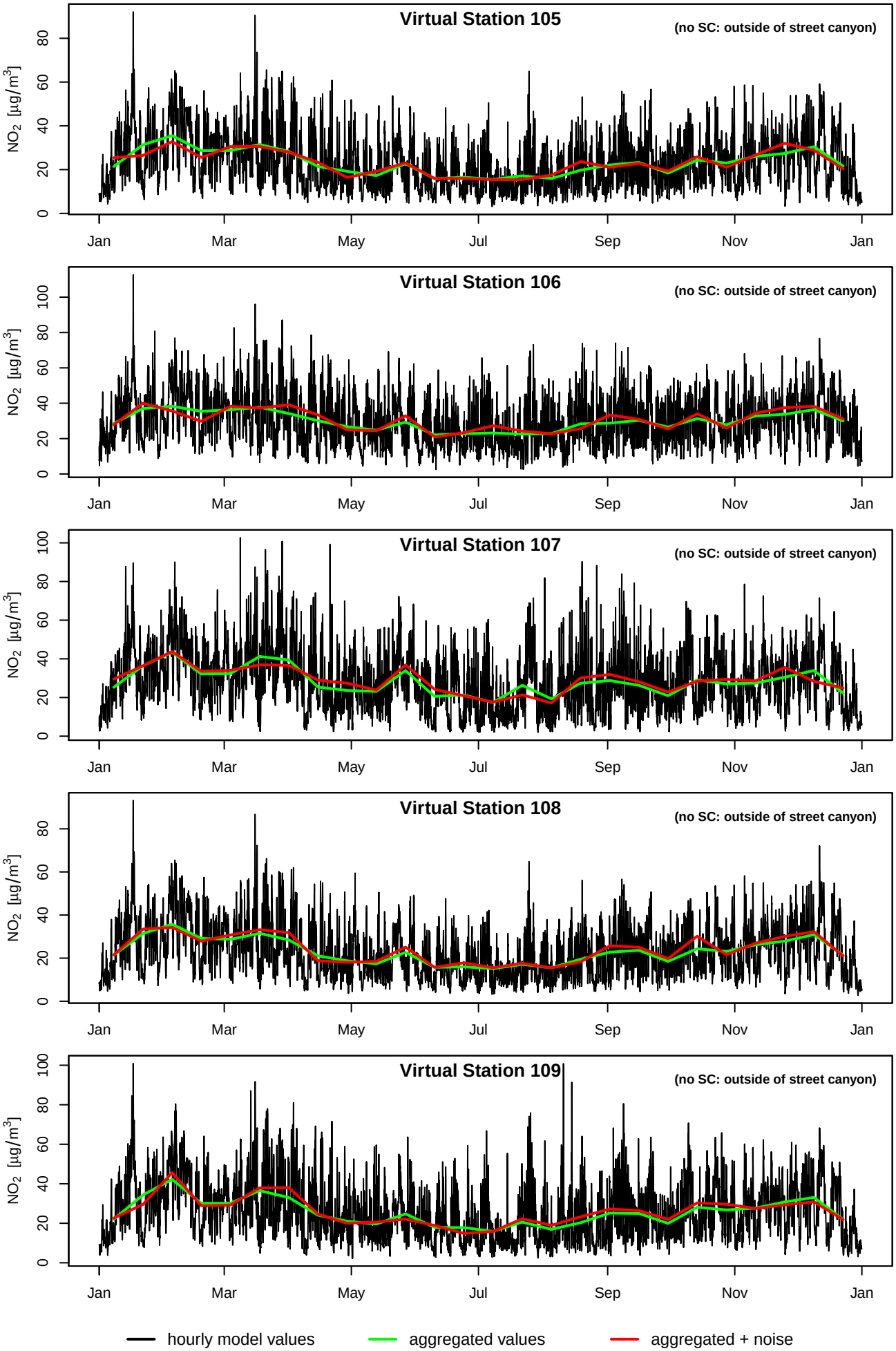

Virtual Station 80
(no SC: outside of street canyon)
Virtual Station 81
(no SC: outside of street canyon)
Virtual Station 82
(no SC: outside of street canyon)
Virtual Station 83
(no SC: outside of street canyon)
Virtual Station 84
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

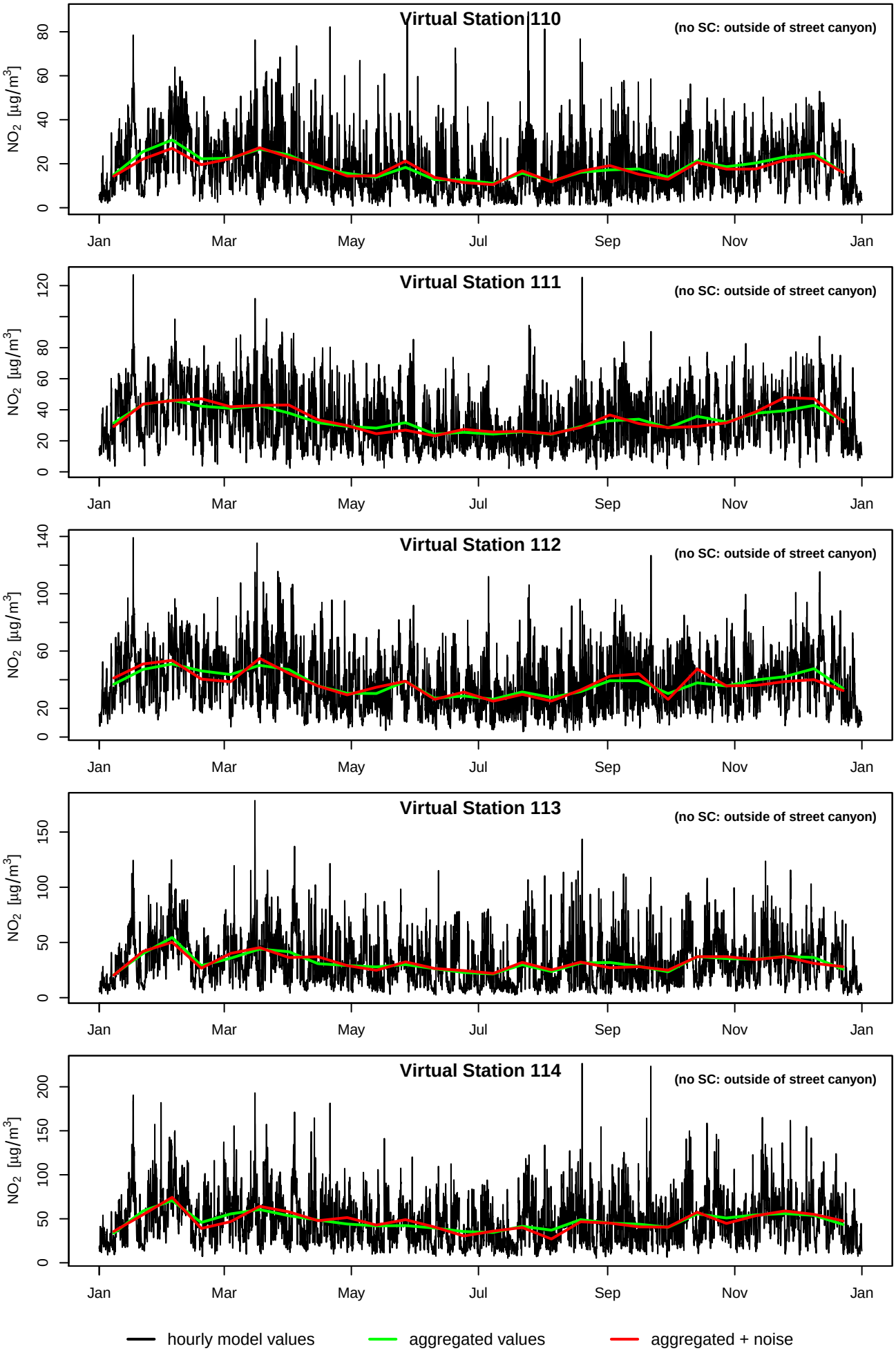

Virtual Station 85
(no SC: outside of street canyon)
Virtual Station 86
(no SC: outside of street canyon)
Virtual Station 87
(no SC: outside of street canyon)
Virtual Station 88
(no SC: outside of street canyon)
Virtual Station 89
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

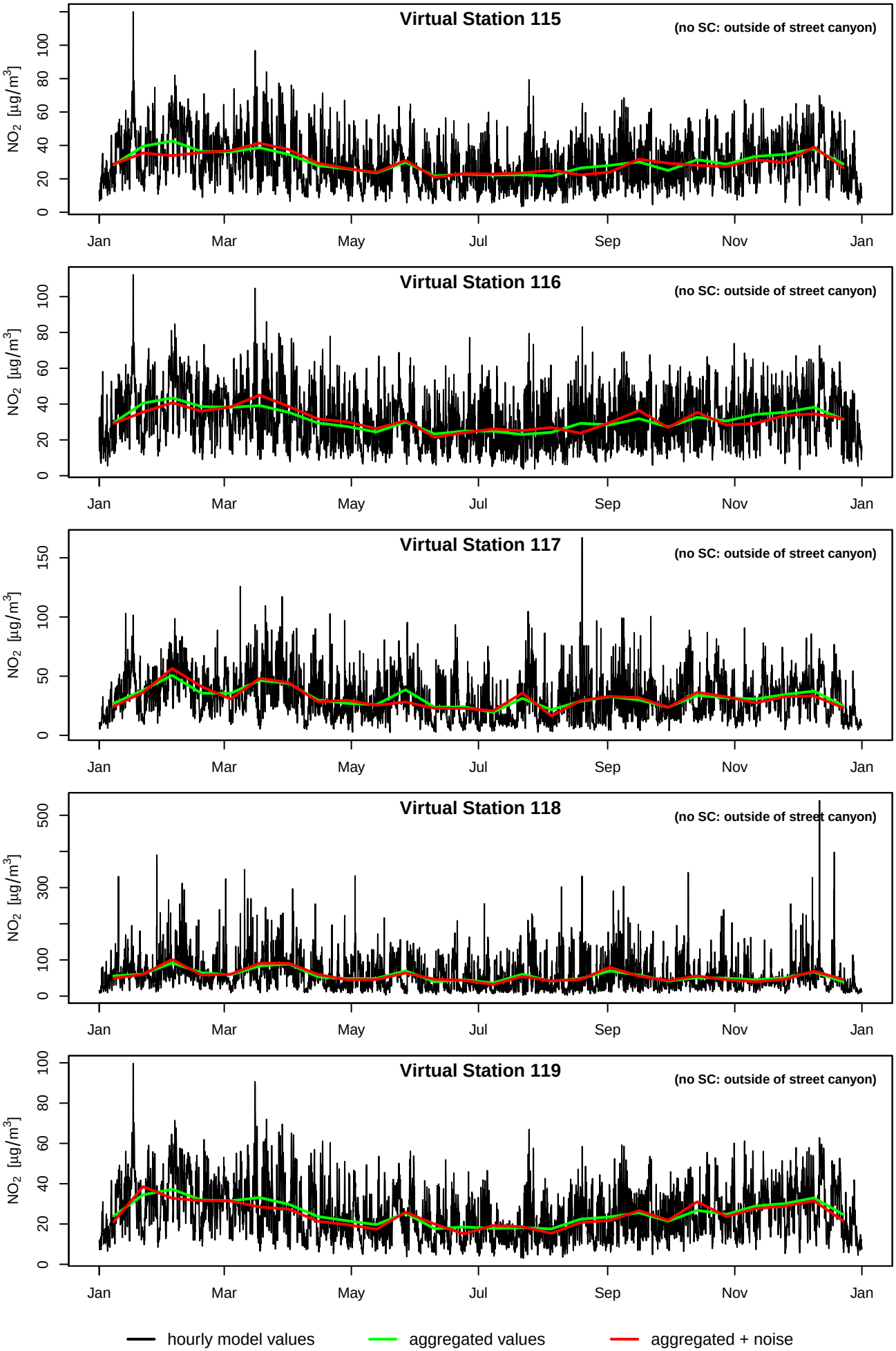

Virtual Station 90
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
150
250
350
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 91
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 92
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 93
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 94
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

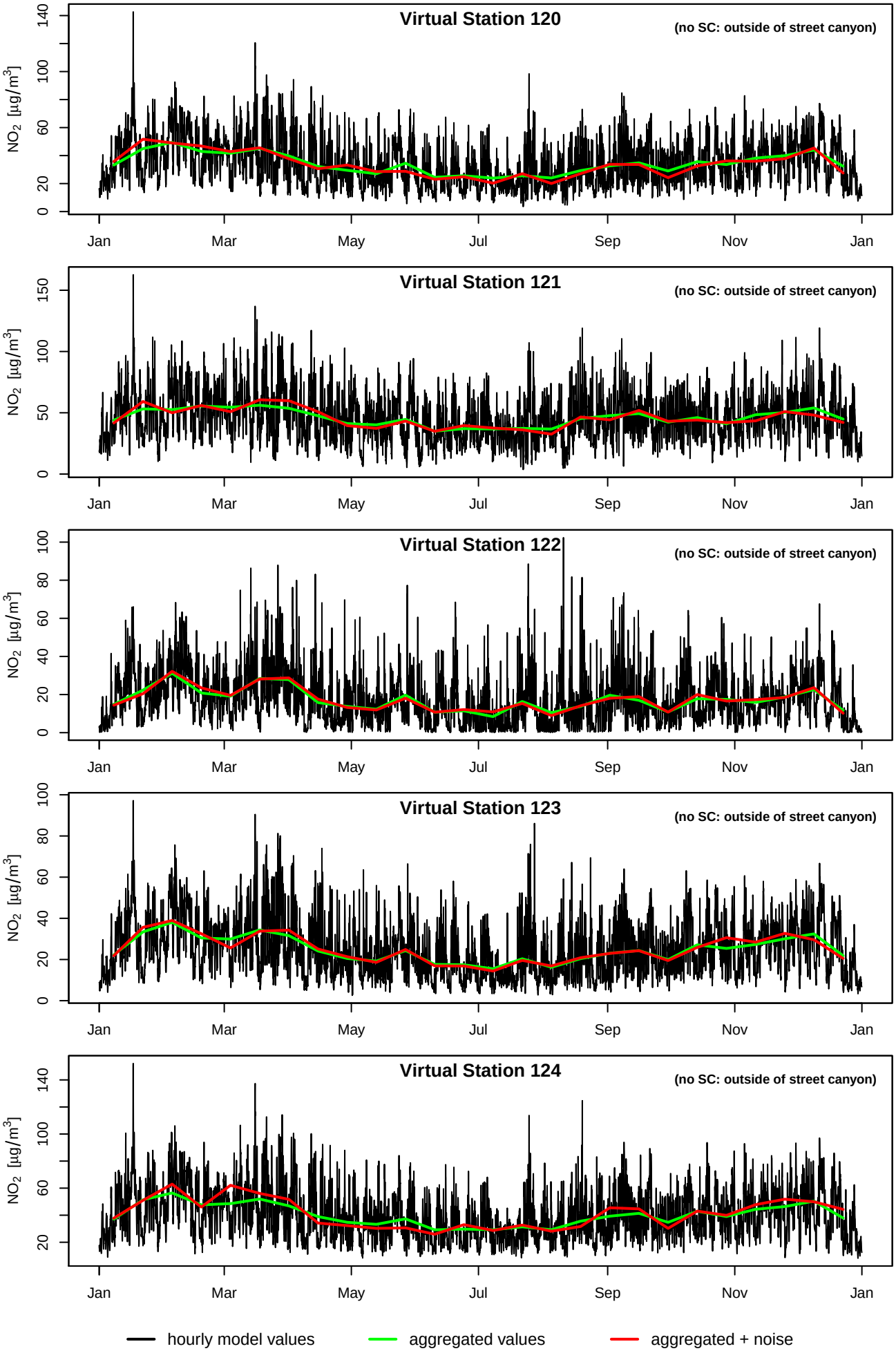

Virtual Station 95
(no SC: outside of street canyon)
Virtual Station 96
(no SC: outside of street canyon)
Virtual Station 97
(no SC: outside of street canyon)
Virtual Station 98
(no SC: outside of street canyon)
Virtual Station 99
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

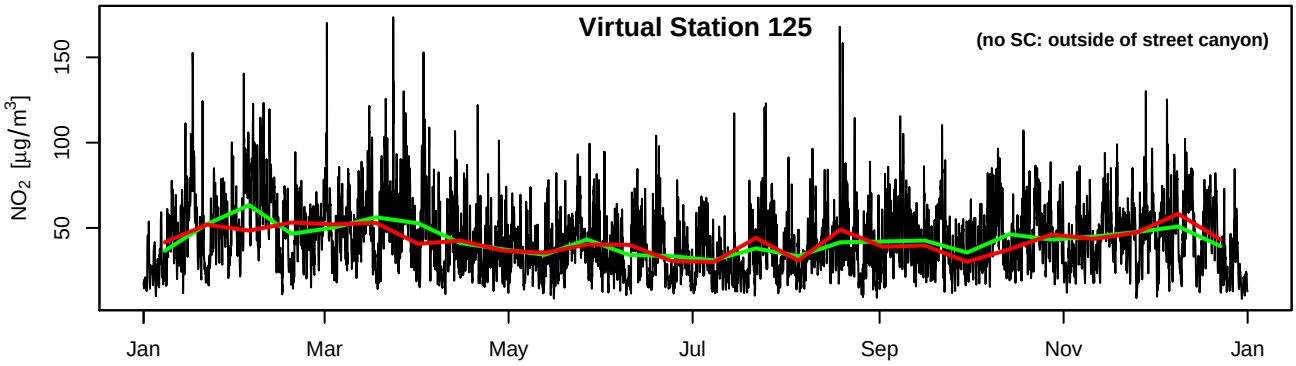

Virtual Station 100
(no SC: outside of street canyon)
Virtual Station 101
(no SC: outside of street canyon)
Virtual Station 102
(no SC: outside of street canyon)
Virtual Station 103
(no SC: outside of street canyon)
Virtual Station 104
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

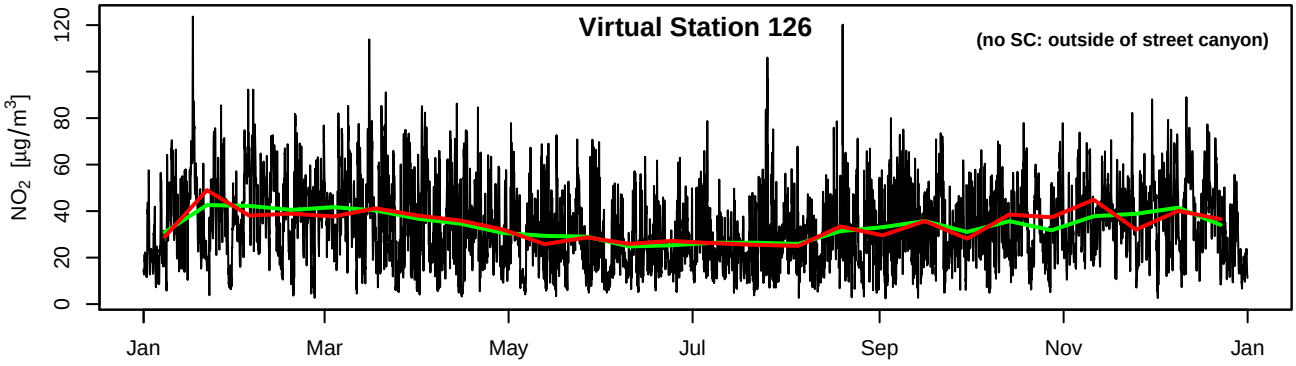

Virtual Station 105
(no SC: outside of street canyon)
Virtual Station 106
(no SC: outside of street canyon)
Virtual Station 107
(no SC: outside of street canyon)
Virtual Station 108
(no SC: outside of street canyon)
Virtual Station 109
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

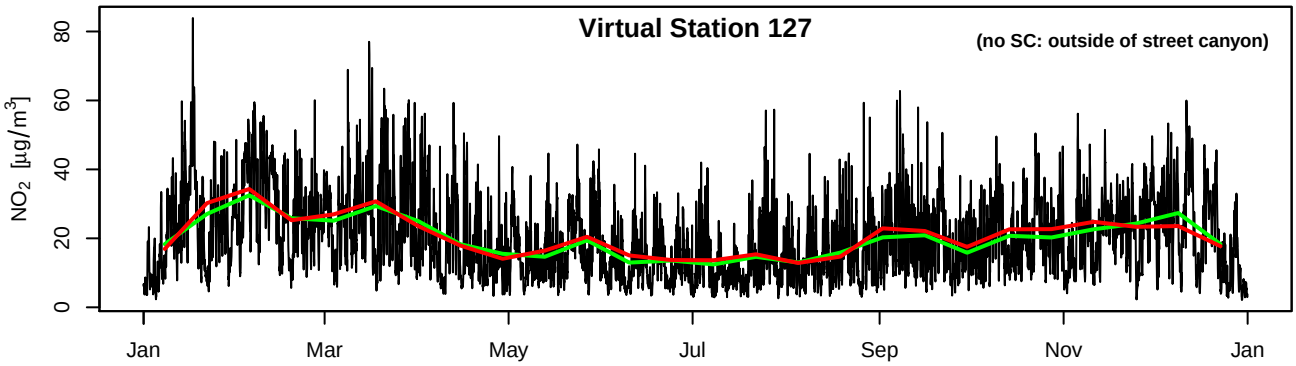

Virtual Station 110
(no SC: outside of street canyon)
Virtual Station 111
(no SC: outside of street canyon)
Virtual Station 112
(no SC: outside of street canyon)
Virtual Station 113
(no SC: outside of street canyon)
Virtual Station 114
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

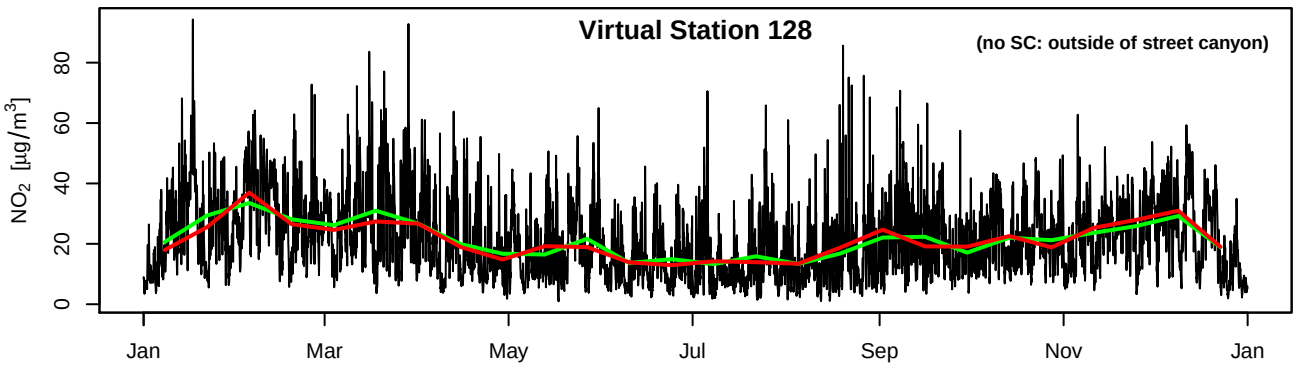

Virtual Station 115
(no SC: outside of street canyon)
NO2 [µg/m3]
0 20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 116
(no SC: outside of street canyon)
NO2 [µg/m3]
0 20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 117
(no SC: outside of street canyon)
NO2 [µg/m3]
0 50 100 150
Jan Mar May Jul Sep Nov Jan
Virtual Station 118
(no SC: outside of street canyon)
NO2 [µg/m3]
0 100 300 500
Jan Mar May Jul Sep Nov Jan
Virtual Station 119
(no SC: outside of street canyon)
NO2 [µg/m3]
0 20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
hourly model values
aggregated values
aggregated + noise

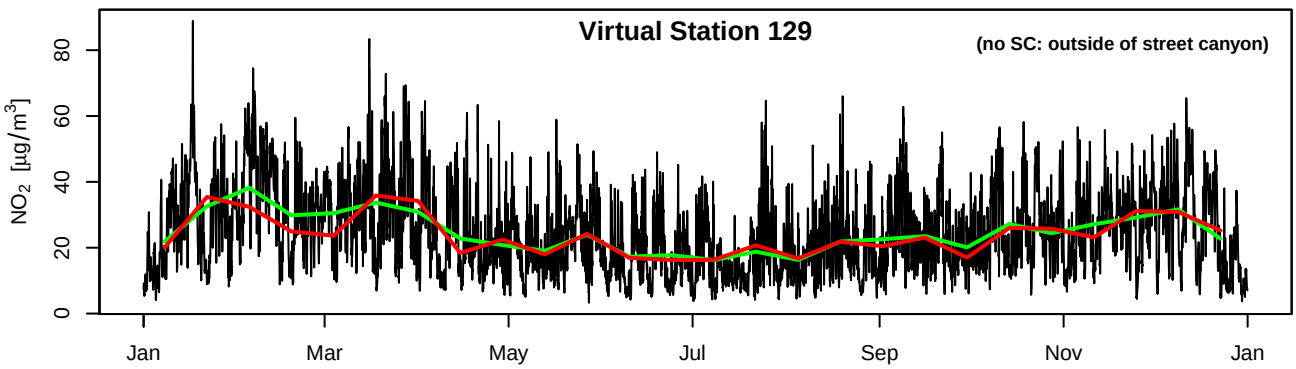

Virtual Station 120
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 121
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 122
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 123
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 124
(no SC: outside of street canyon)
NO2 [µg/m3]
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

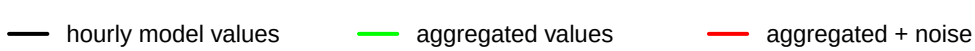

Virtual Station 125
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan

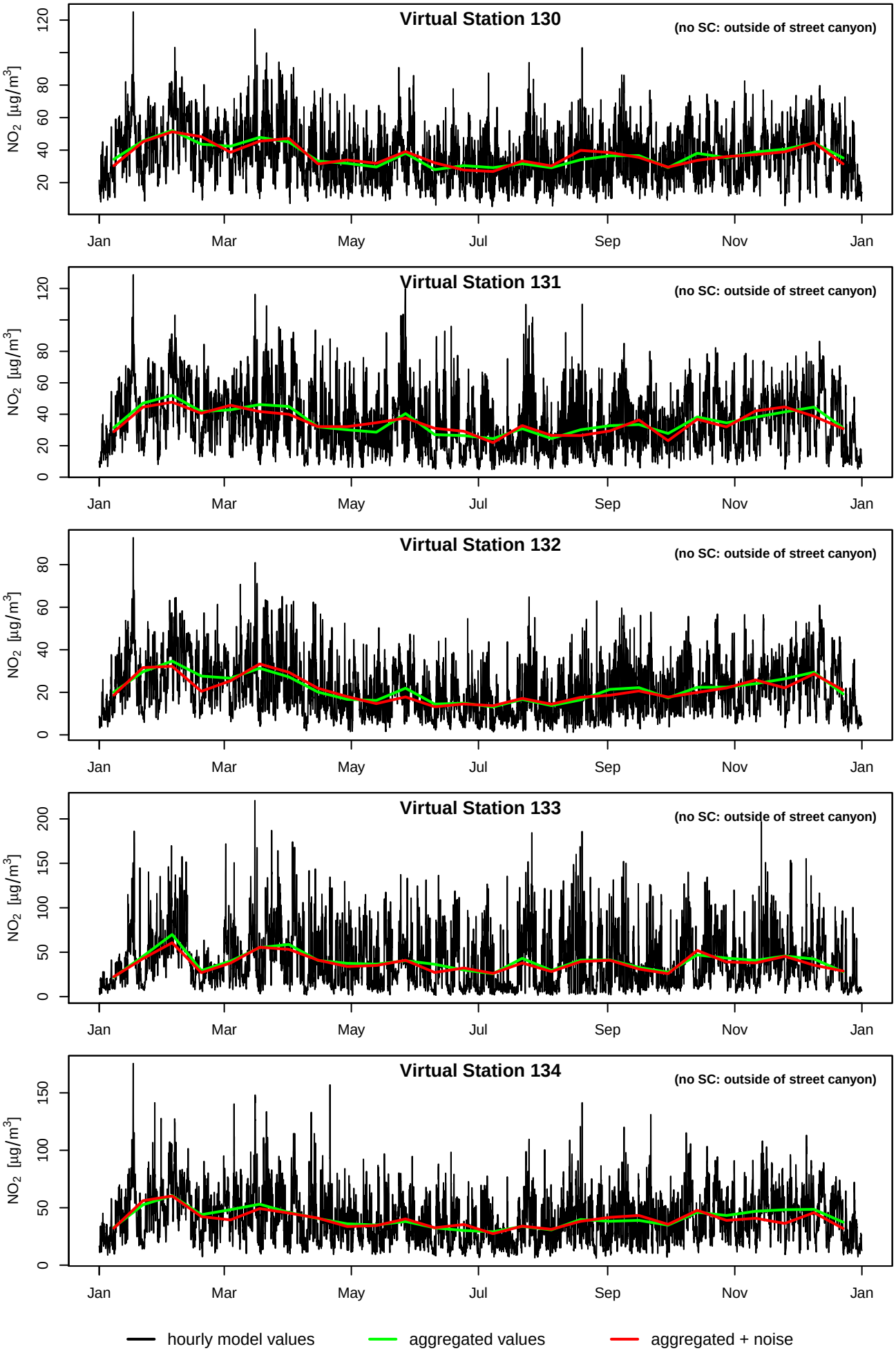

Virtual Station 126
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan

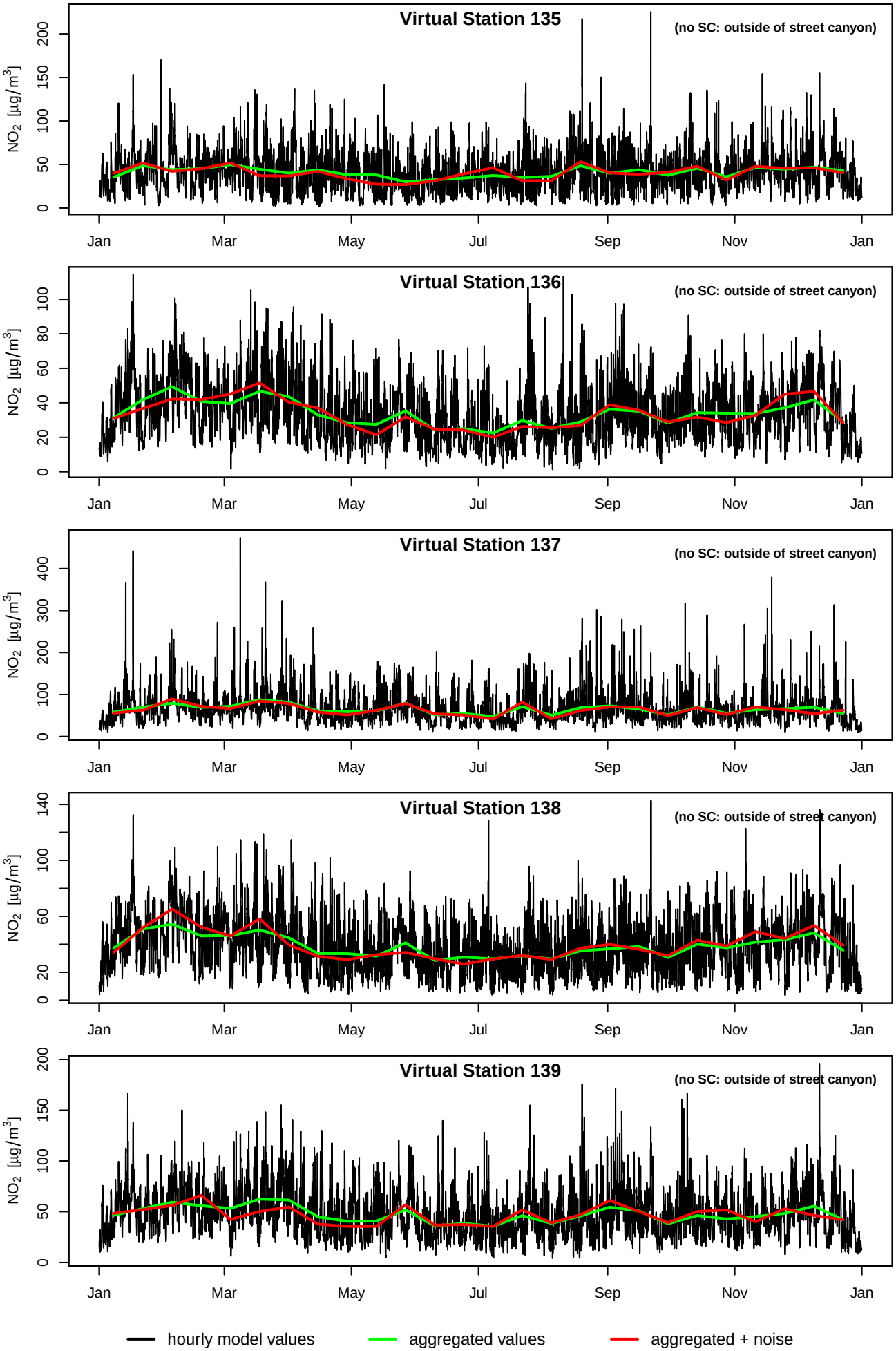

Virtual Station 127
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
Jan
Mar
May
Jul
Sep
Nov
Jan

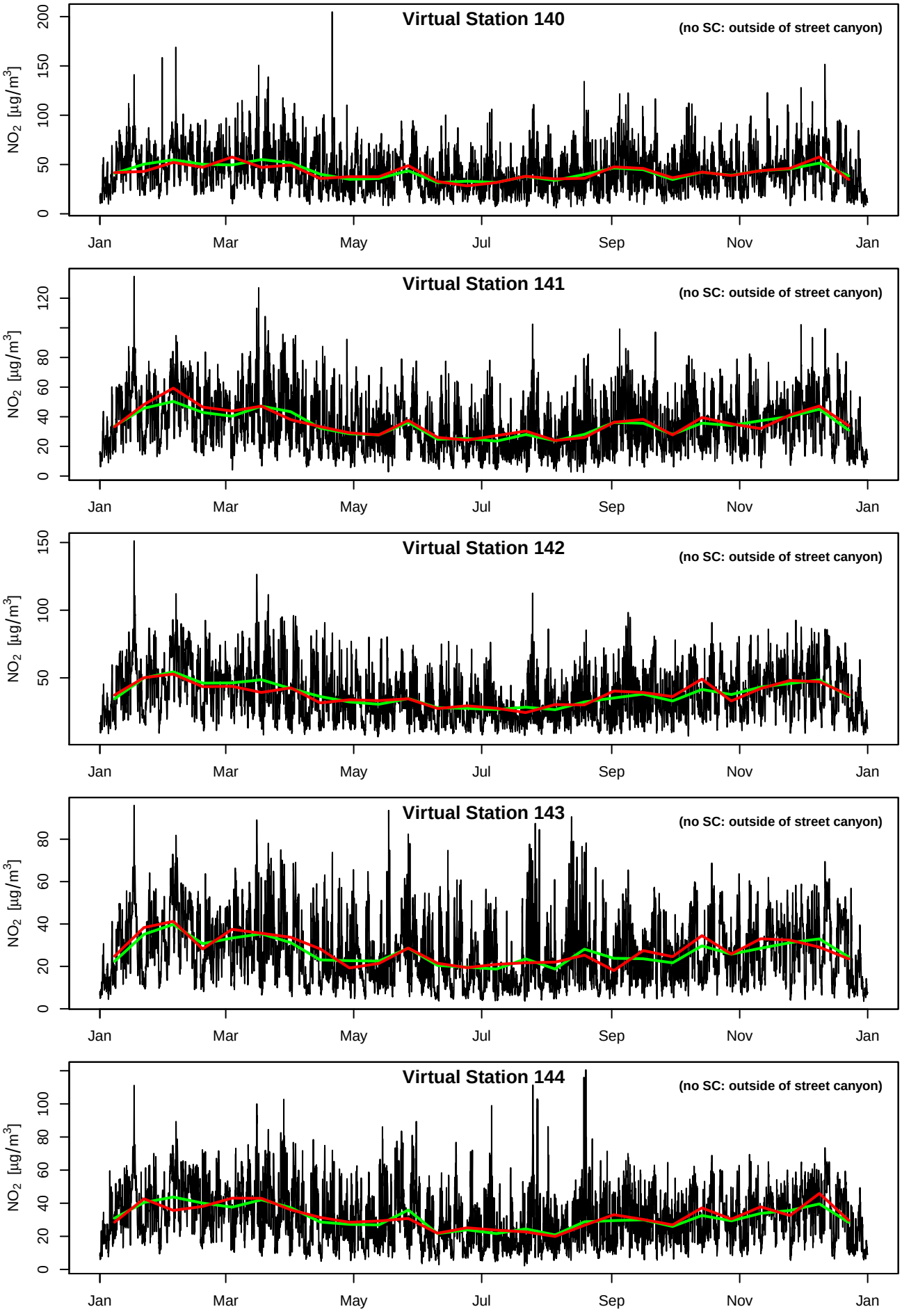

Virtual Station 128
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
Jan
Mar
May
Jul
Sep
Nov
Jan

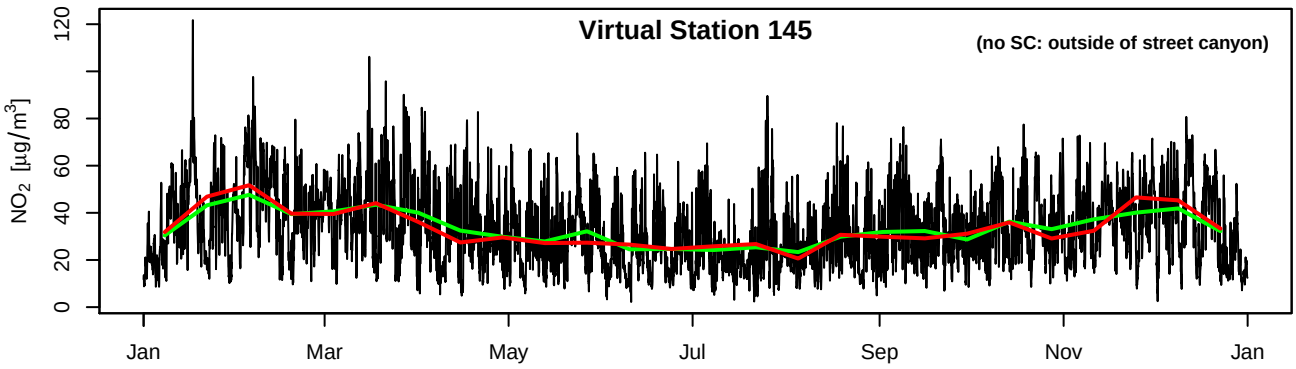

Virtual Station 129
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
Jan
Mar
May
Jul
Sep
Nov
Jan

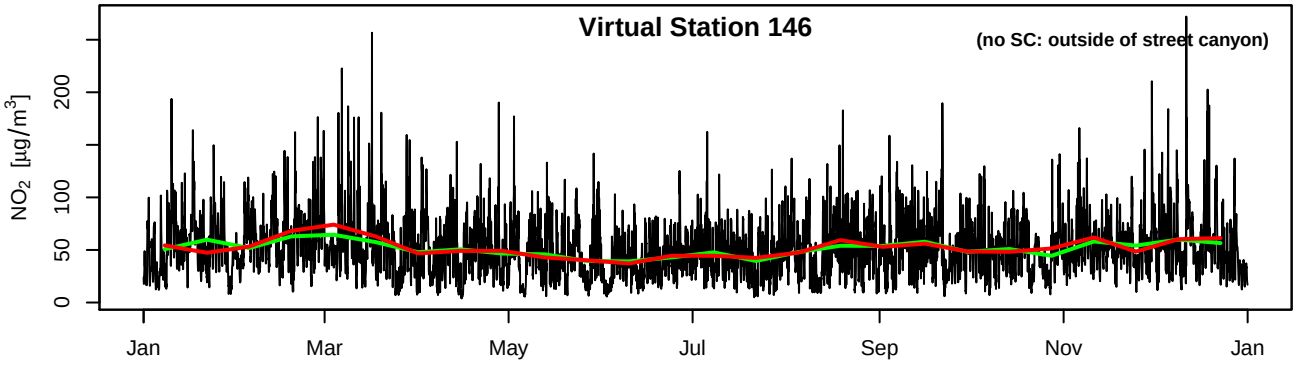

hourly model values
aggregated values
aggregated + noise

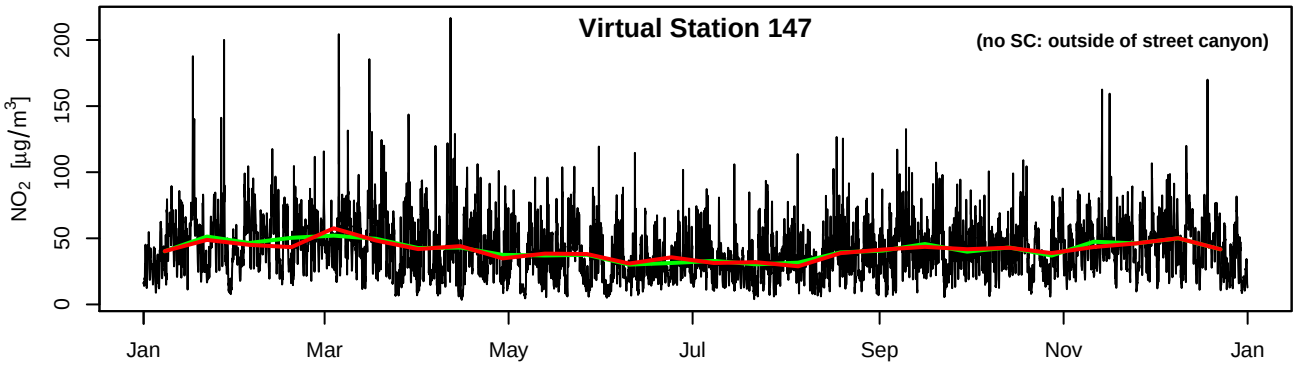

Virtual Station 130
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 131
(no SC: outside of street canyon)
Virtual Station 132
(no SC: outside of street canyon)
Virtual Station 133
(no SC: outside of street canyon)
Virtual Station 134
(no SC: outside of street canyon)
hourly model values
aggregated values
aggregated + noise

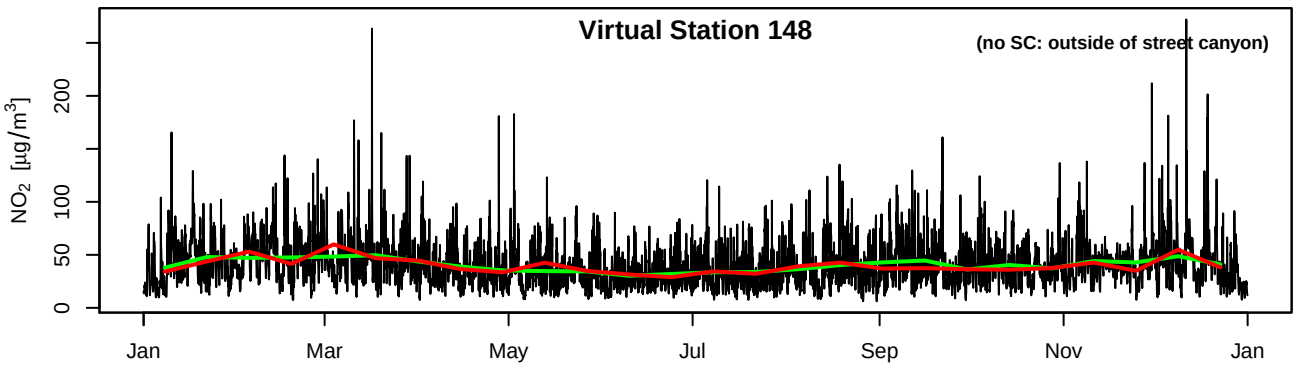

Virtual Station 135
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 136
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 137
(no SC: outside of street canyon)
NO2 [µg/m3]
0
100
200
300
400
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 138
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 139
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

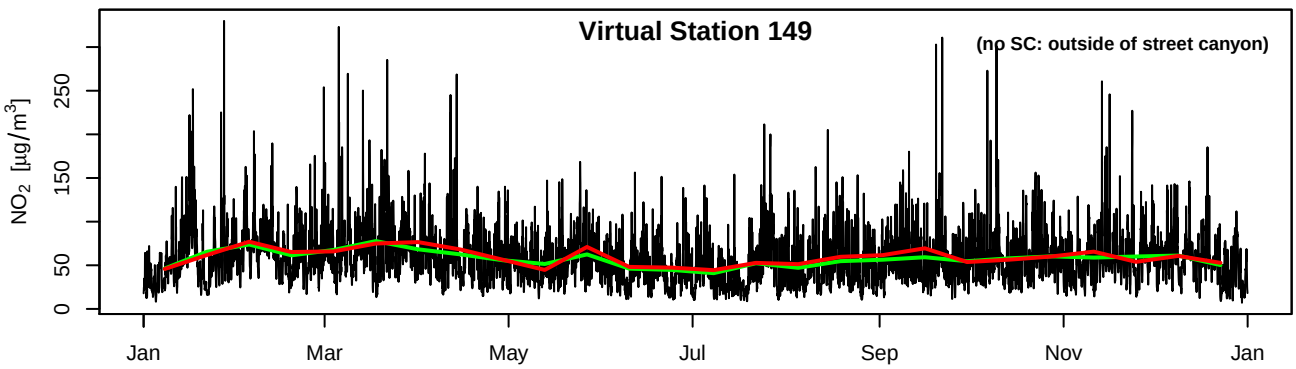

Virtual Station 140
(no SC: outside of street canyon)
Virtual Station 141
(no SC: outside of street canyon)
Virtual Station 142
(no SC: outside of street canyon)
Virtual Station 143
(no SC: outside of street canyon)
Virtual Station 144
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

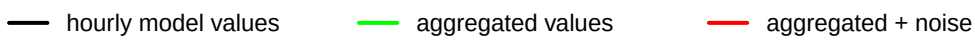

Virtual Station 145
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan

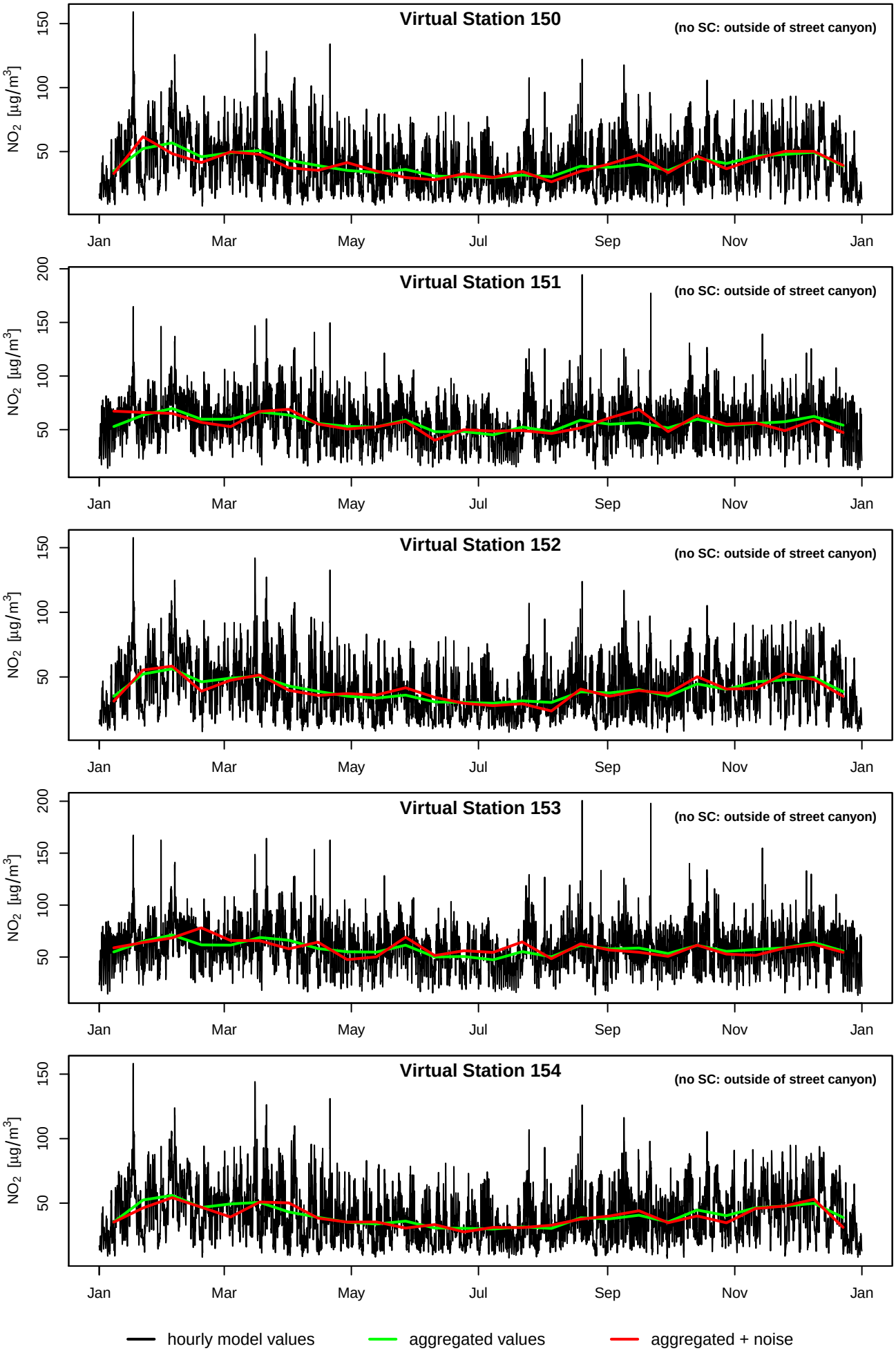

Virtual Station 146
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
200
Jan
Mar
May
Jul
Sep
Nov
Jan

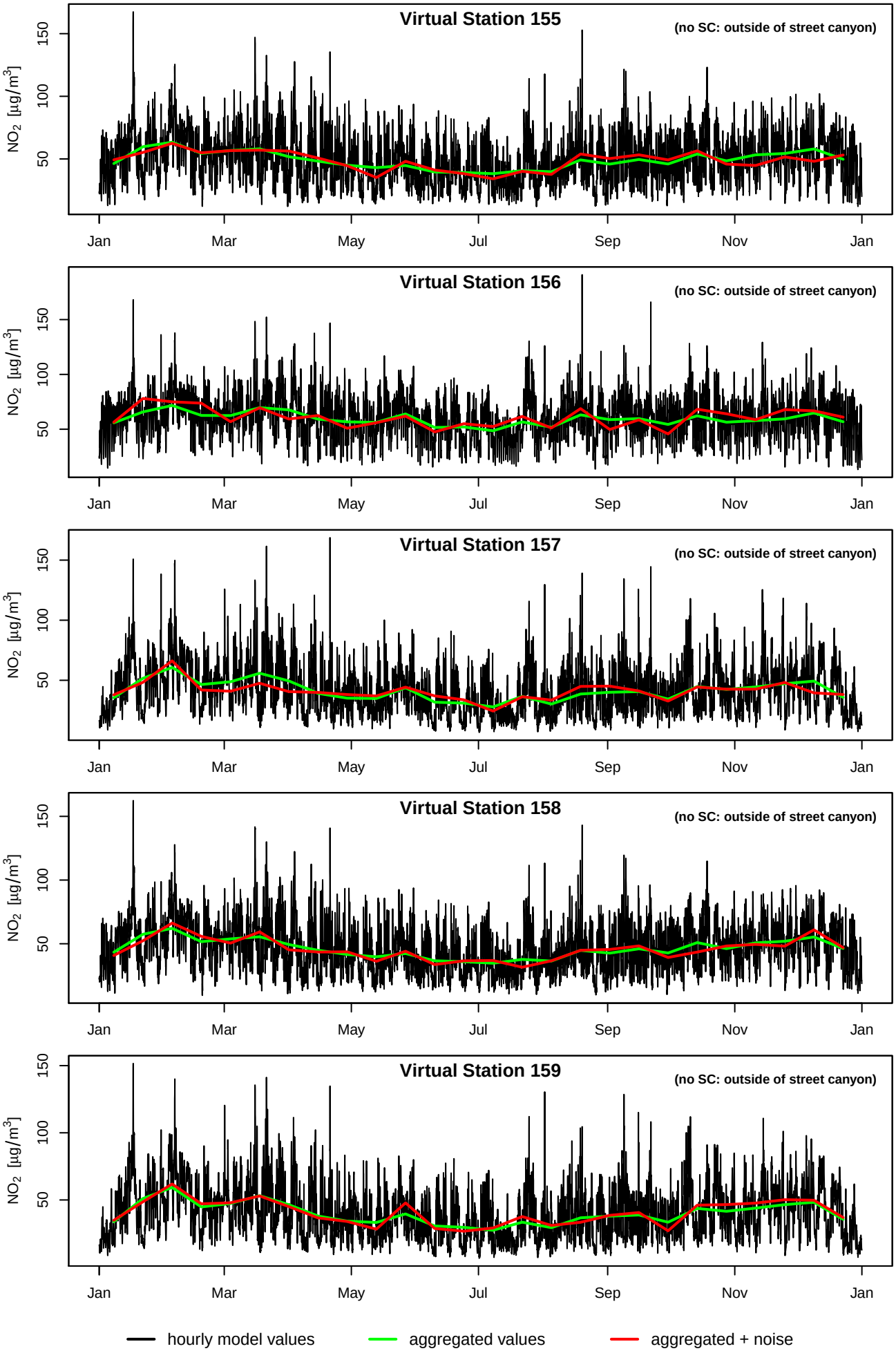

Virtual Station 147
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan

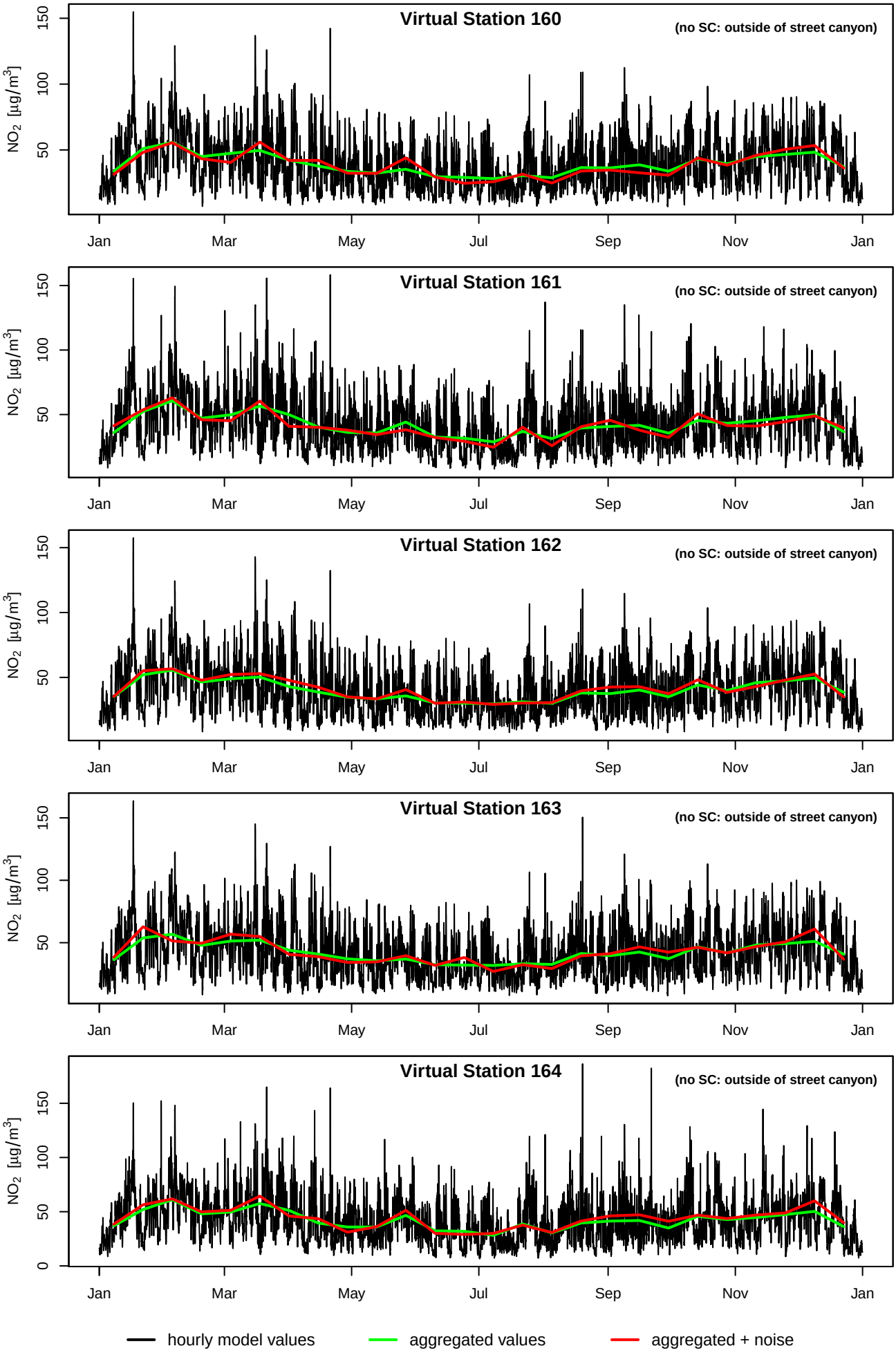

Virtual Station 148
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
200
Jan
Mar
May
Jul
Sep
Nov
Jan

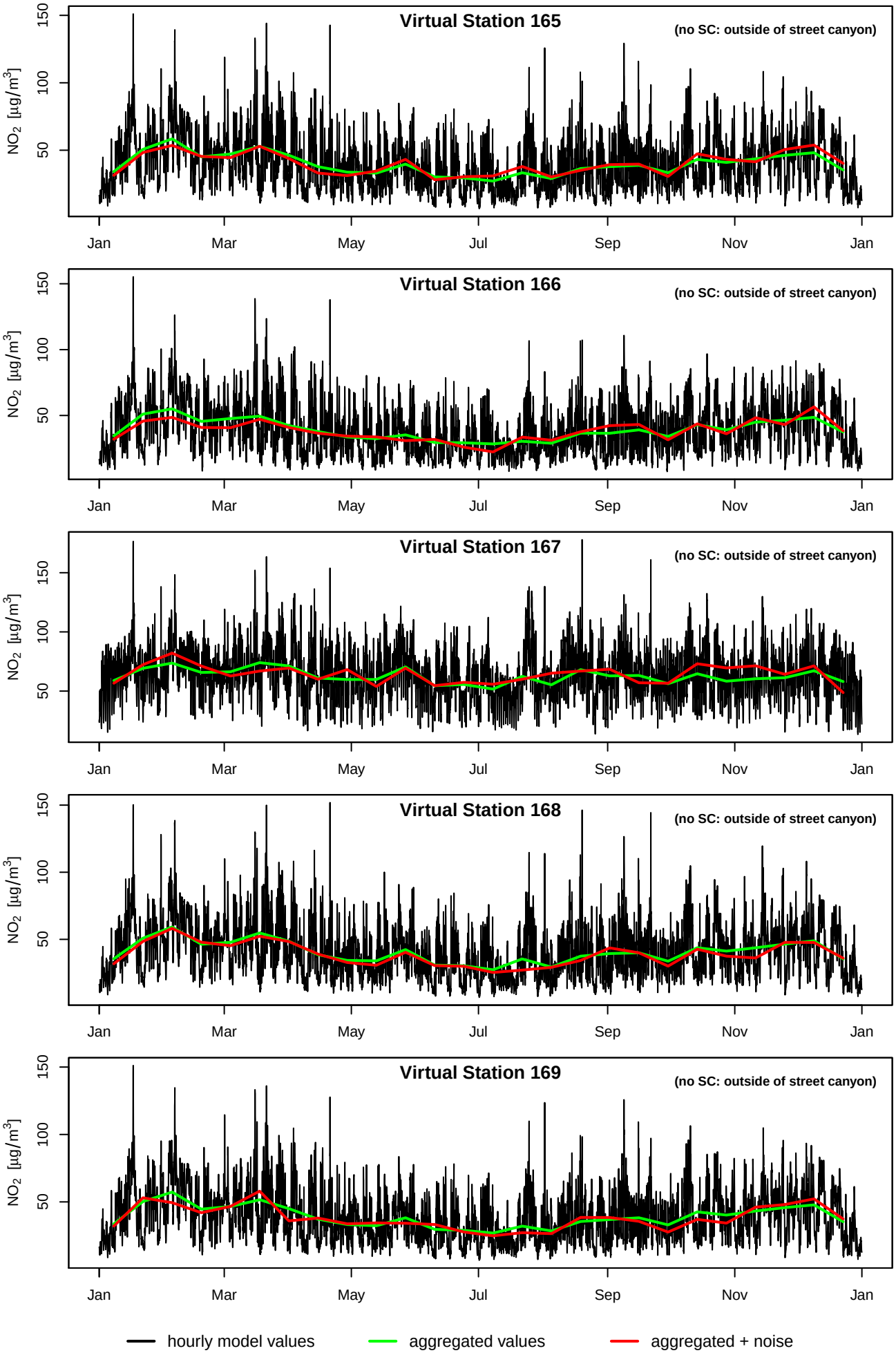

Virtual Station 149
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
150
250
Jan
Mar
May
Jul
Sep
Nov
Jan

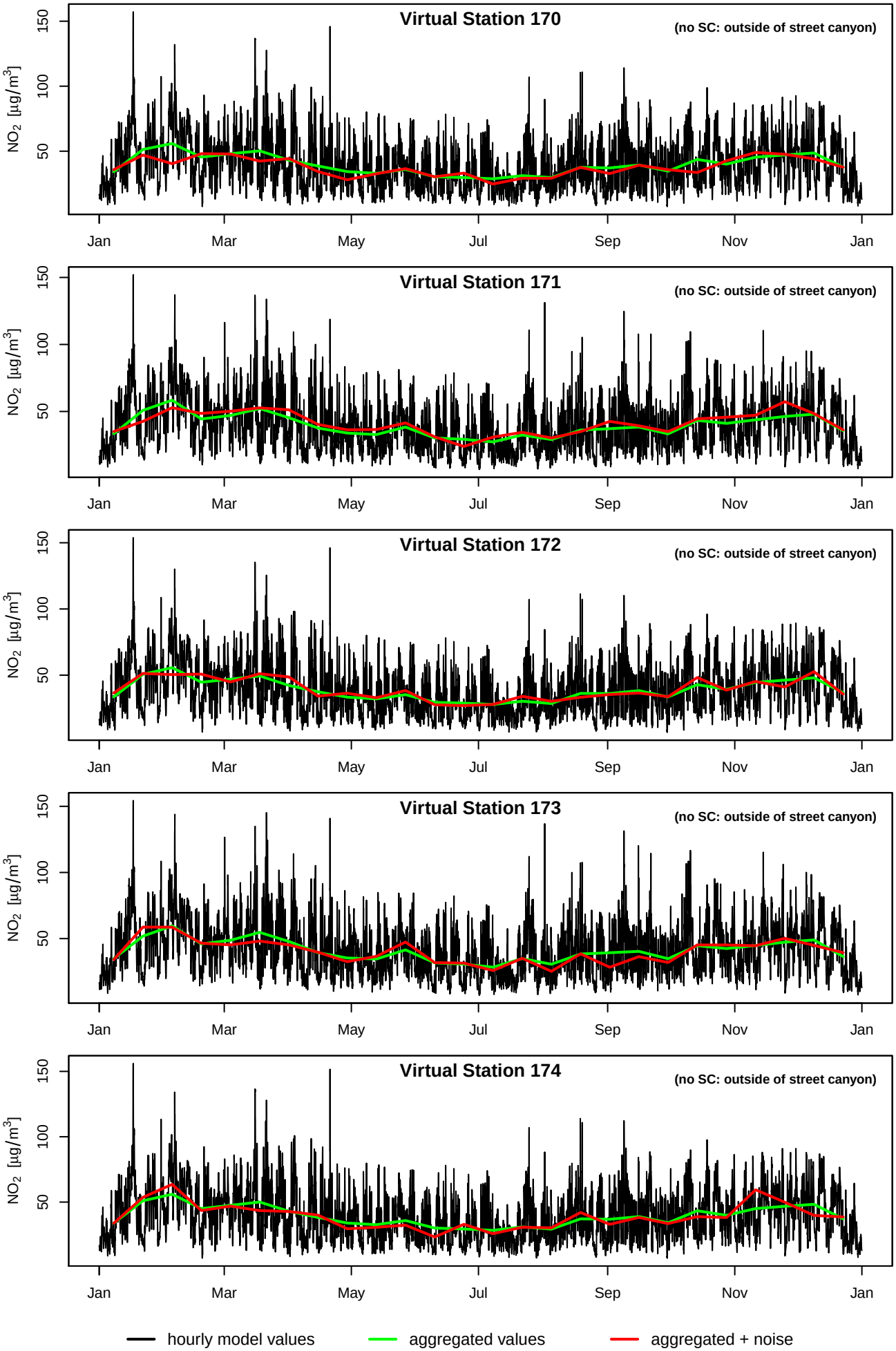

hourly model values
aggregated values
aggregated + noise

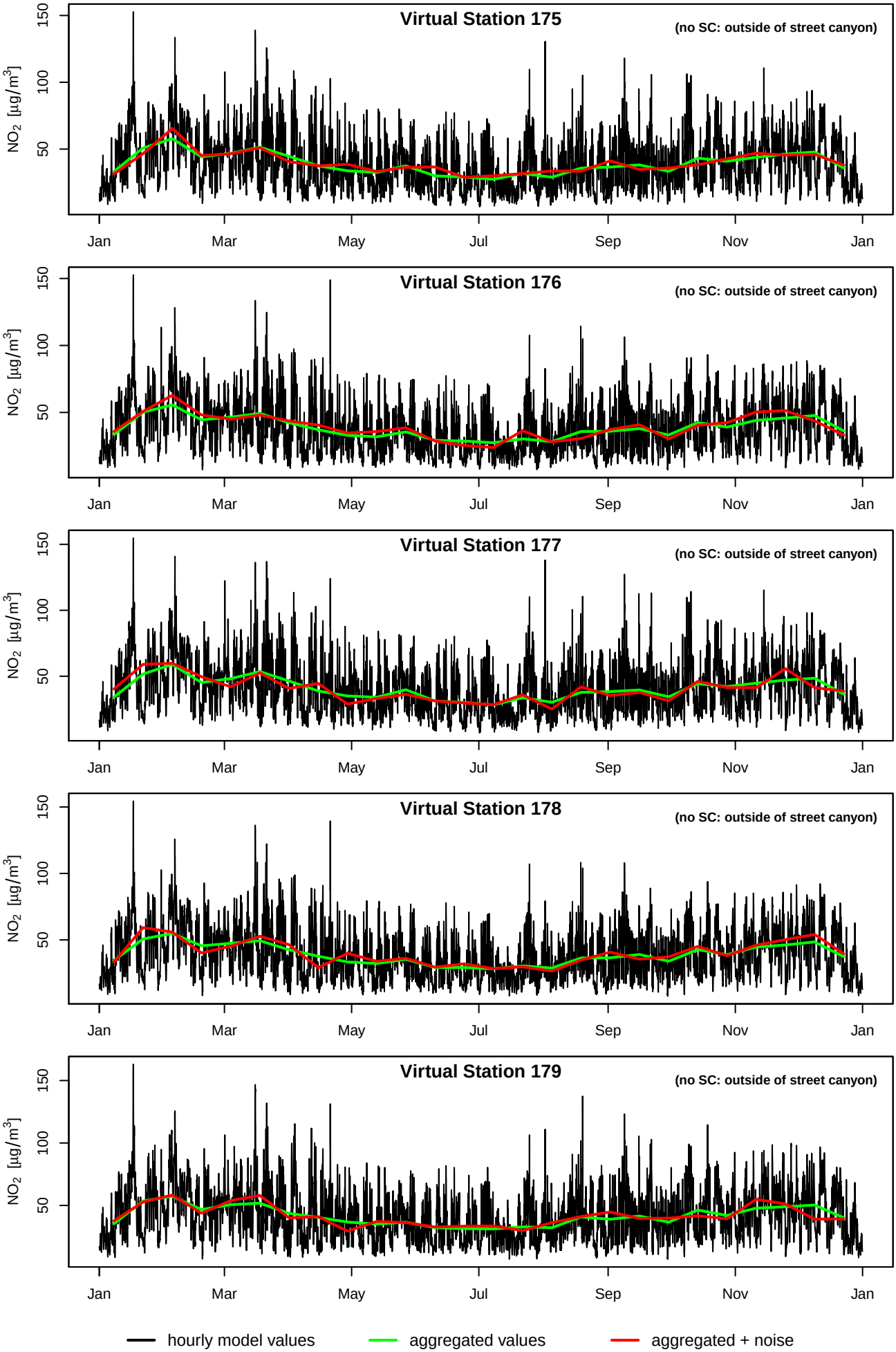

Virtual Station 150
(no SC: outside of street canyon)
Virtual Station 151
(no SC: outside of street canyon)
Virtual Station 152
(no SC: outside of street canyon)
Virtual Station 153
(no SC: outside of street canyon)
Virtual Station 154
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

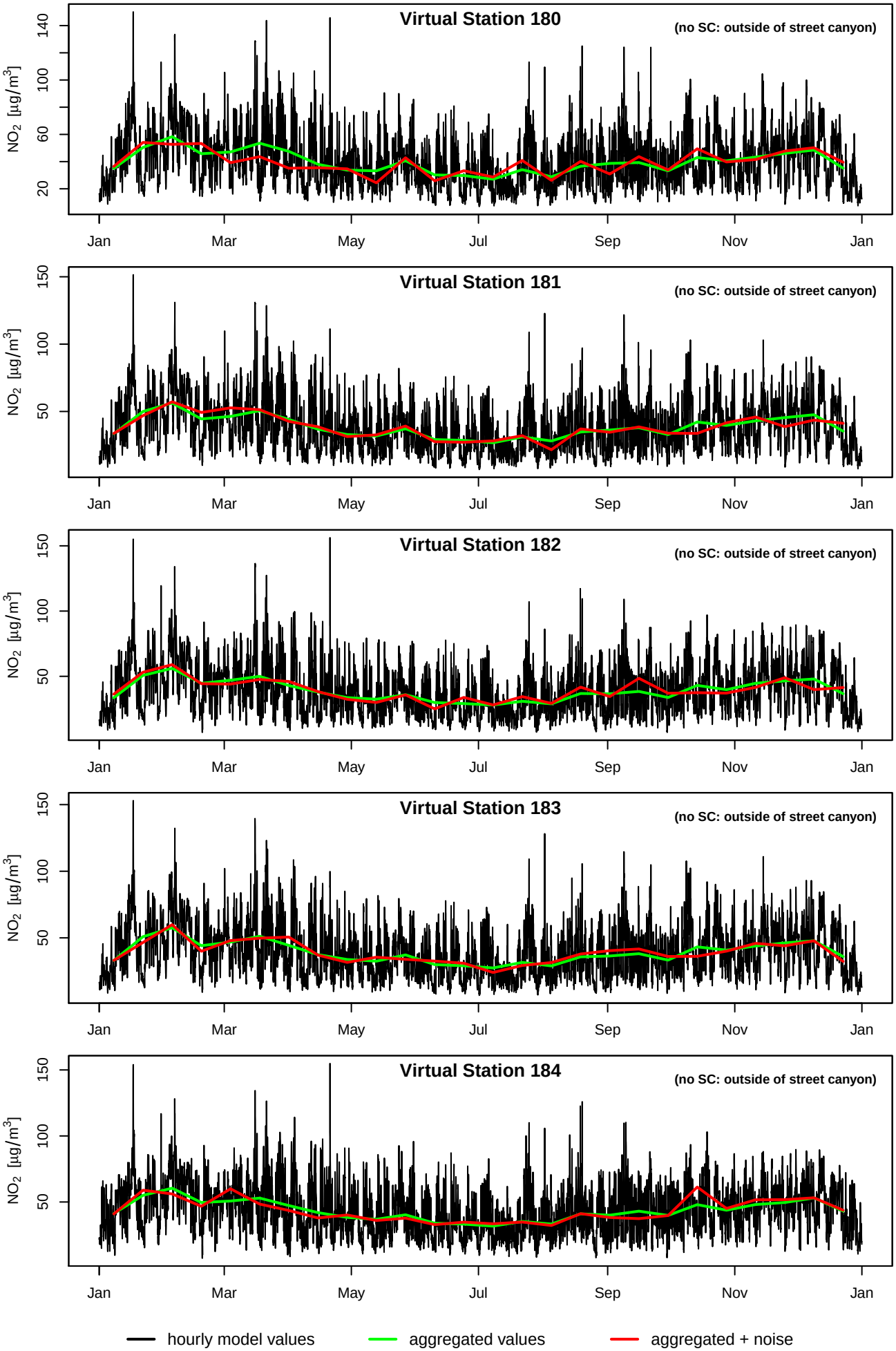

Virtual Station 155
(no SC: outside of street canyon)
Virtual Station 156
(no SC: outside of street canyon)
Virtual Station 157
(no SC: outside of street canyon)
Virtual Station 158
(no SC: outside of street canyon)
Virtual Station 159
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

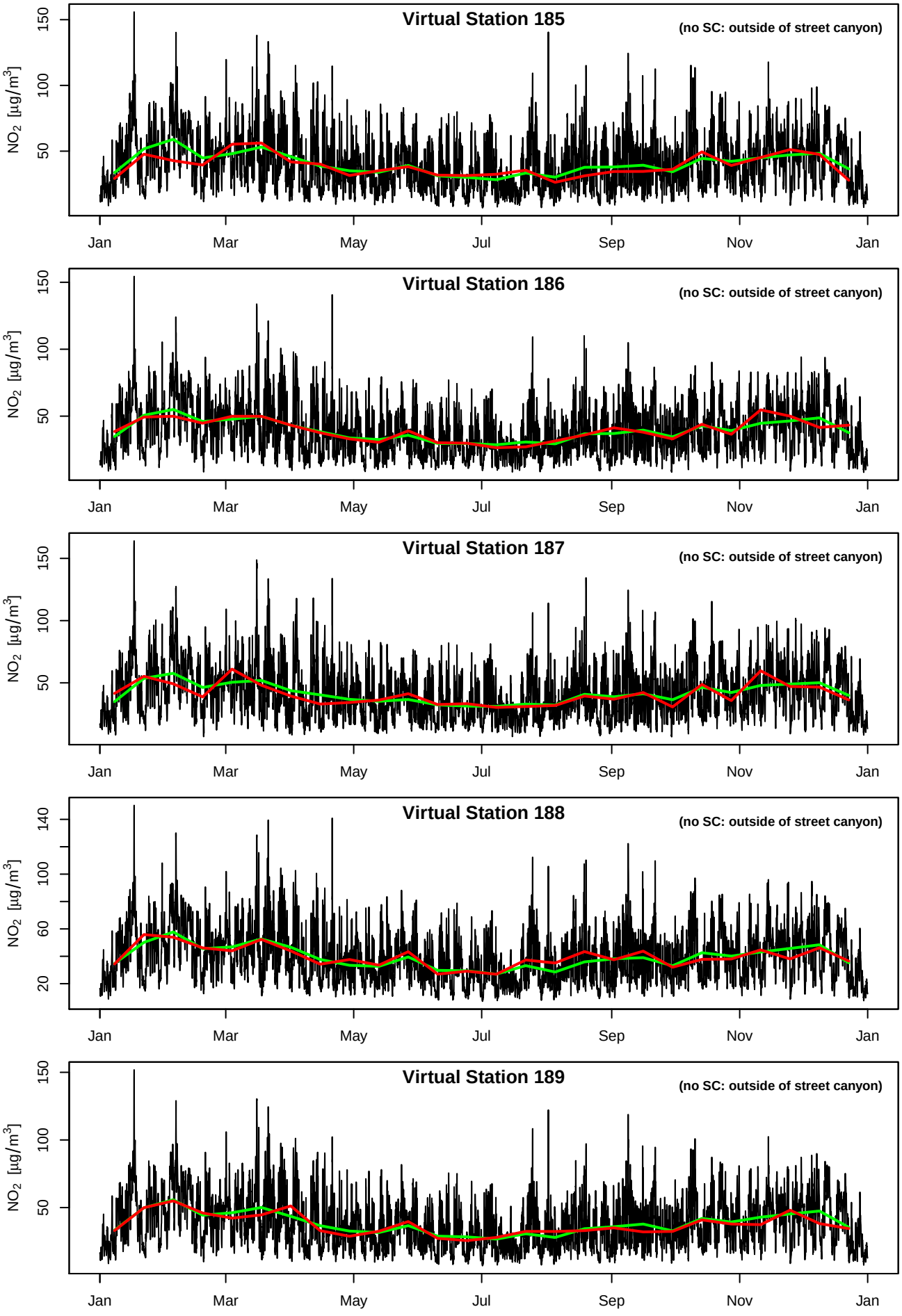

Virtual Station 160
(no SC: outside of street canyon)
Virtual Station 161
(no SC: outside of street canyon)
Virtual Station 162
(no SC: outside of street canyon)
Virtual Station 163
(no SC: outside of street canyon)
Virtual Station 164
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

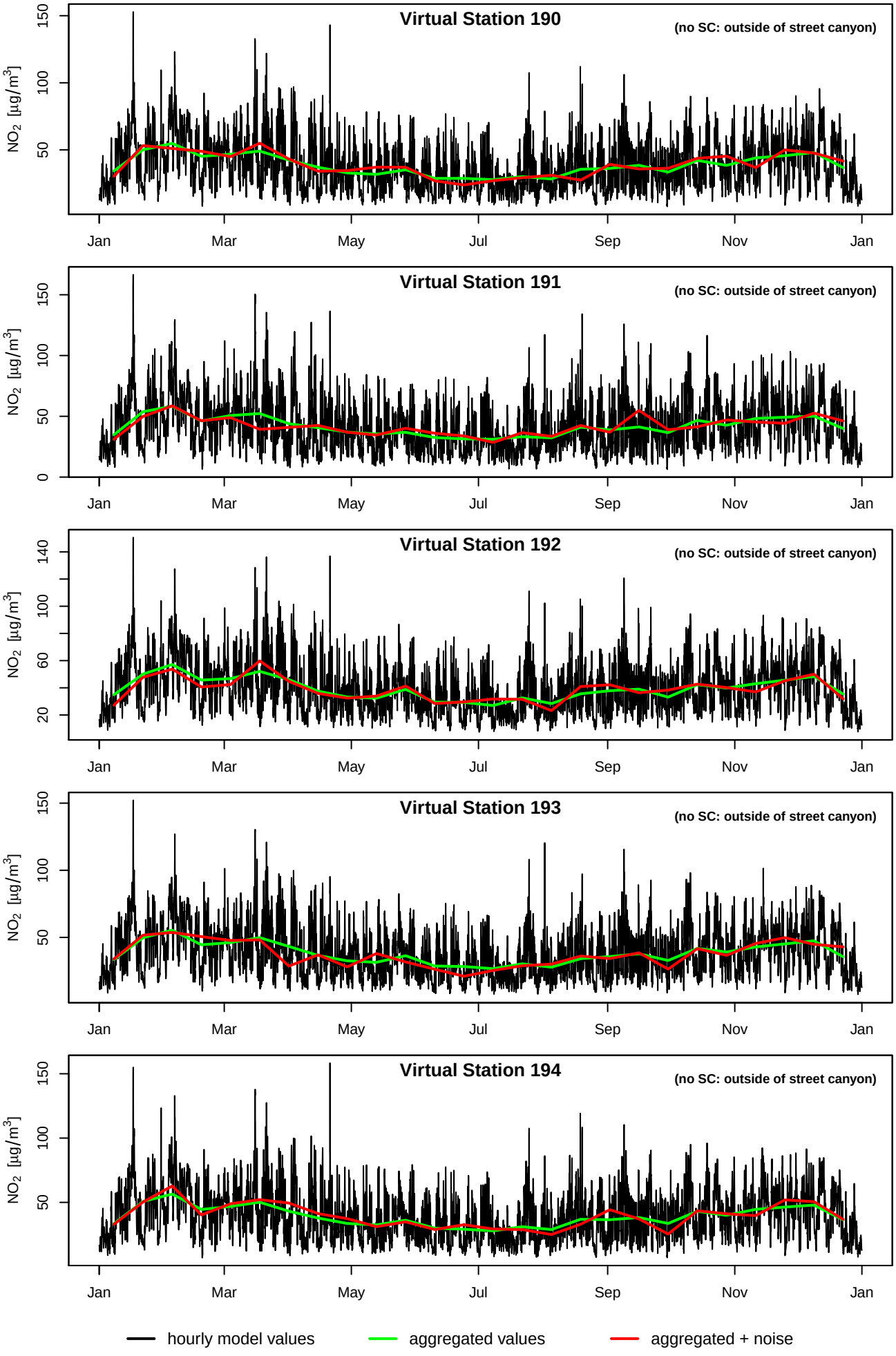

Virtual Station 165
(no SC: outside of street canyon)
Virtual Station 166
(no SC: outside of street canyon)
Virtual Station 167
(no SC: outside of street canyon)
Virtual Station 168
(no SC: outside of street canyon)
Virtual Station 169
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

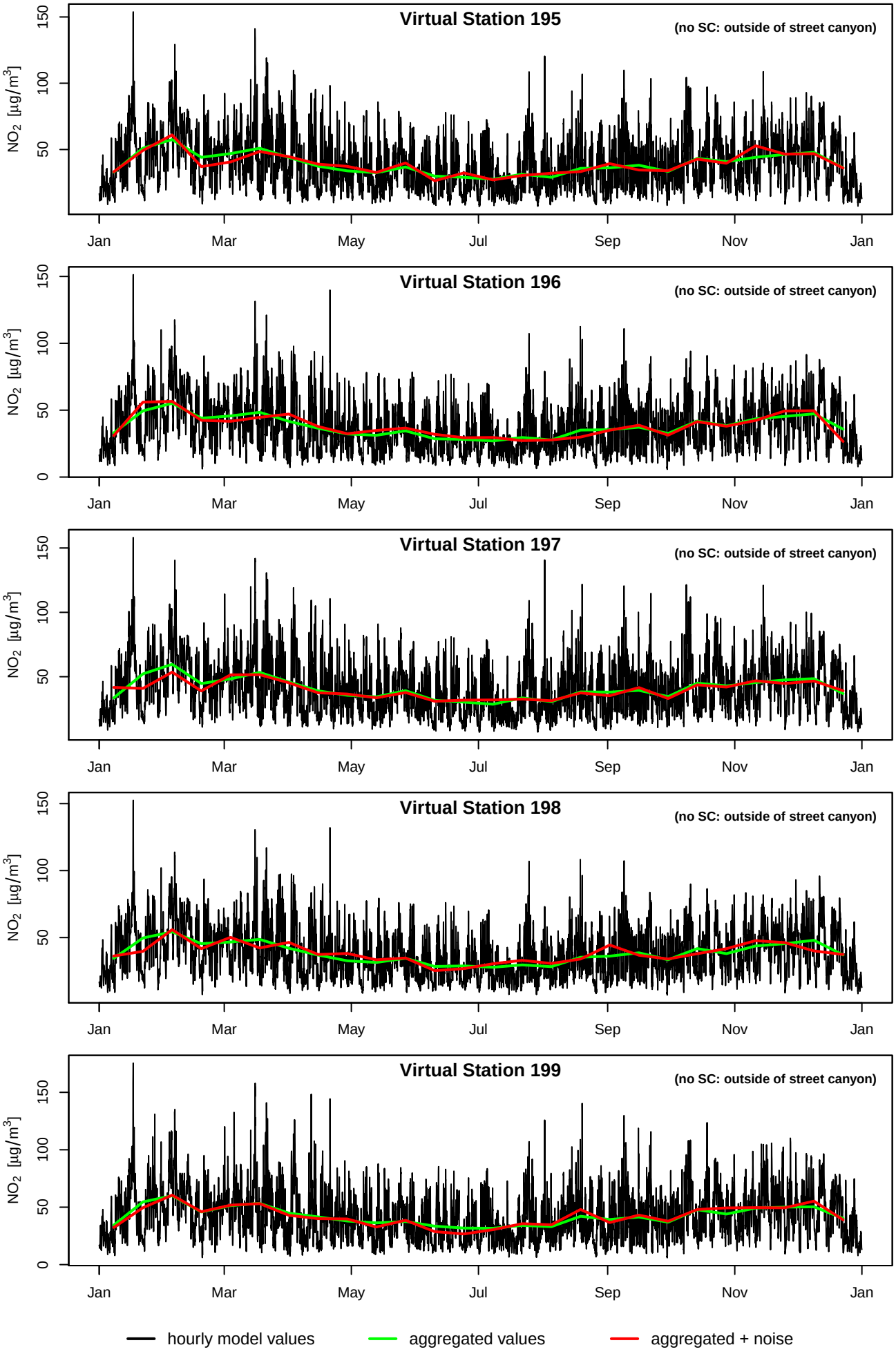

Virtual Station 170
(no SC: outside of street canyon)
Virtual Station 171
(no SC: outside of street canyon)
Virtual Station 172
(no SC: outside of street canyon)
Virtual Station 173
(no SC: outside of street canyon)
Virtual Station 174
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

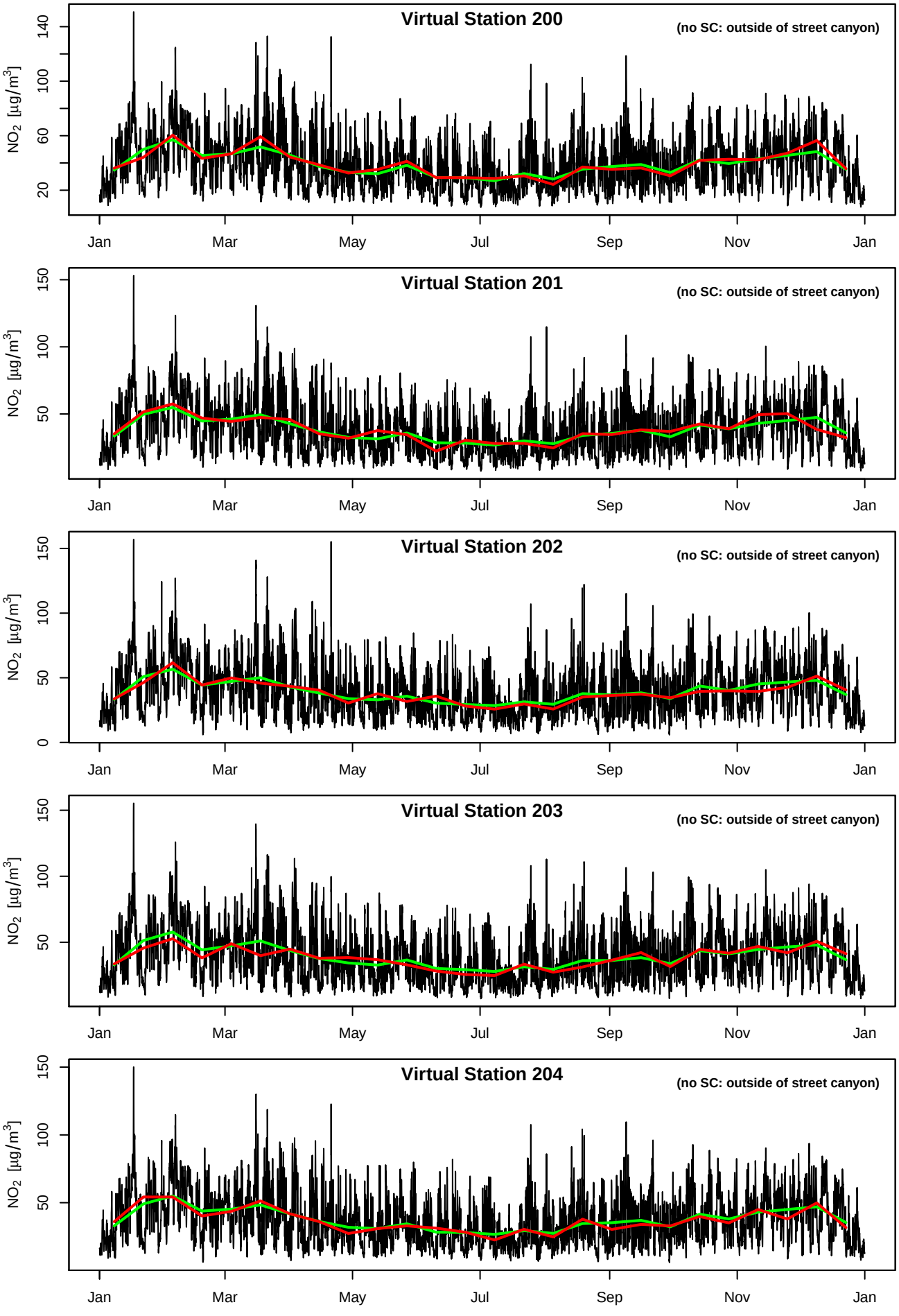

Virtual Station 175
(no SC: outside of street canyon)
Virtual Station 176
(no SC: outside of street canyon)
Virtual Station 177
(no SC: outside of street canyon)
Virtual Station 178
(no SC: outside of street canyon)
Virtual Station 179
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

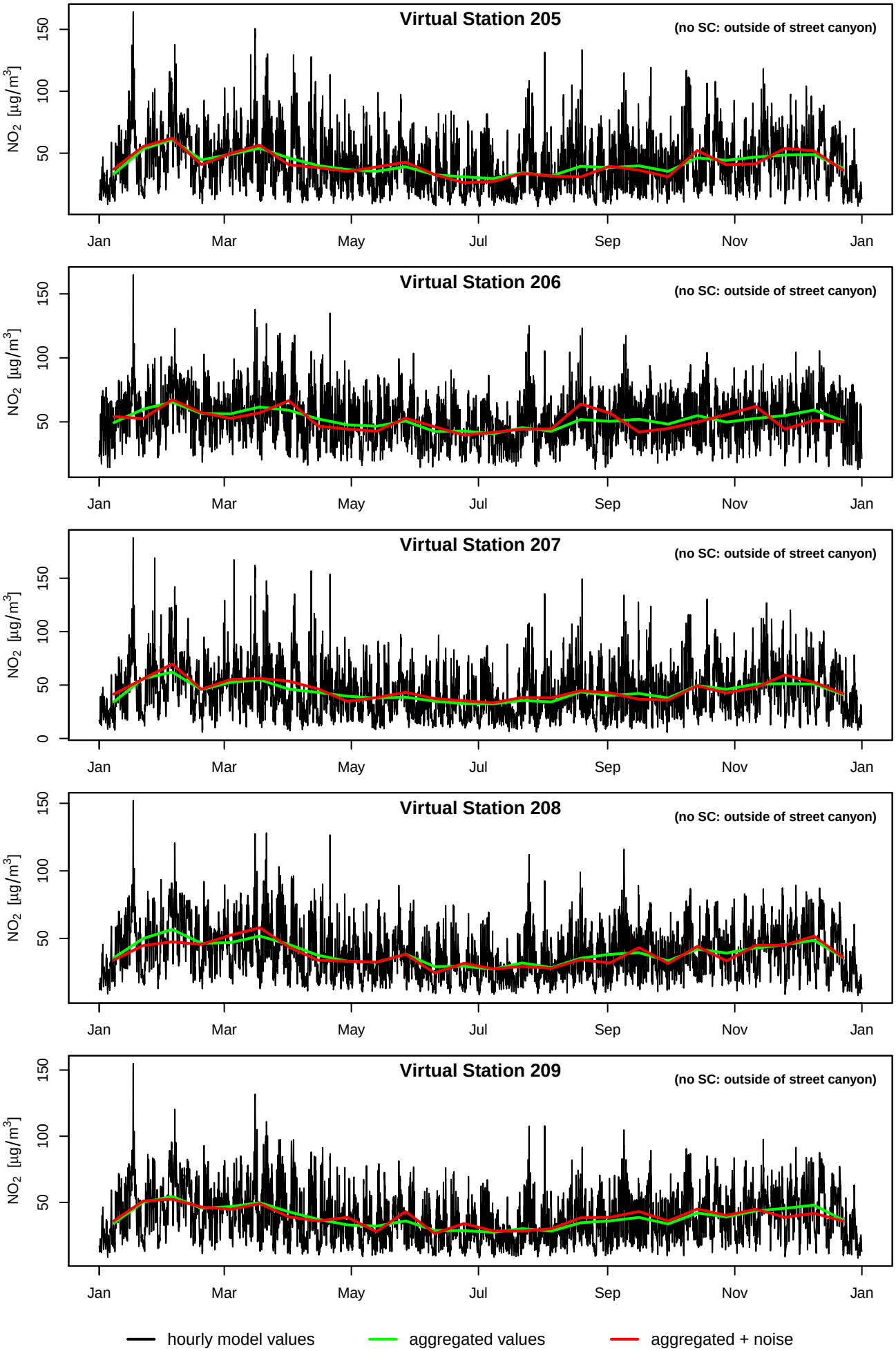

Virtual Station 180
(no SC: outside of street canyon)
Virtual Station 181
(no SC: outside of street canyon)
Virtual Station 182
(no SC: outside of street canyon)
Virtual Station 183
(no SC: outside of street canyon)
Virtual Station 184
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

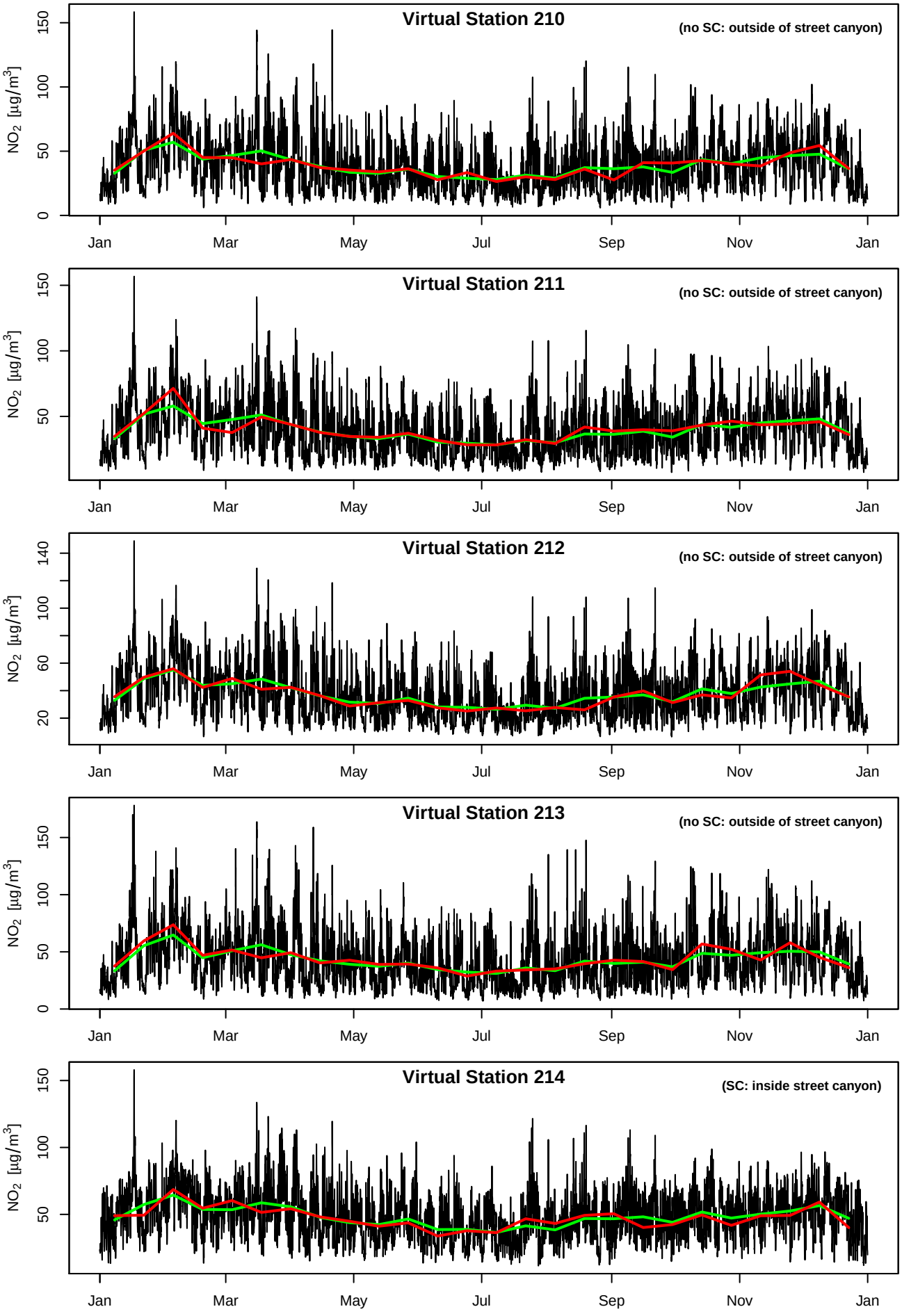

Virtual Station 185
(no SC: outside of street canyon)
Virtual Station 186
(no SC: outside of street canyon)
Virtual Station 187
(no SC: outside of street canyon)
Virtual Station 188
(no SC: outside of street canyon)
Virtual Station 189
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

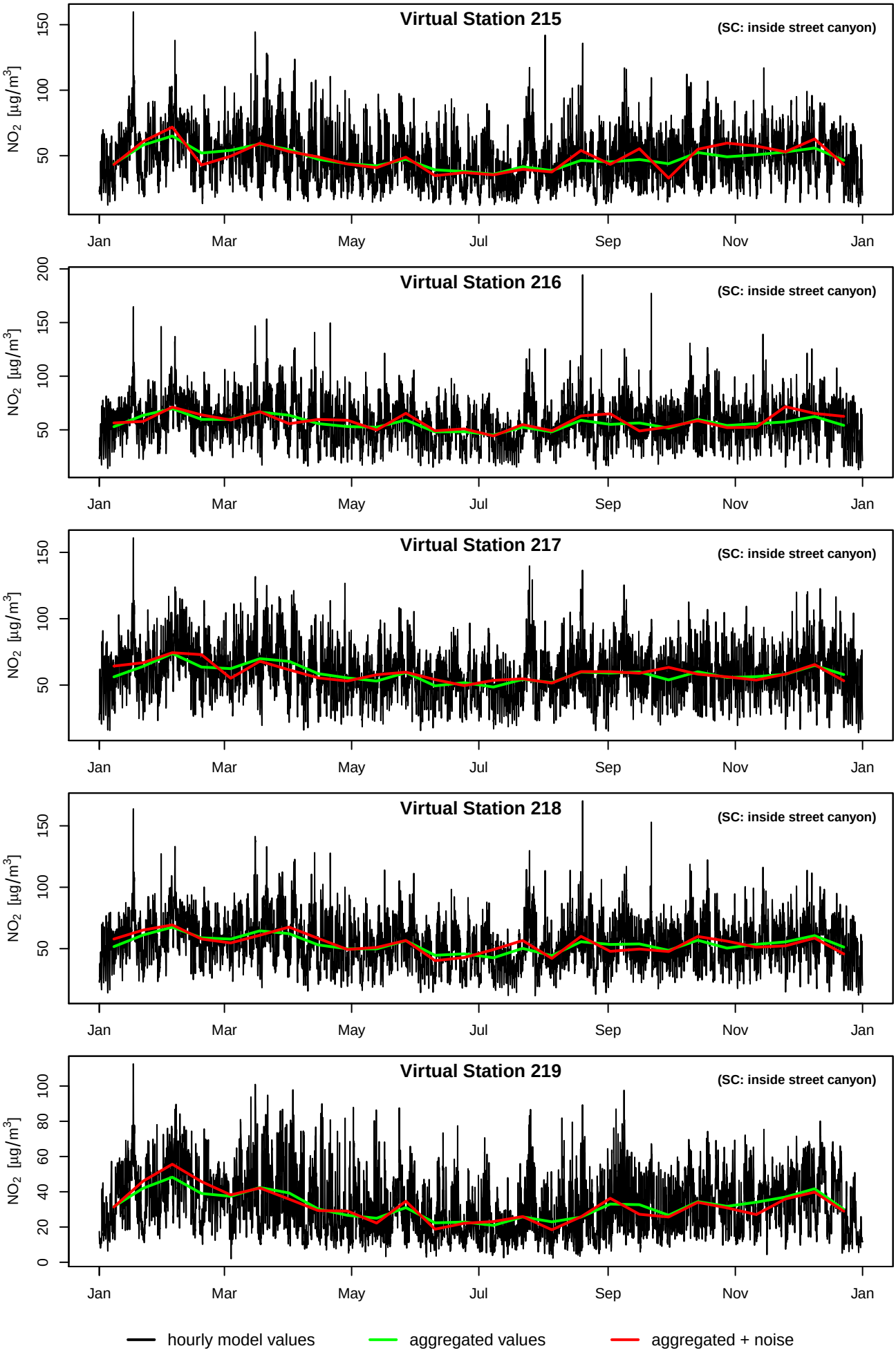

Virtual Station 190
(no SC: outside of street canyon)
Virtual Station 191
(no SC: outside of street canyon)
Virtual Station 192
(no SC: outside of street canyon)
Virtual Station 193
(no SC: outside of street canyon)
Virtual Station 194
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

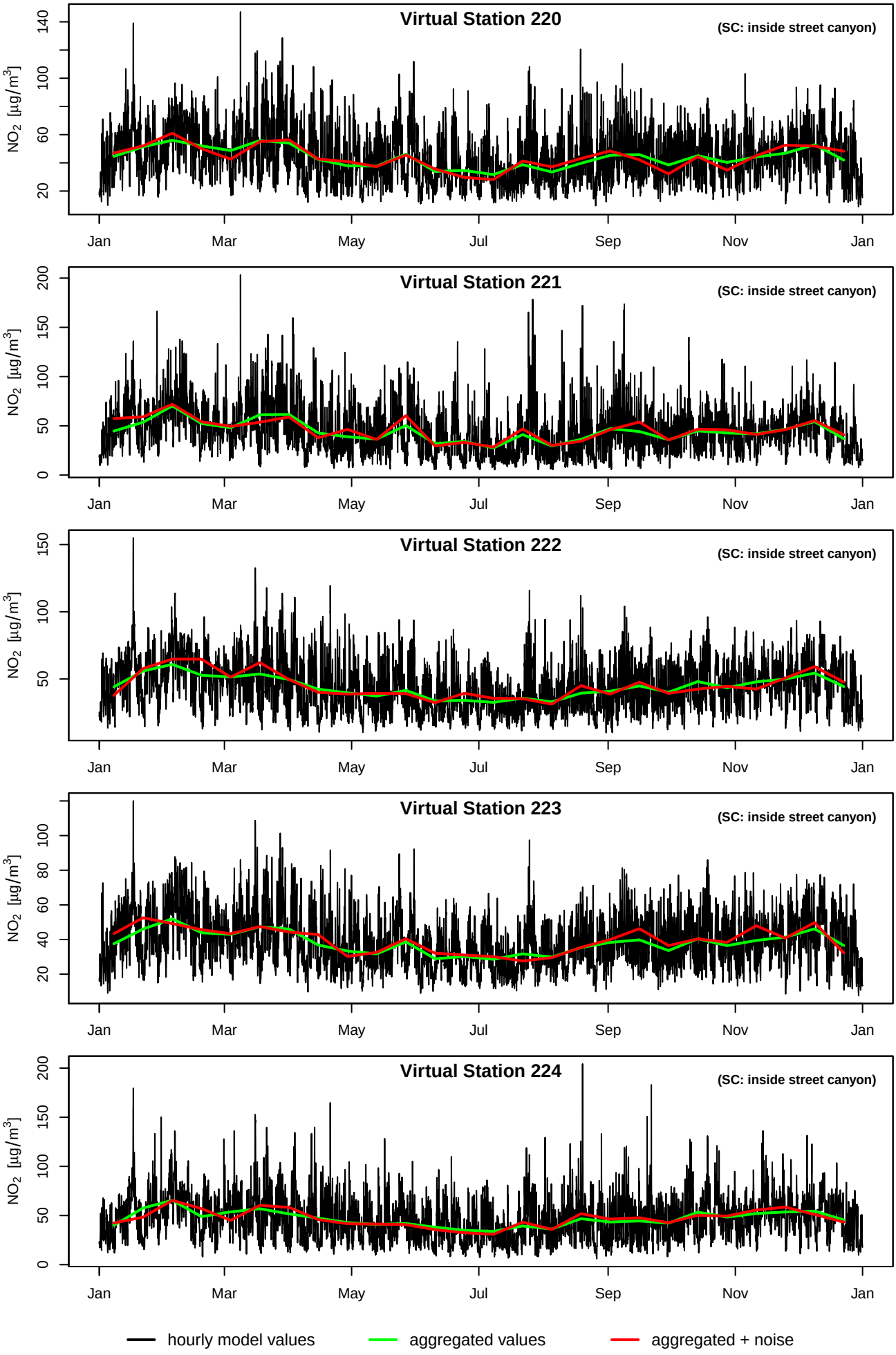

Virtual Station 195
(no SC: outside of street canyon)
Virtual Station 196
(no SC: outside of street canyon)
Virtual Station 197
(no SC: outside of street canyon)
Virtual Station 198
(no SC: outside of street canyon)
Virtual Station 199
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

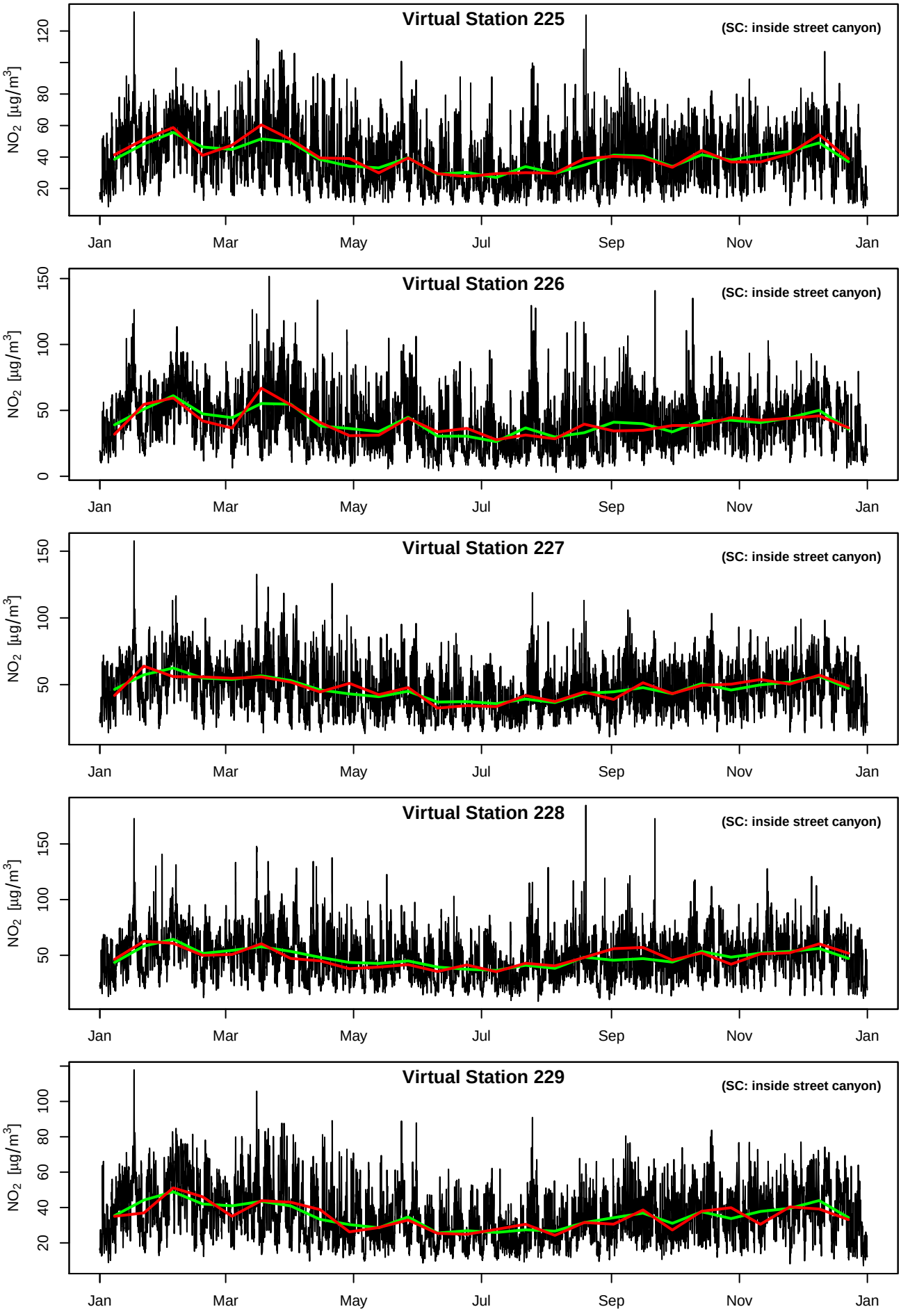

Virtual Station 200
(no SC: outside of street canyon)
NO2 [µg/m3]
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 201
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 202
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 203
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 204
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

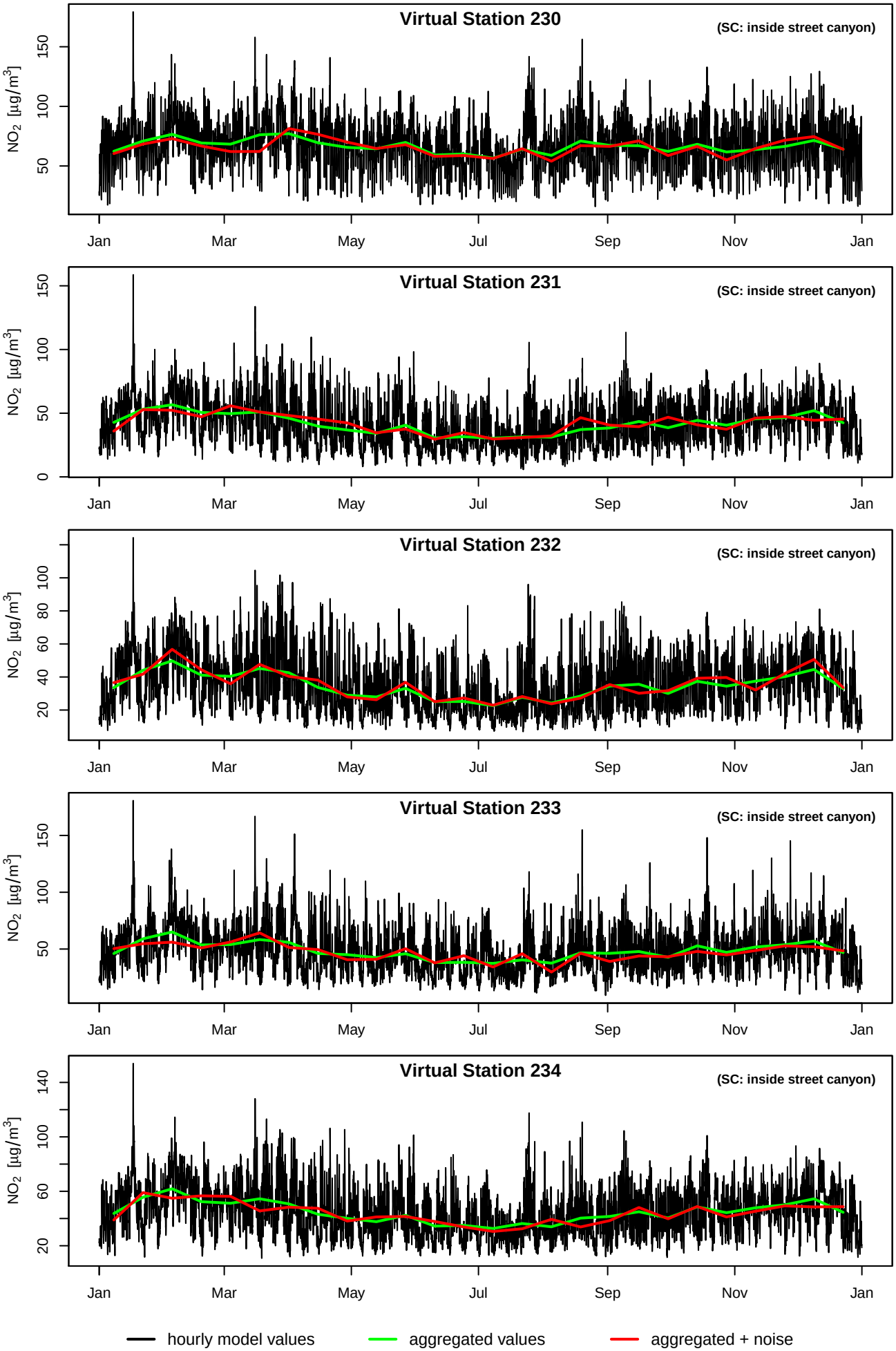

Virtual Station 205
(no SC: outside of street canyon)
Virtual Station 206
(no SC: outside of street canyon)
Virtual Station 207
(no SC: outside of street canyon)
Virtual Station 208
(no SC: outside of street canyon)
Virtual Station 209
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

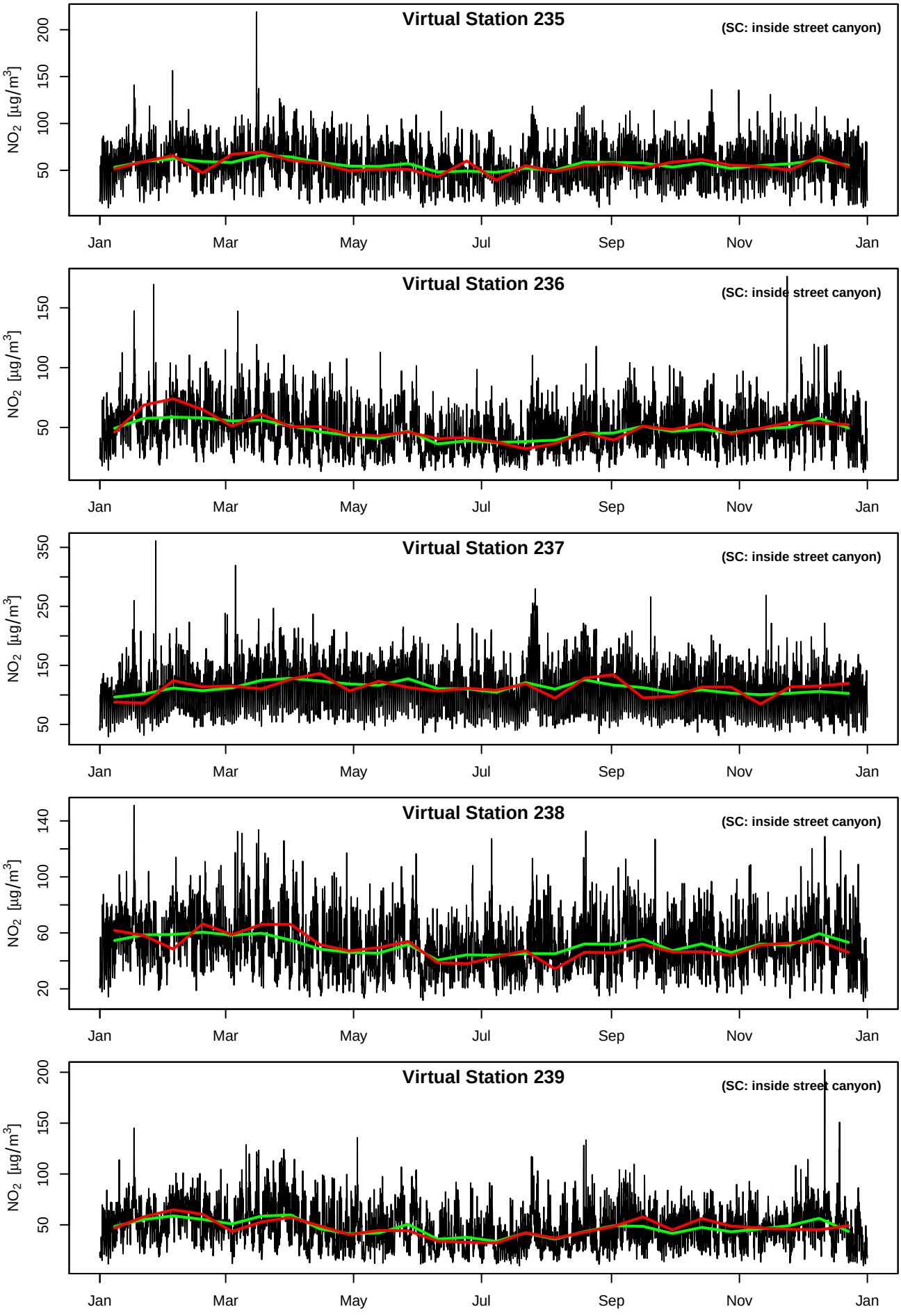

Virtual Station 210
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 211
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 212
(no SC: outside of street canyon)
NO2 [µg/m3]
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 213
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 214
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

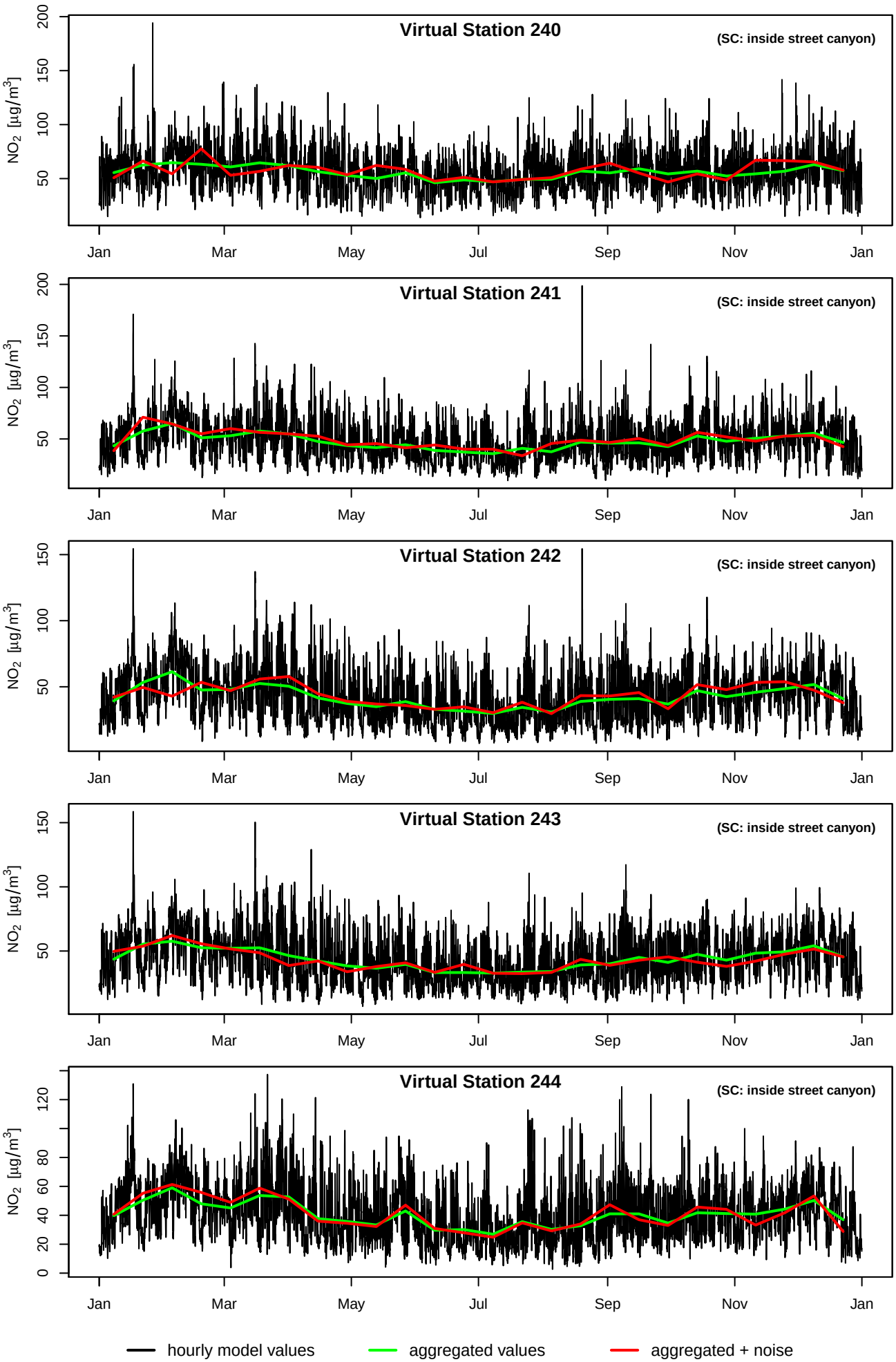

Virtual Station 215
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 216
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 217
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 218
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 219
(SC: inside street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

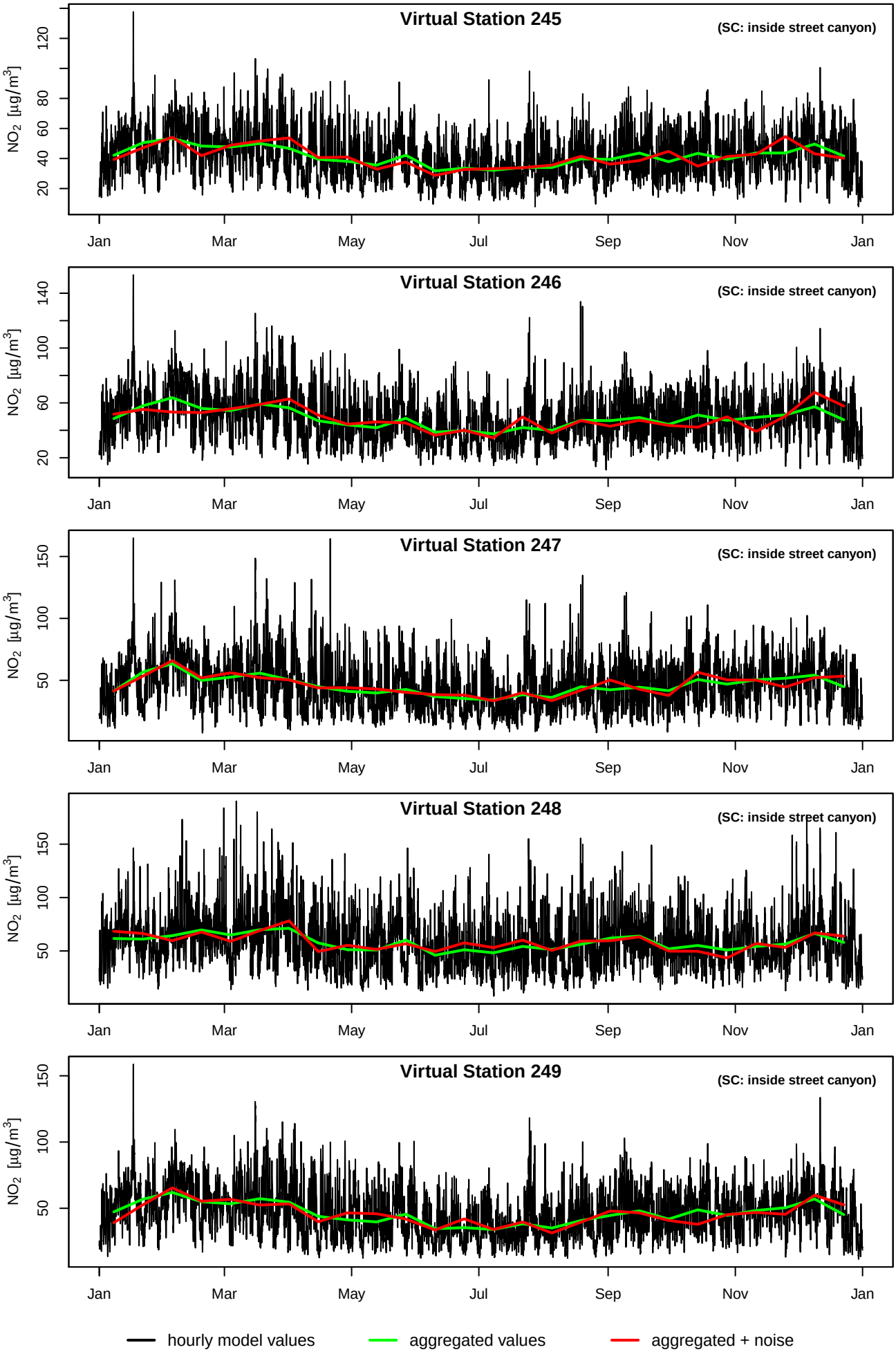

Virtual Station 220
(SC: inside street canyon)
NO2 [µg/m3]
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 221
(SC: inside street canyon)
NO2 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 222
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 223
(SC: inside street canyon)
NO2 [µg/m3]
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 224
(SC: inside street canyon)
NO2 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

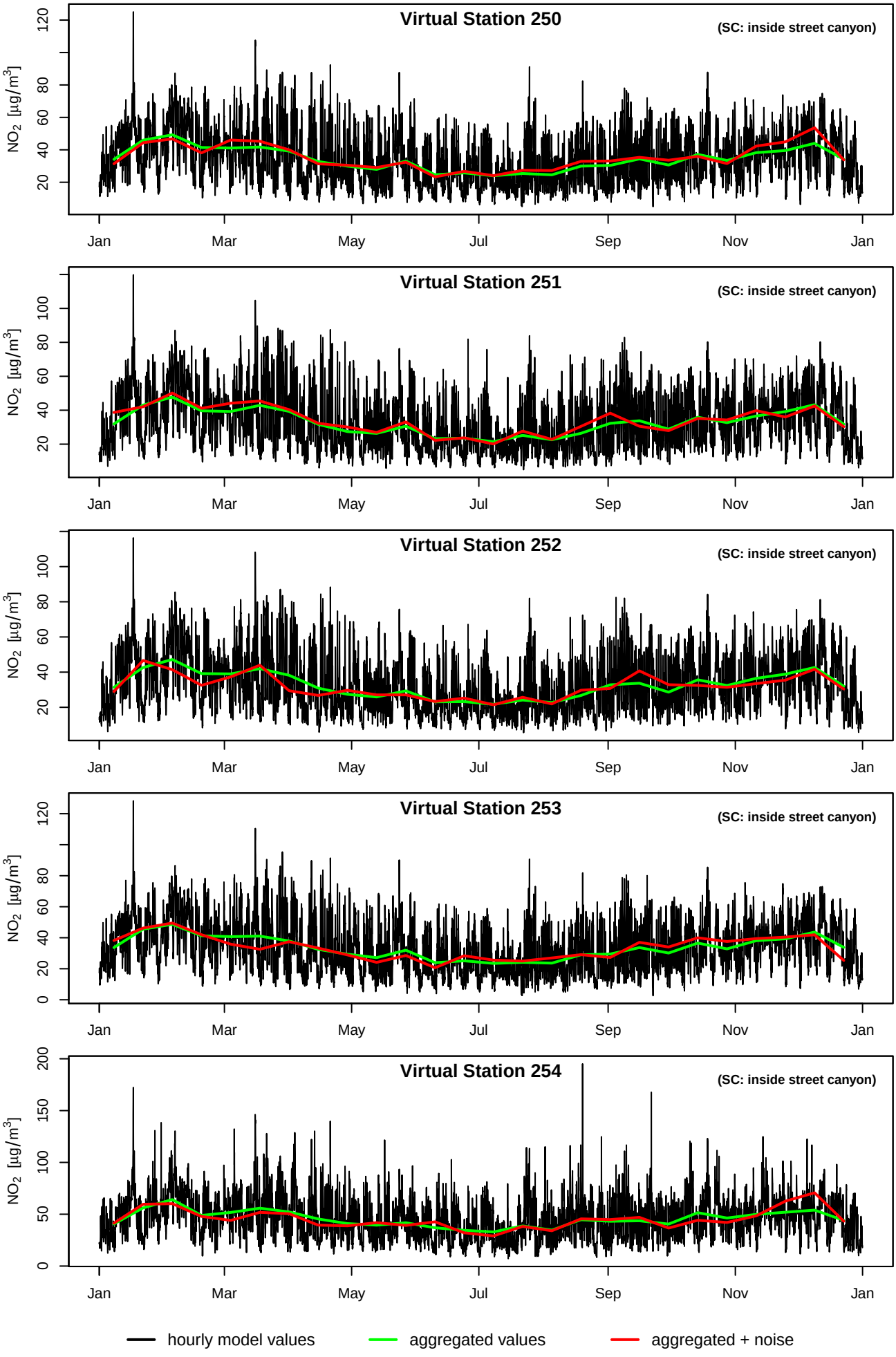

Virtual Station 225
(SC: inside street canyon)
NO2 [µg/m3]
20 40 60 80 120
Jan Mar May Jul Sep Nov Jan
Virtual Station 226
(SC: inside street canyon)
NO2 [µg/m3]
0 50 100 150
Jan Mar May Jul Sep Nov Jan
Virtual Station 227
(SC: inside street canyon)
NO2 [µg/m3]
50 100 150
Jan Mar May Jul Sep Nov Jan
Virtual Station 228
(SC: inside street canyon)
NO2 [µg/m3]
50 100 150
Jan Mar May Jul Sep Nov Jan
Virtual Station 229
(SC: inside street canyon)
NO2 [µg/m3]
20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
hourly model values
aggregated values
aggregated + noise

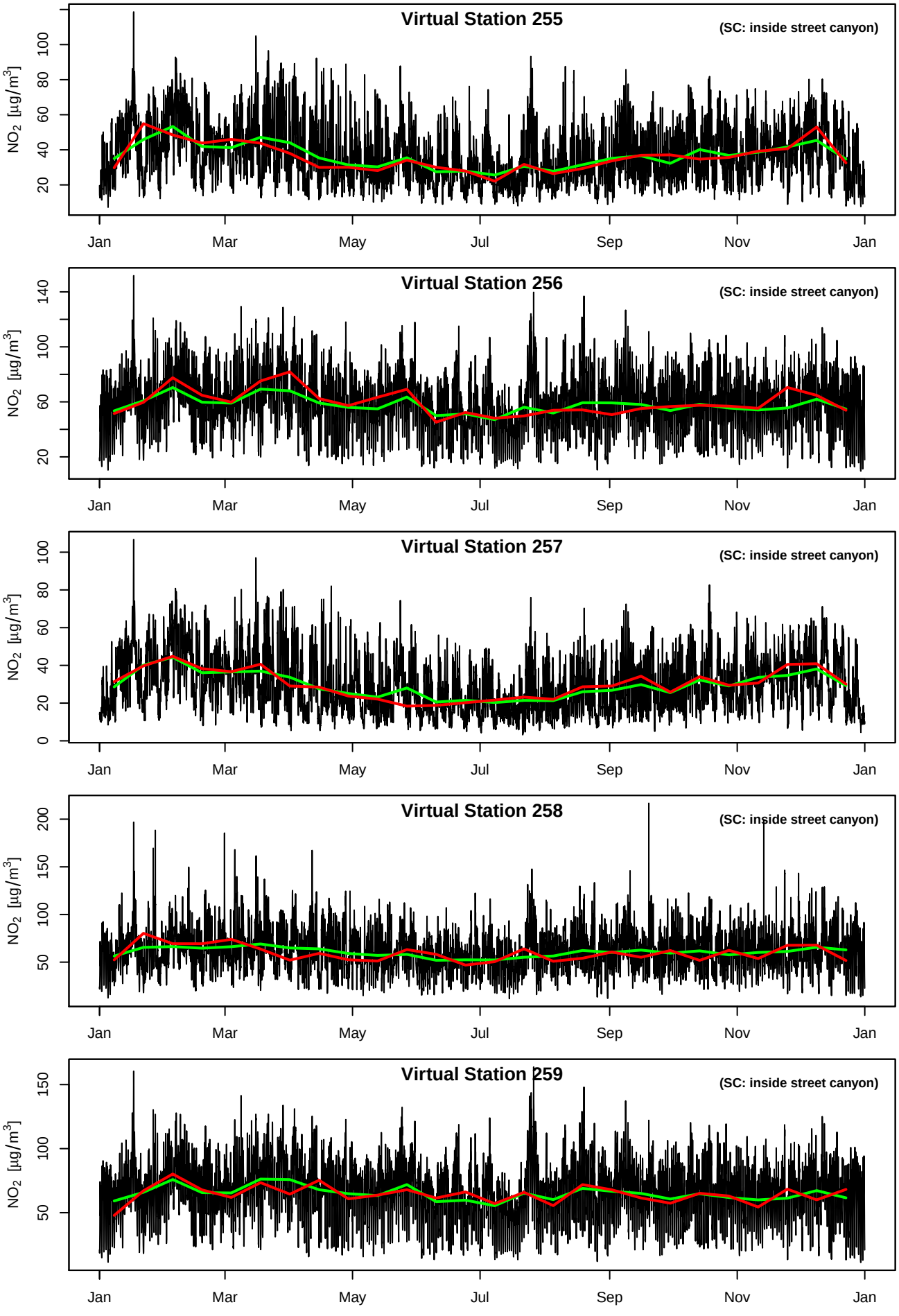

Virtual Station 230
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 231
(SC: inside street canyon)
NO2 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 232
(SC: inside street canyon)
NO2 [µg/m3]
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 233
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 234
(SC: inside street canyon)
NO2 [µg/m3]
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

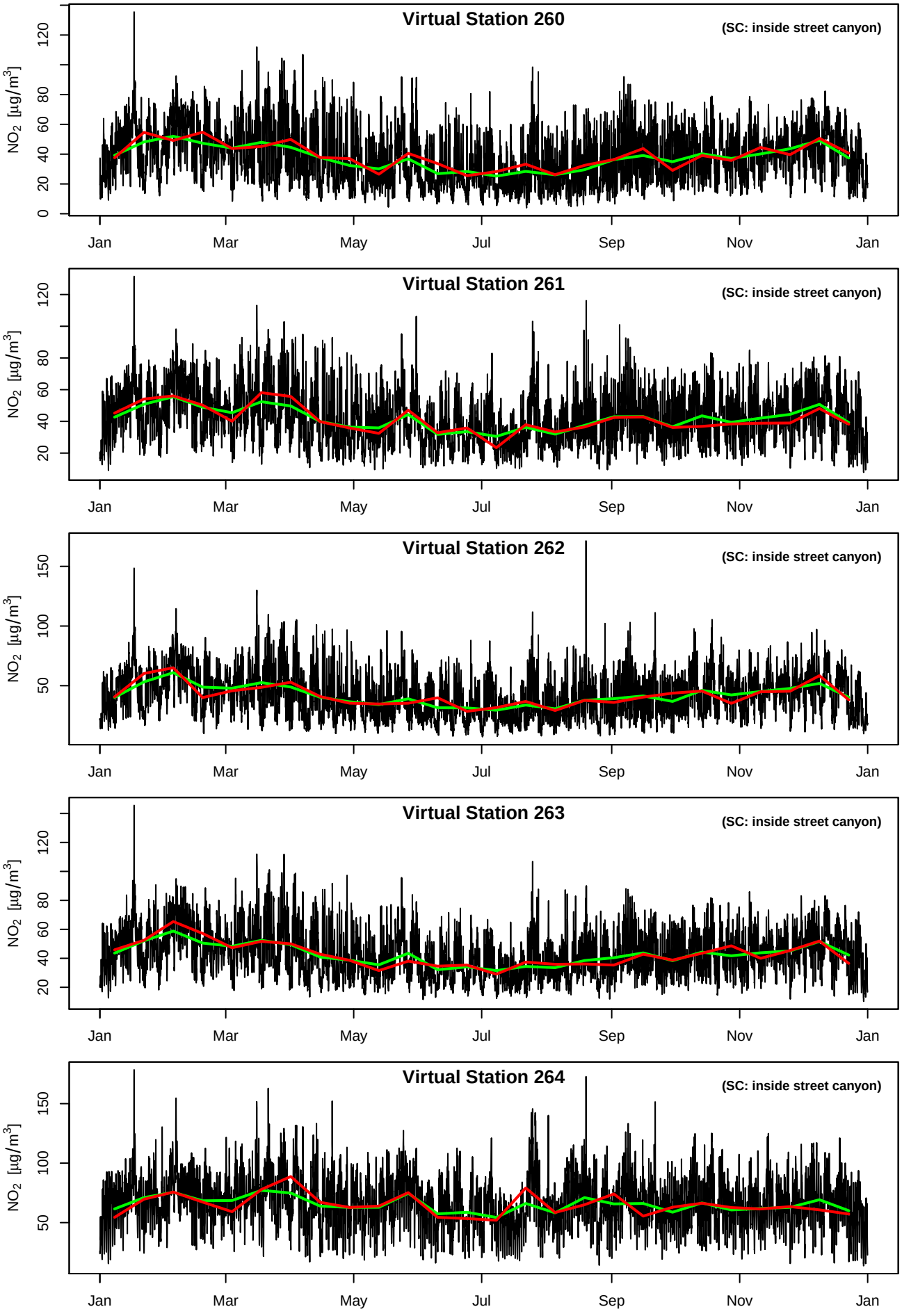

Virtual Station 235
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 236
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 237
(SC: inside street canyon)
NO2 [µg/m3]
50
150
250
350
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 238
(SC: inside street canyon)
NO2 [µg/m3]
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 239
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

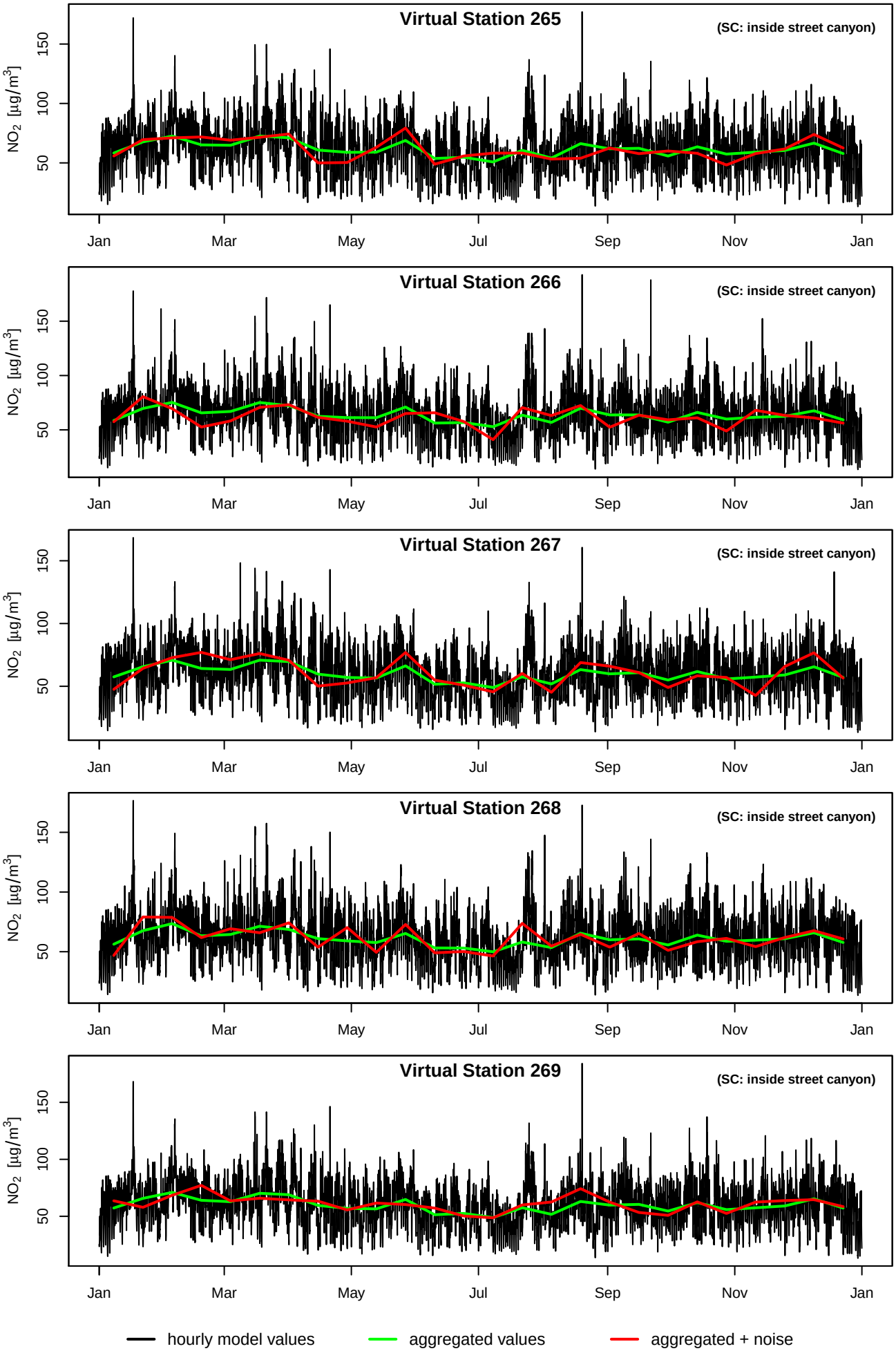

Virtual Station 240
(SC: inside street canyon)
Virtual Station 241
(SC: inside street canyon)
Virtual Station 242
(SC: inside street canyon)
Virtual Station 243
(SC: inside street canyon)
Virtual Station 244
(SC: inside street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

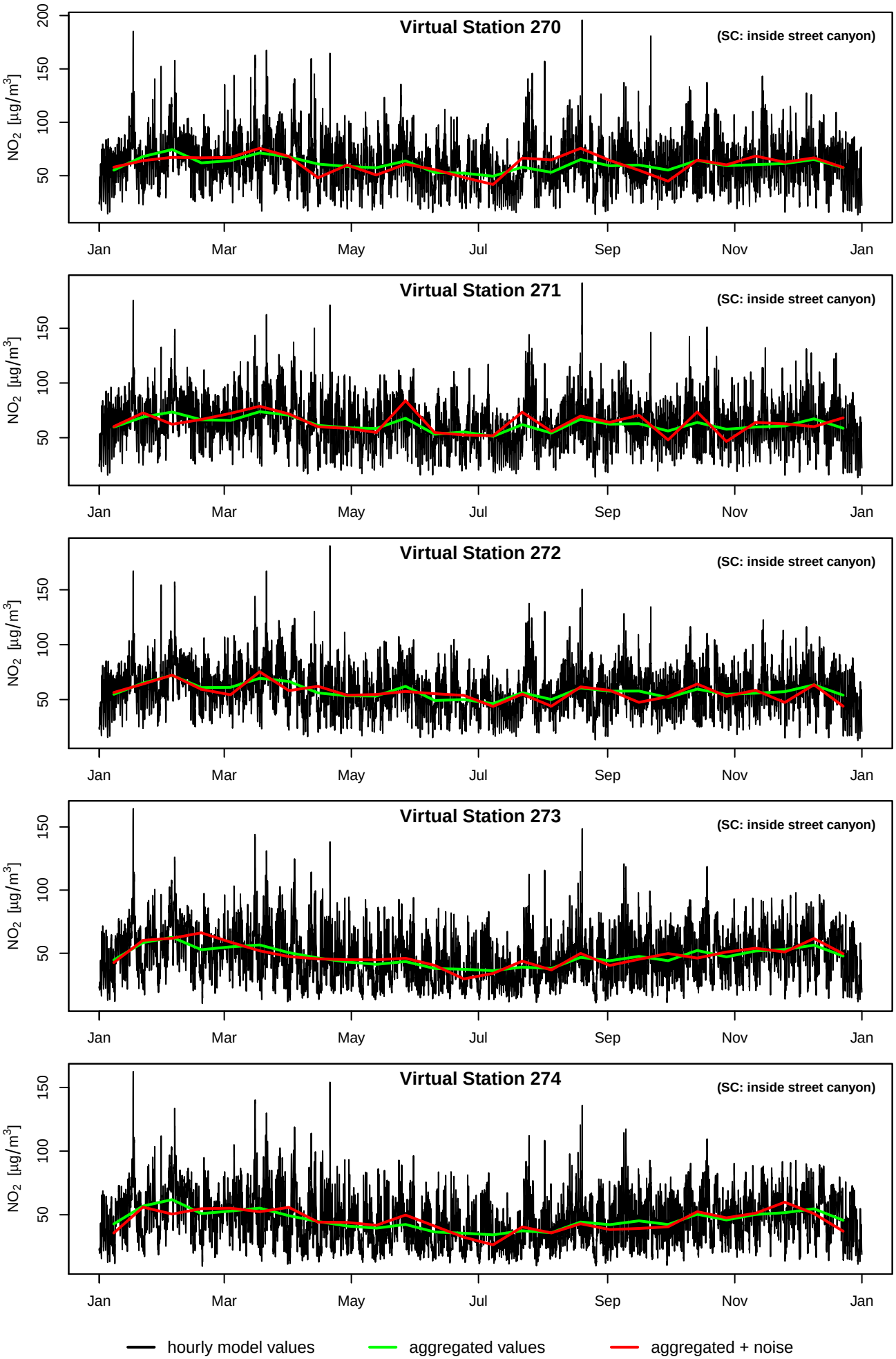

Virtual Station 245
(SC: inside street canyon)
NO2 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 246
(SC: inside street canyon)
NO2 [µg/m3]
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 247
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 248
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 249
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

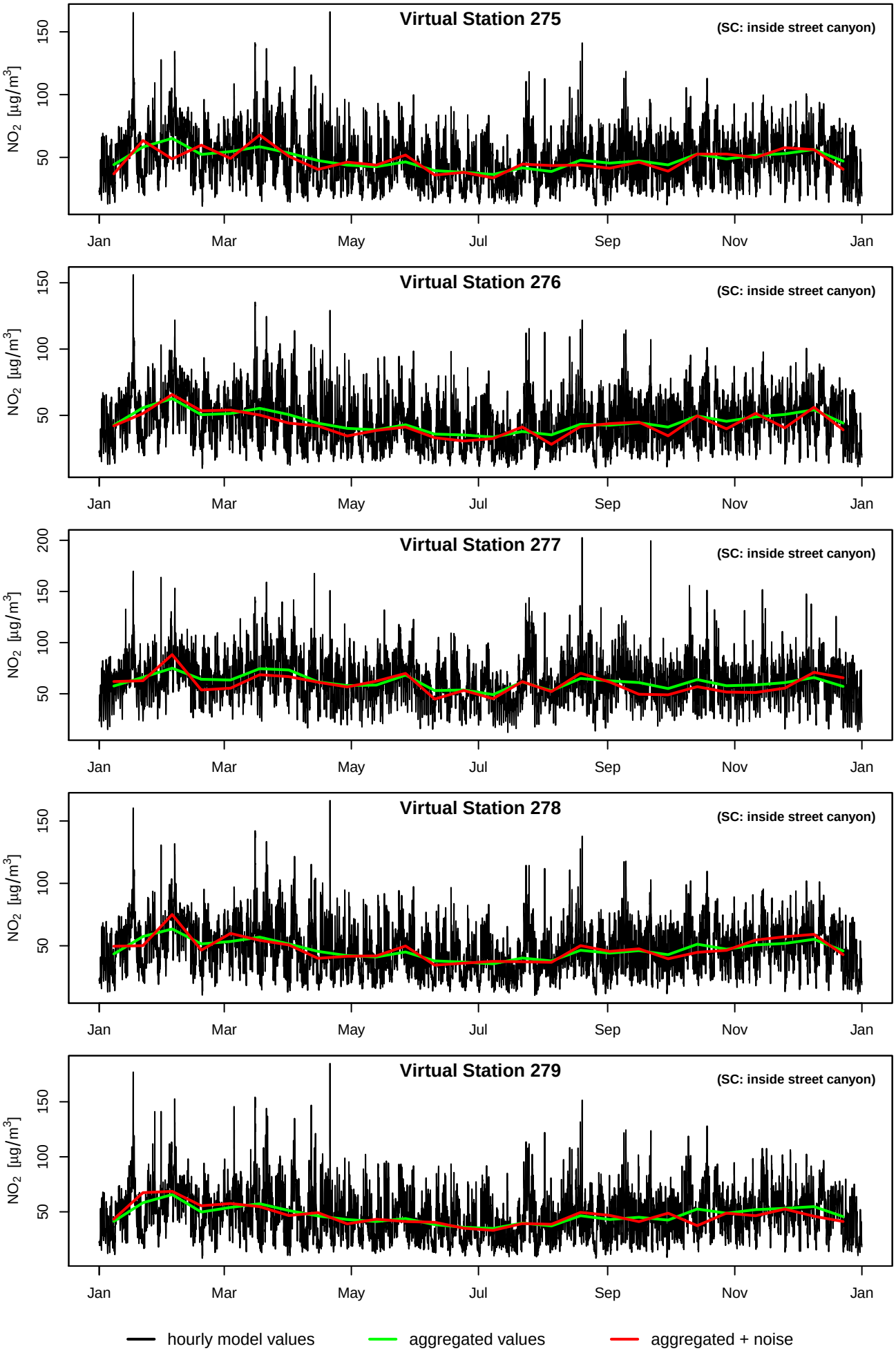

Virtual Station 250
(SC: inside street canyon)
Virtual Station 251
(SC: inside street canyon)
Virtual Station 252
(SC: inside street canyon)
Virtual Station 253
(SC: inside street canyon)
Virtual Station 254
(SC: inside street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

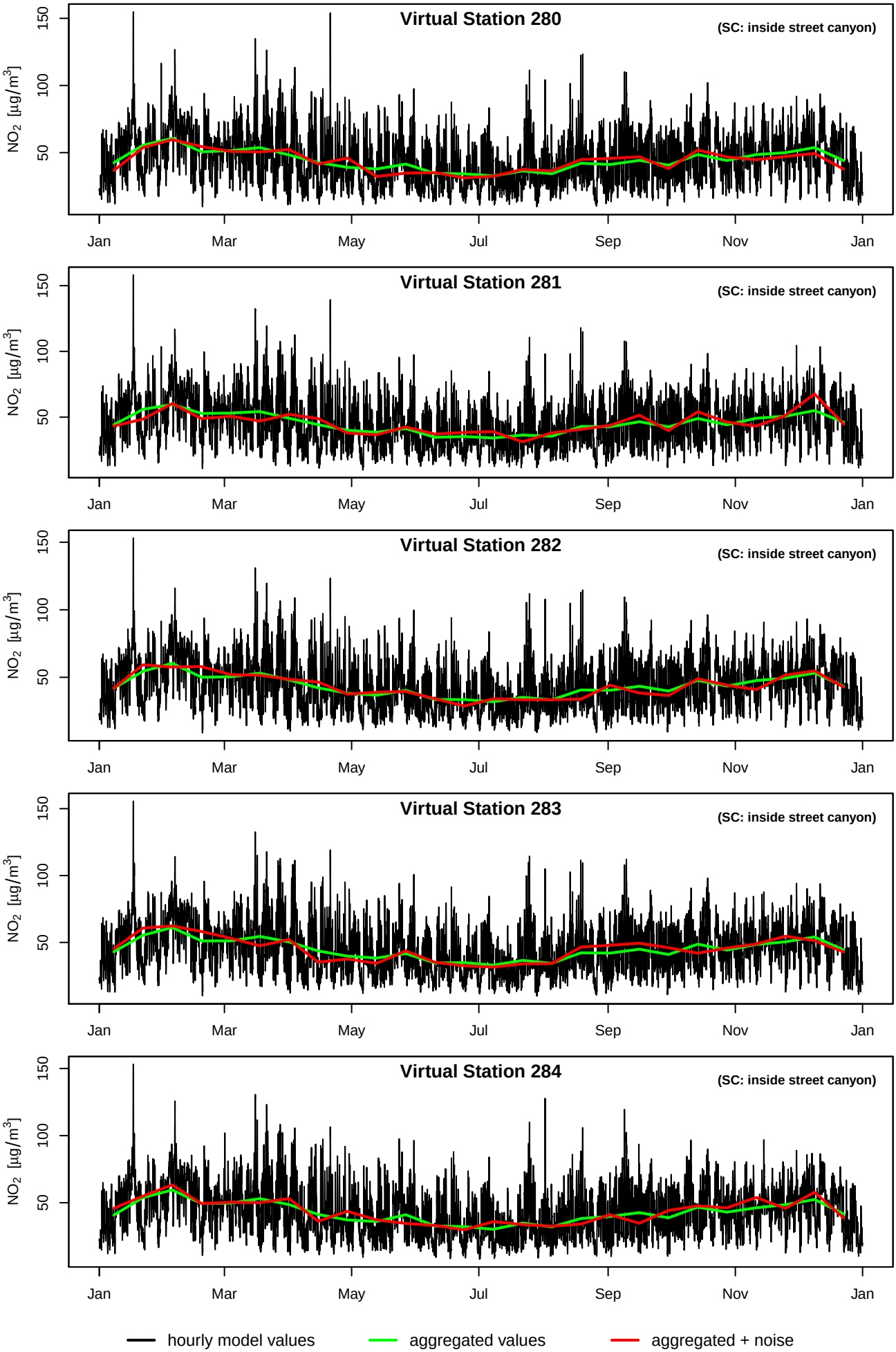

Virtual Station 255
(SC: inside street canyon)
NO2 [µg/m3]
20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 256
(SC: inside street canyon)
NO2 [µg/m3]
20 60 100 140
Jan Mar May Jul Sep Nov Jan
Virtual Station 257
(SC: inside street canyon)
NO2 [µg/m3]
0 20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 258
(SC: inside street canyon)
NO2 [µg/m3]
50 100 150 200
Jan Mar May Jul Sep Nov Jan
Virtual Station 259
(SC: inside street canyon)
NO2 [µg/m3]
50 100 150
Jan Mar May Jul Sep Nov Jan
hourly model values
aggregated values
aggregated + noise

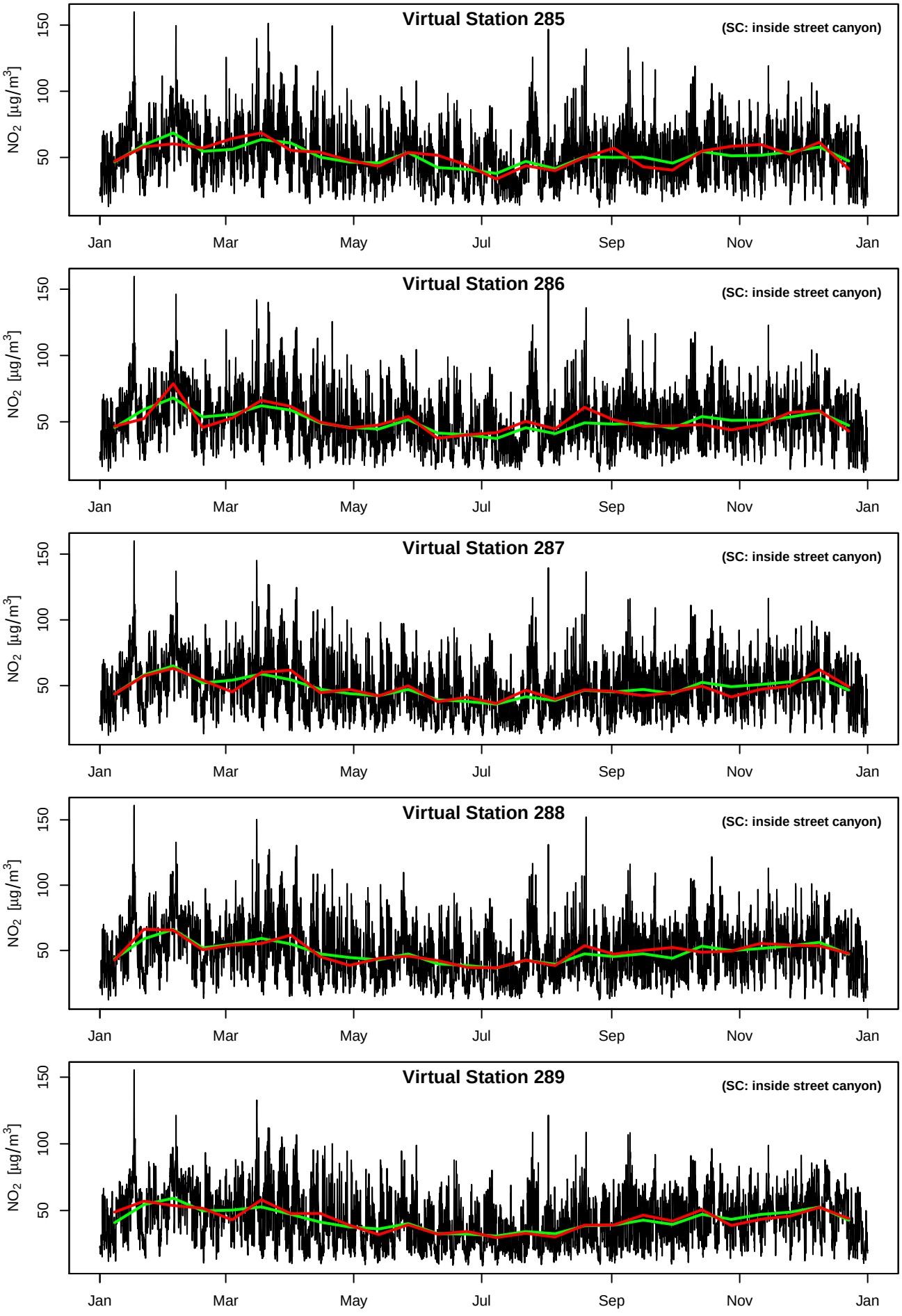

Virtual Station 260
(SC: inside street canyon)
Virtual Station 261
(SC: inside street canyon)
Virtual Station 262
(SC: inside street canyon)
Virtual Station 263
(SC: inside street canyon)
Virtual Station 264
(SC: inside street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

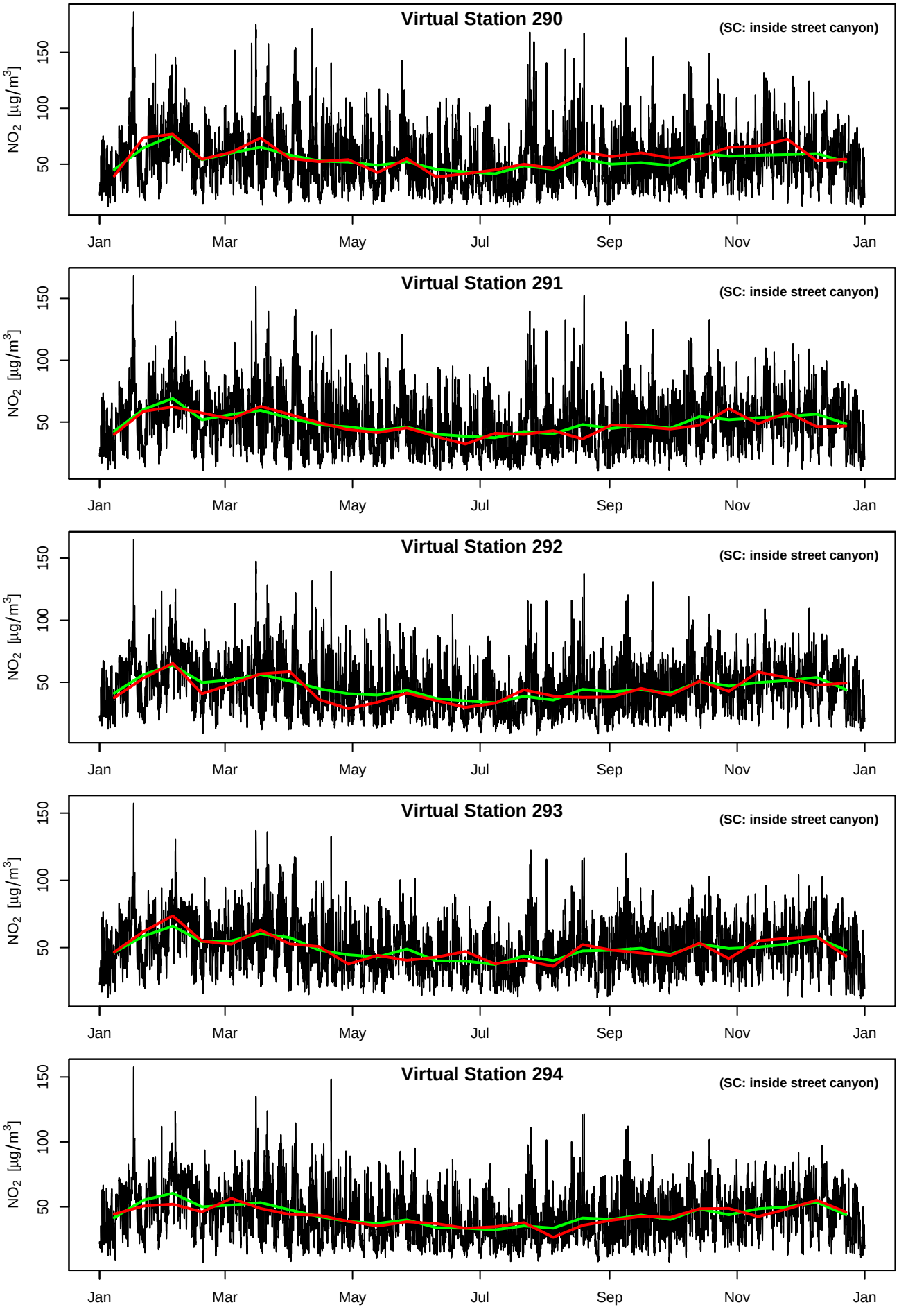

Virtual Station 265
(SC: inside street canyon)
Virtual Station 266
(SC: inside street canyon)
Virtual Station 267
(SC: inside street canyon)
Virtual Station 268
(SC: inside street canyon)
Virtual Station 269
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

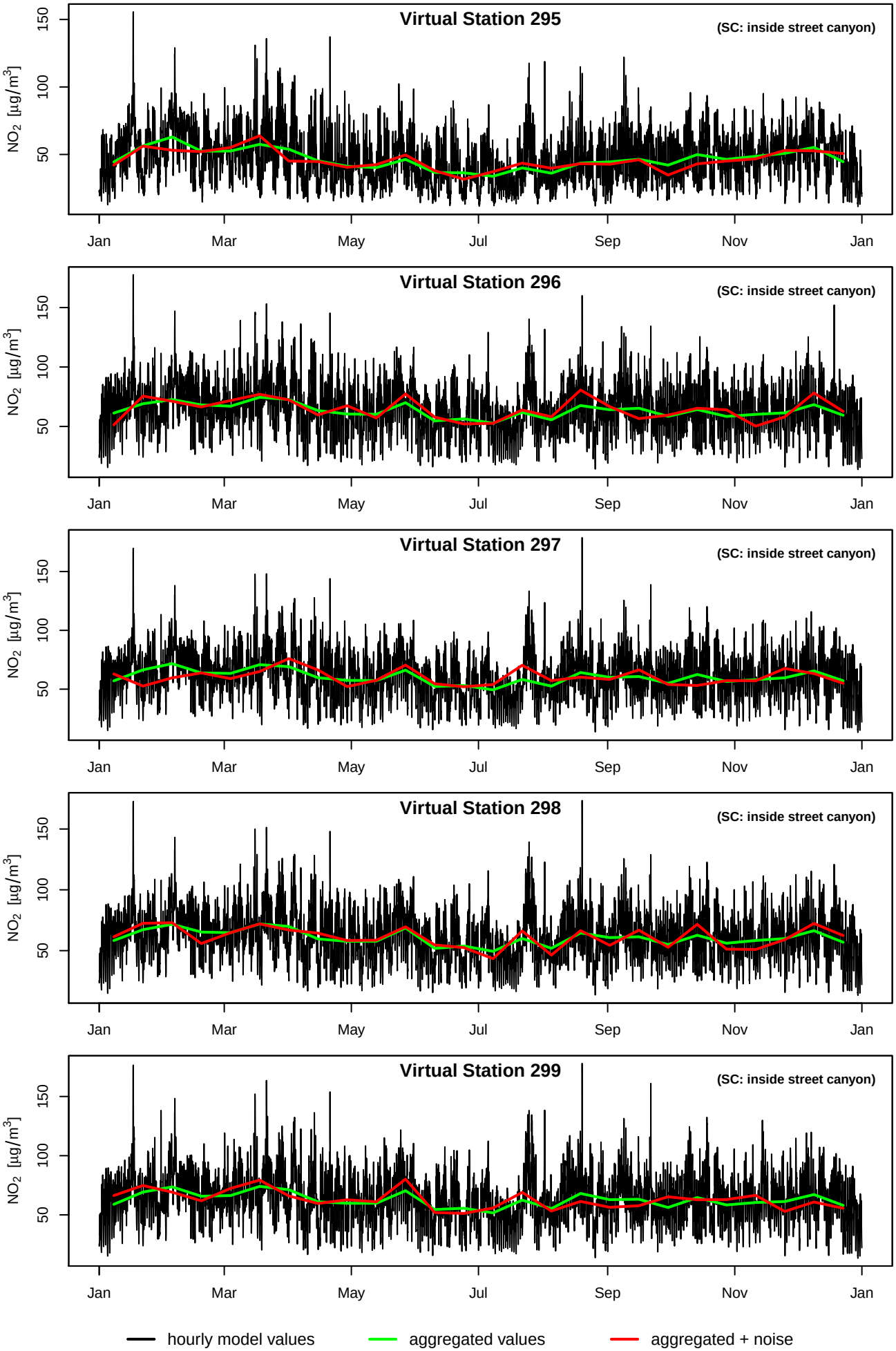

Virtual Station 270
(SC: inside street canyon)
Virtual Station 271
(SC: inside street canyon)
Virtual Station 272
(SC: inside street canyon)
Virtual Station 273
(SC: inside street canyon)
Virtual Station 274
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

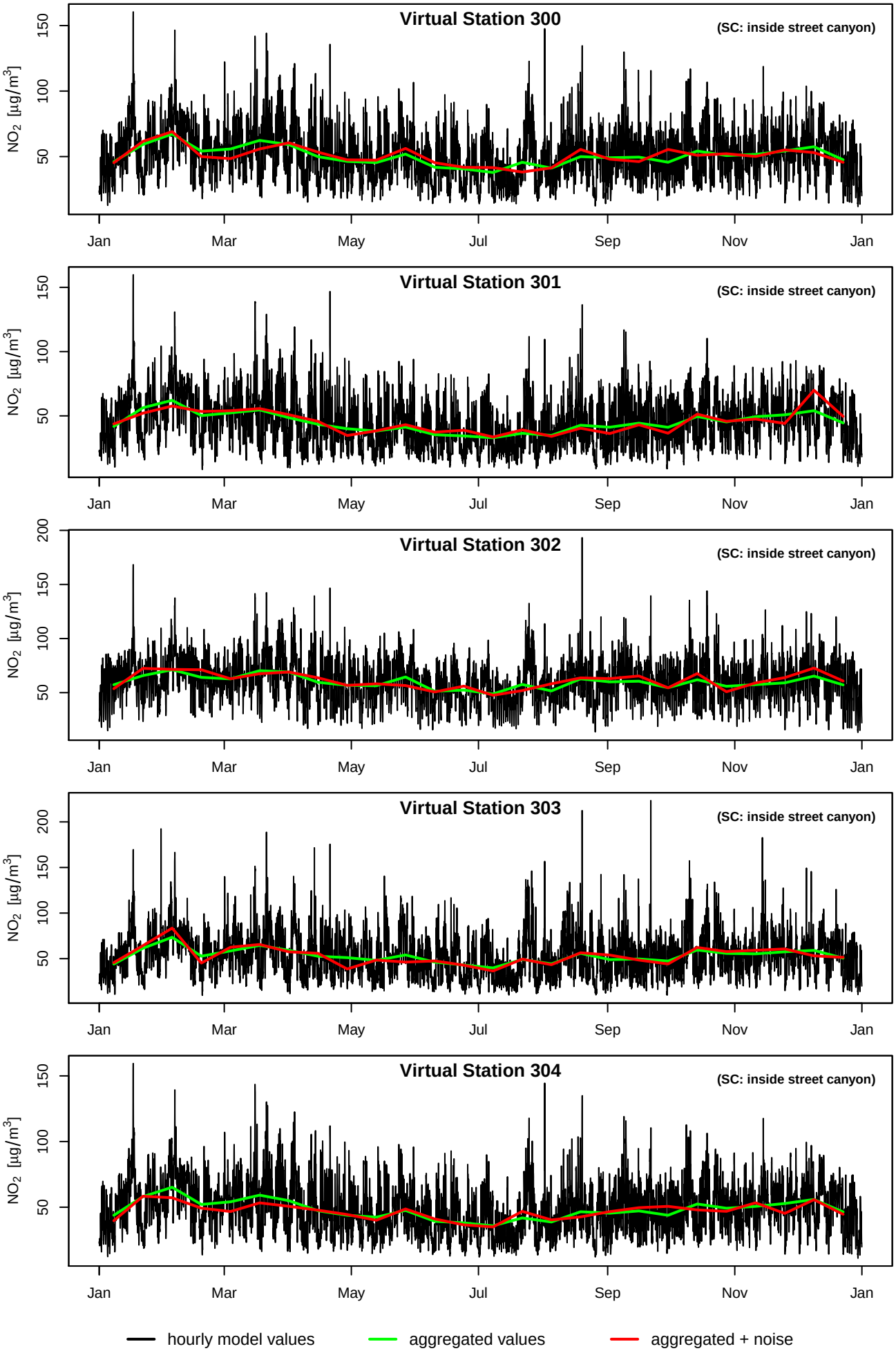

Virtual Station 275
(SC: inside street canyon)
Virtual Station 276
(SC: inside street canyon)
Virtual Station 277
(SC: inside street canyon)
Virtual Station 278
(SC: inside street canyon)
Virtual Station 279
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

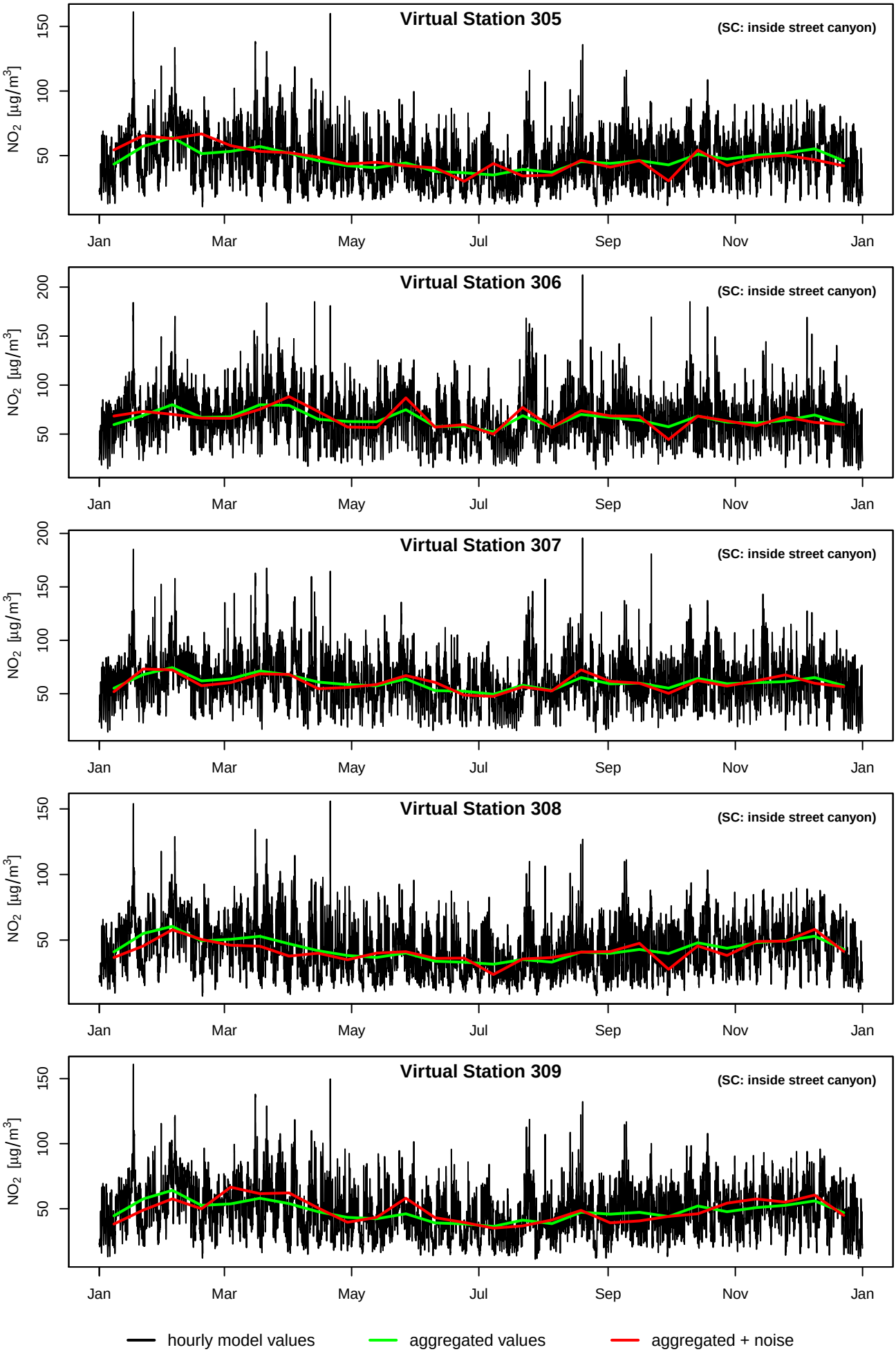

Virtual Station 280
(SC: inside street canyon)
Virtual Station 281
(SC: inside street canyon)
Virtual Station 282
(SC: inside street canyon)
Virtual Station 283
(SC: inside street canyon)
Virtual Station 284
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

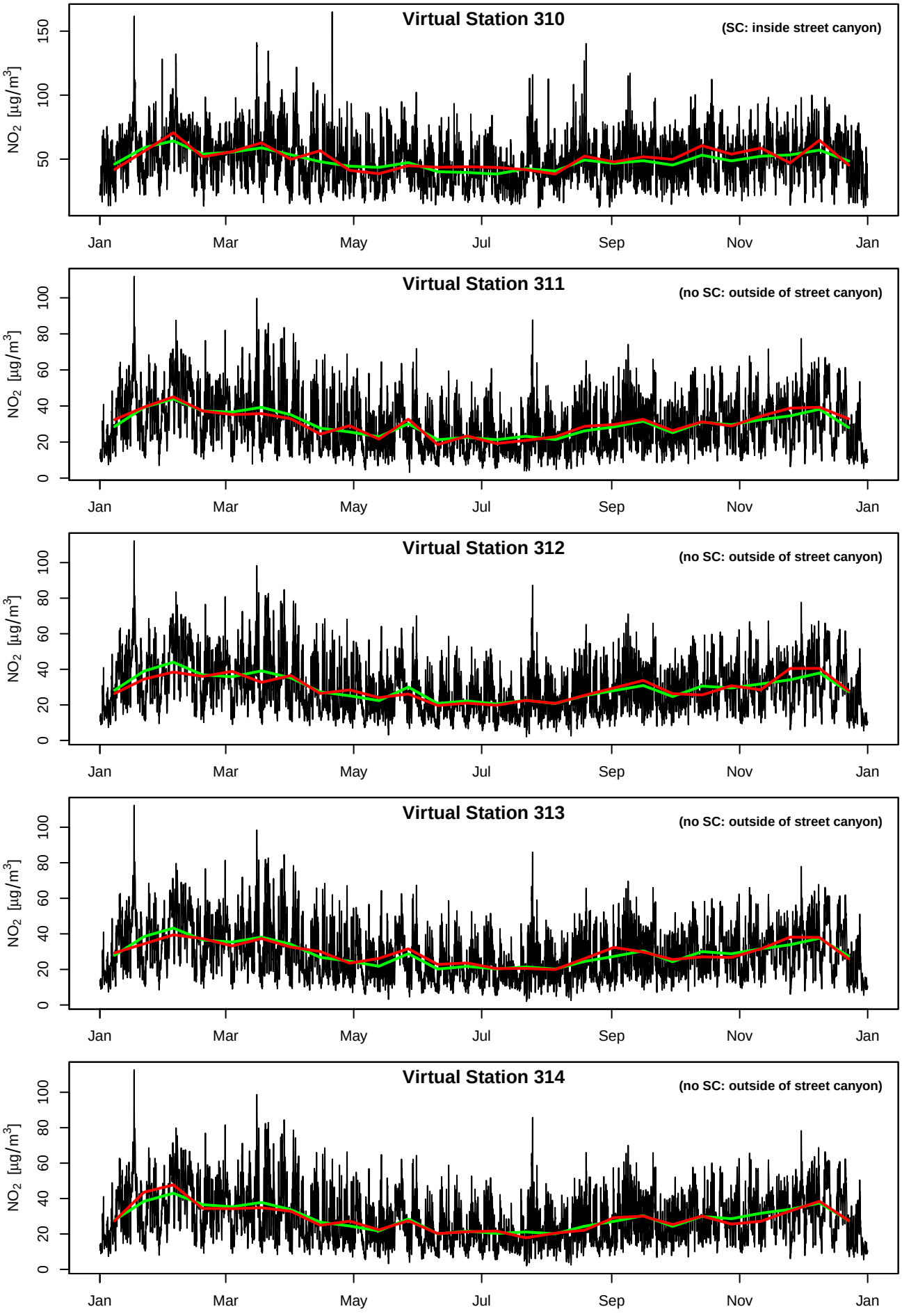

Virtual Station 285
(SC: inside street canyon)
Virtual Station 286
(SC: inside street canyon)
Virtual Station 287
(SC: inside street canyon)
Virtual Station 288
(SC: inside street canyon)
Virtual Station 289
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

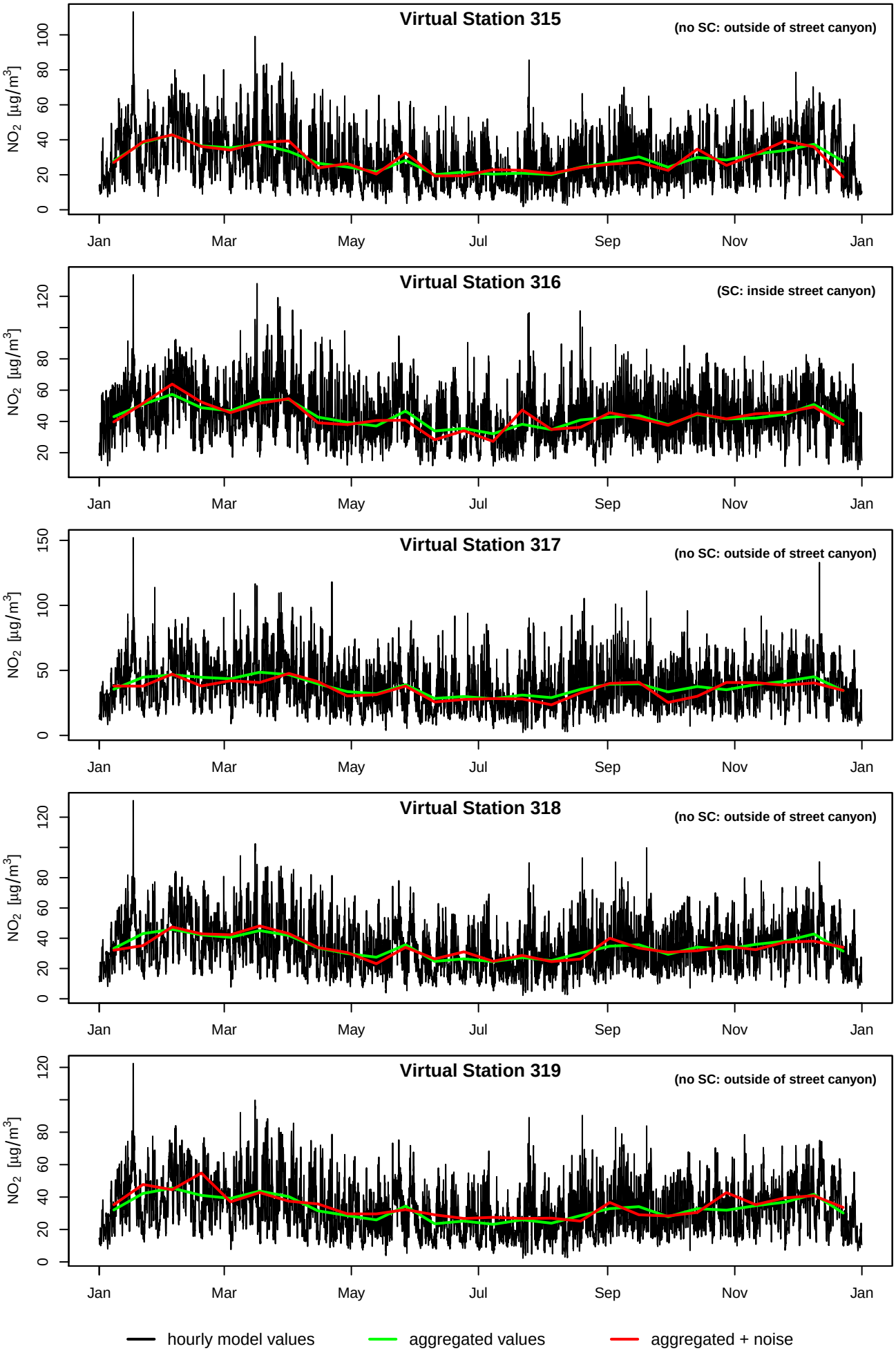

Virtual Station 290
(SC: inside street canyon)
Virtual Station 291
(SC: inside street canyon)
Virtual Station 292
(SC: inside street canyon)
Virtual Station 293
(SC: inside street canyon)
Virtual Station 294
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

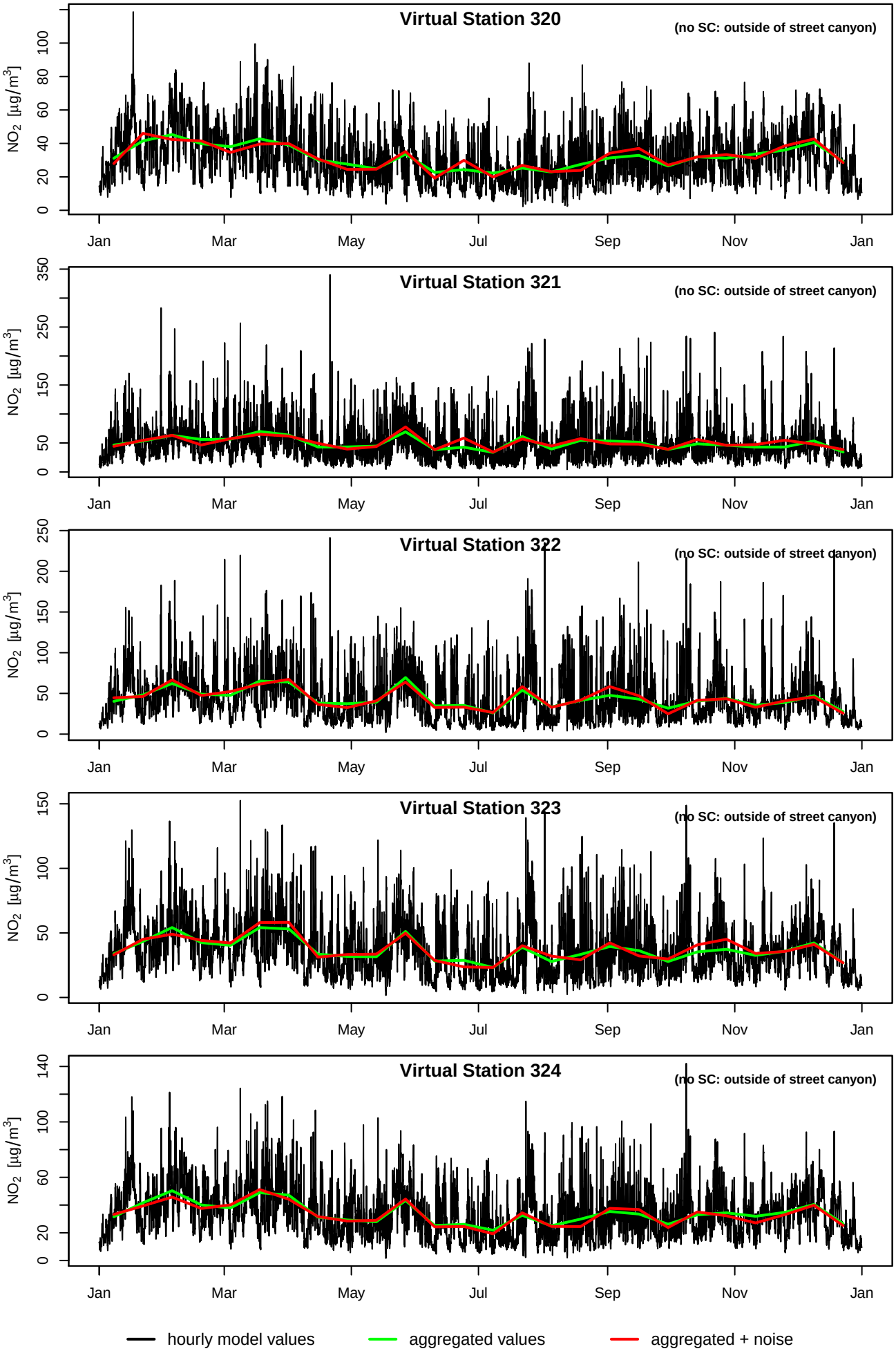

Virtual Station 295
(SC: inside street canyon)
Virtual Station 296
(SC: inside street canyon)
Virtual Station 297
(SC: inside street canyon)
Virtual Station 298
(SC: inside street canyon)
Virtual Station 299
(SC: inside street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

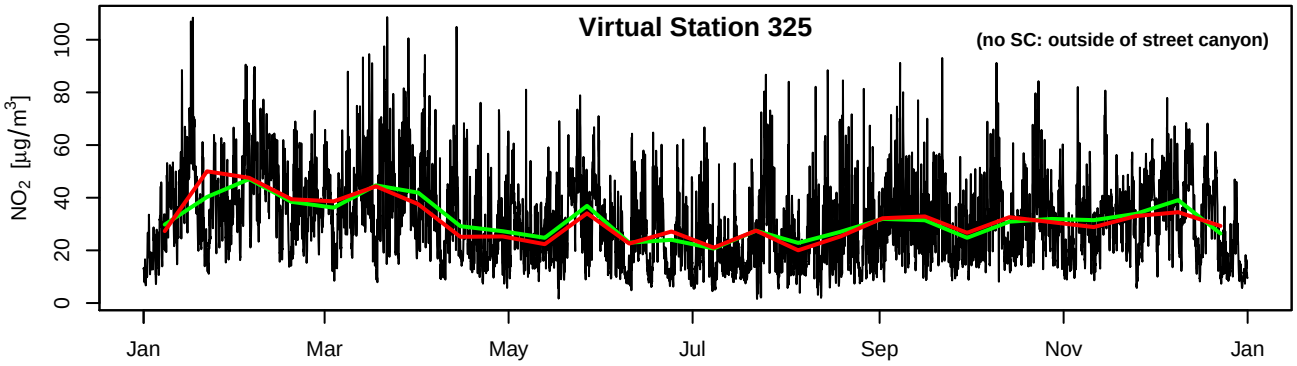

Virtual Station 300
(SC: inside street canyon)
Virtual Station 301
(SC: inside street canyon)
Virtual Station 302
(SC: inside street canyon)
Virtual Station 303
(SC: inside street canyon)
Virtual Station 304
(SC: inside street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

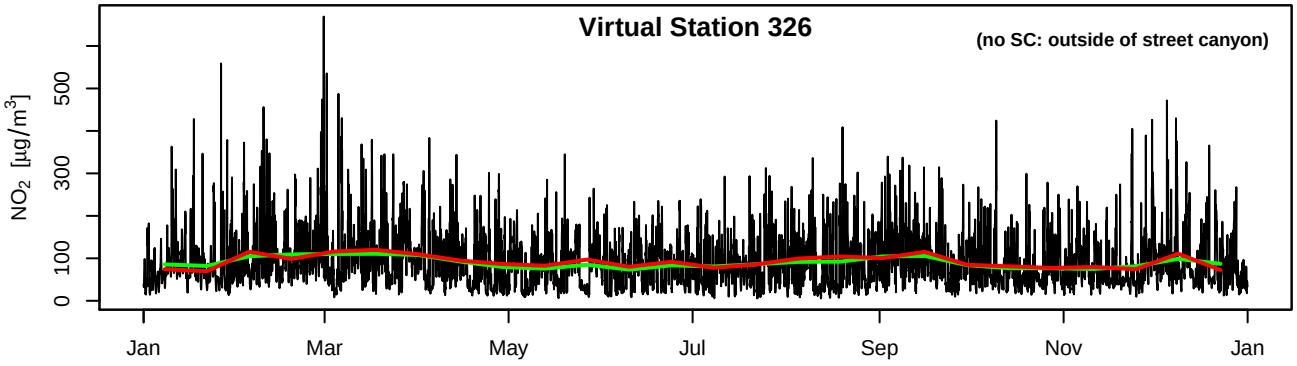

Virtual Station 305
(SC: inside street canyon)
Virtual Station 306
(SC: inside street canyon)
Virtual Station 307
(SC: inside street canyon)
Virtual Station 308
(SC: inside street canyon)
Virtual Station 309
(SC: inside street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

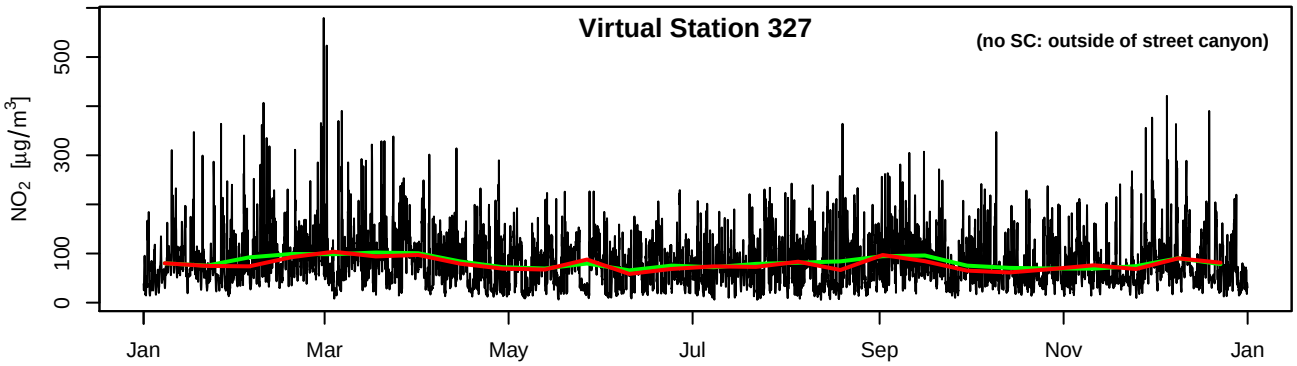

Virtual Station 310
(SC: inside street canyon)
Virtual Station 311
(no SC: outside of street canyon)
Virtual Station 312
(no SC: outside of street canyon)
Virtual Station 313
(no SC: outside of street canyon)
Virtual Station 314
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

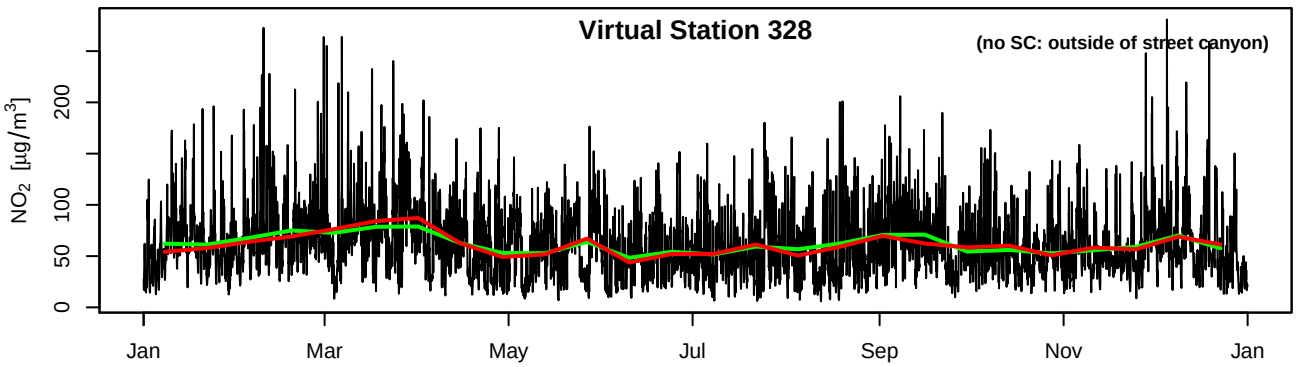

Virtual Station 315
(no SC: outside of street canyon)
Virtual Station 316
(SC: inside street canyon)
Virtual Station 317
(no SC: outside of street canyon)
Virtual Station 318
(no SC: outside of street canyon)
Virtual Station 319
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

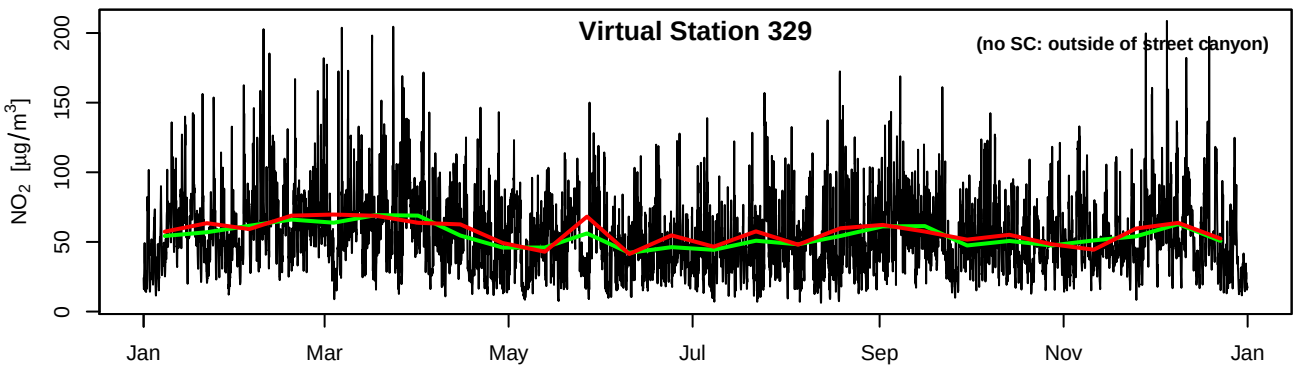

Virtual Station 320
(no SC: outside of street canyon)
NO2 [µg/m3]
0 20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 321
(no SC: outside of street canyon)
NO2 [µg/m3]
0 50 150 250 350
Jan Mar May Jul Sep Nov Jan
Virtual Station 322
(no SC: outside of street canyon)
NO2 [µg/m3]
0 50 100 150 200 250
Jan Mar May Jul Sep Nov Jan
Virtual Station 323
(no SC: outside of street canyon)
NO2 [µg/m3]
0 50 100 150
Jan Mar May Jul Sep Nov Jan
Virtual Station 324
(no SC: outside of street canyon)
NO2 [µg/m3]
0 20 60 100 140
Jan Mar May Jul Sep Nov Jan
hourly model values
aggregated values
aggregated + noise

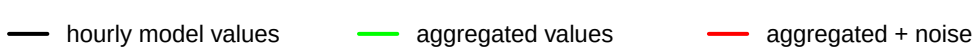

Virtual Station 325
(no SC: outside of street canyon)
NO2 [µg/m3]
0
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan

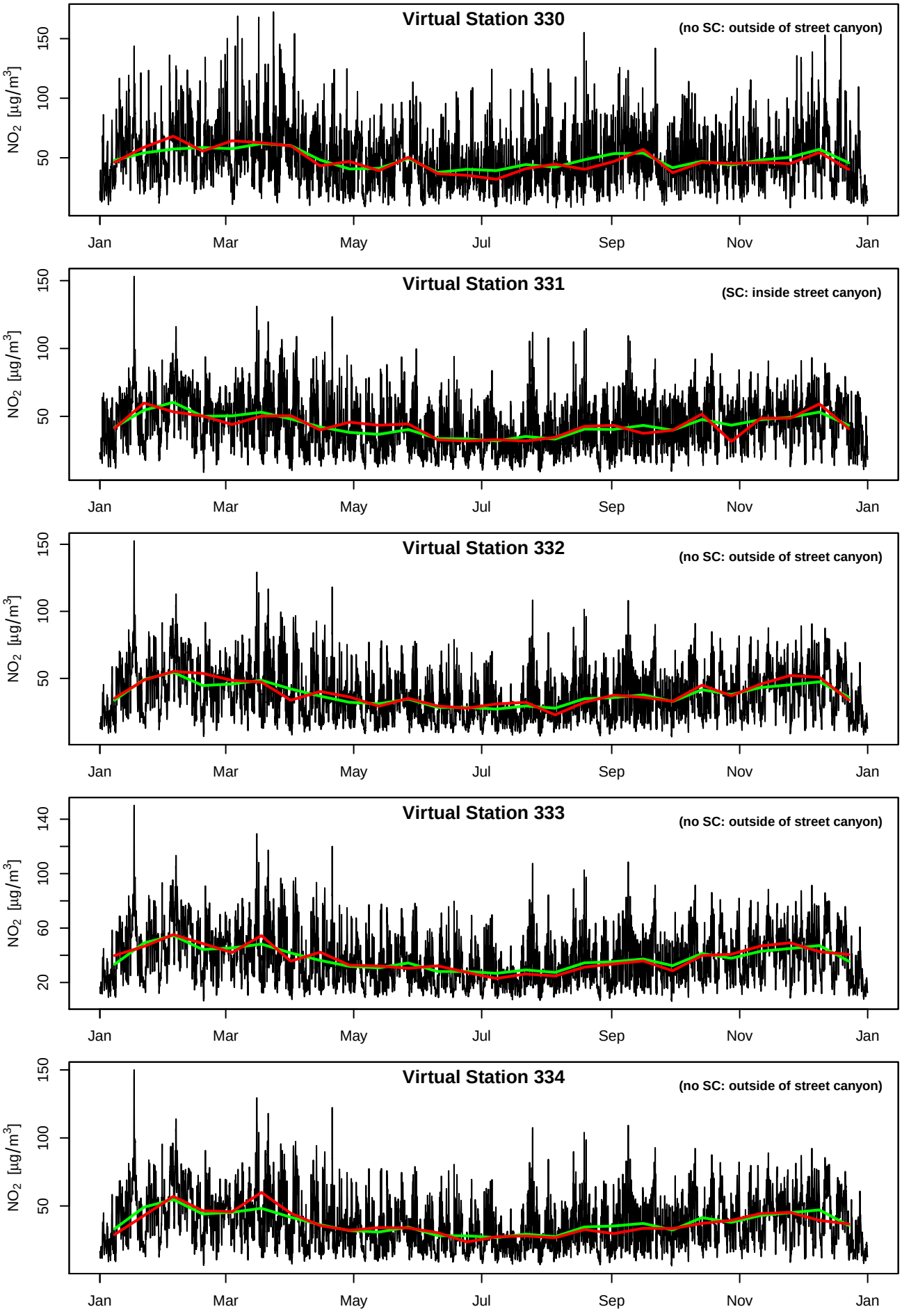

Virtual Station 326
(no SC: outside of street canyon)
NO2 [µg/m3]
0
100
300
500
Jan
Mar
May
Jul
Sep
Nov
Jan

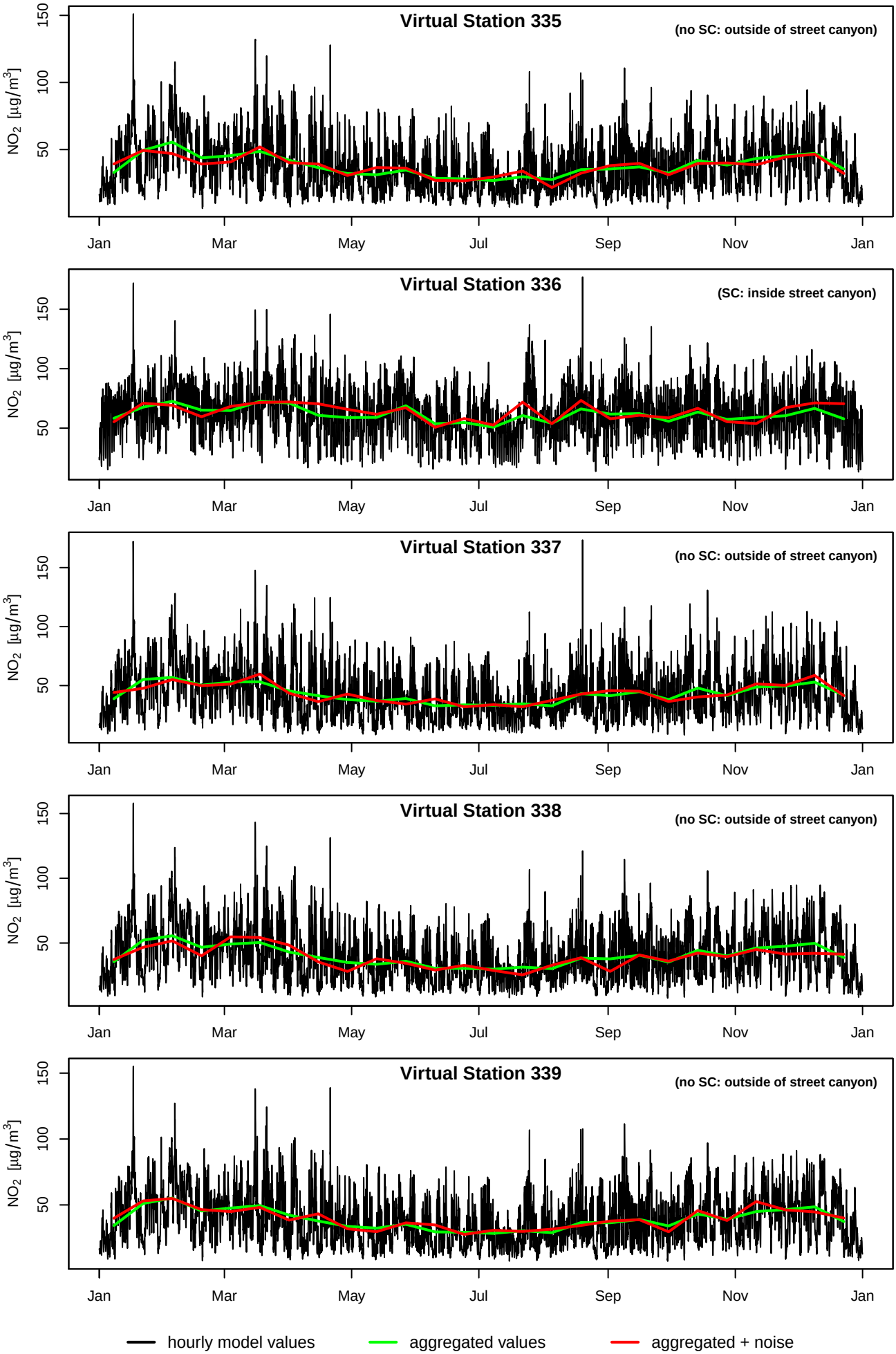

Virtual Station 327
(no SC: outside of street canyon)
NO2 [µg/m3]
0
100
300
500
Jan
Mar
May
Jul
Sep
Nov
Jan

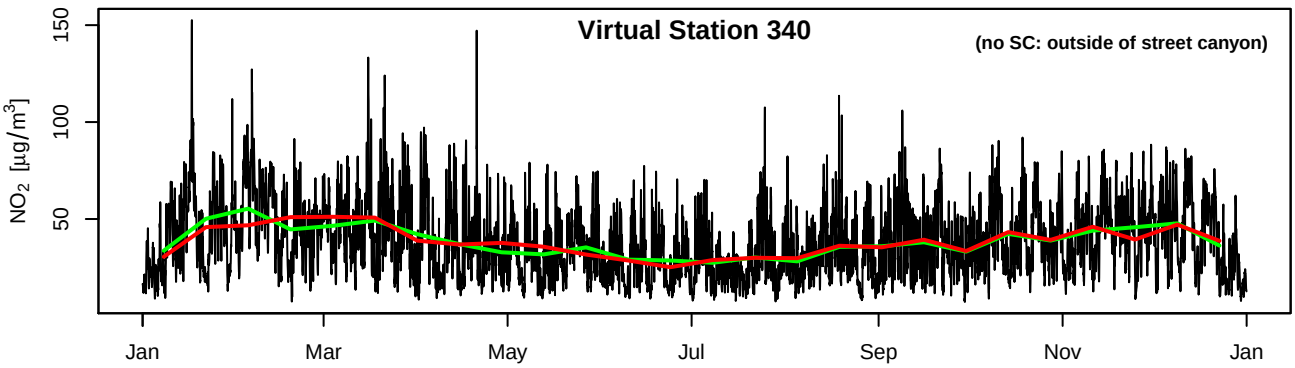

Virtual Station 328
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
200
Jan
Mar
May
Jul
Sep
Nov
Jan

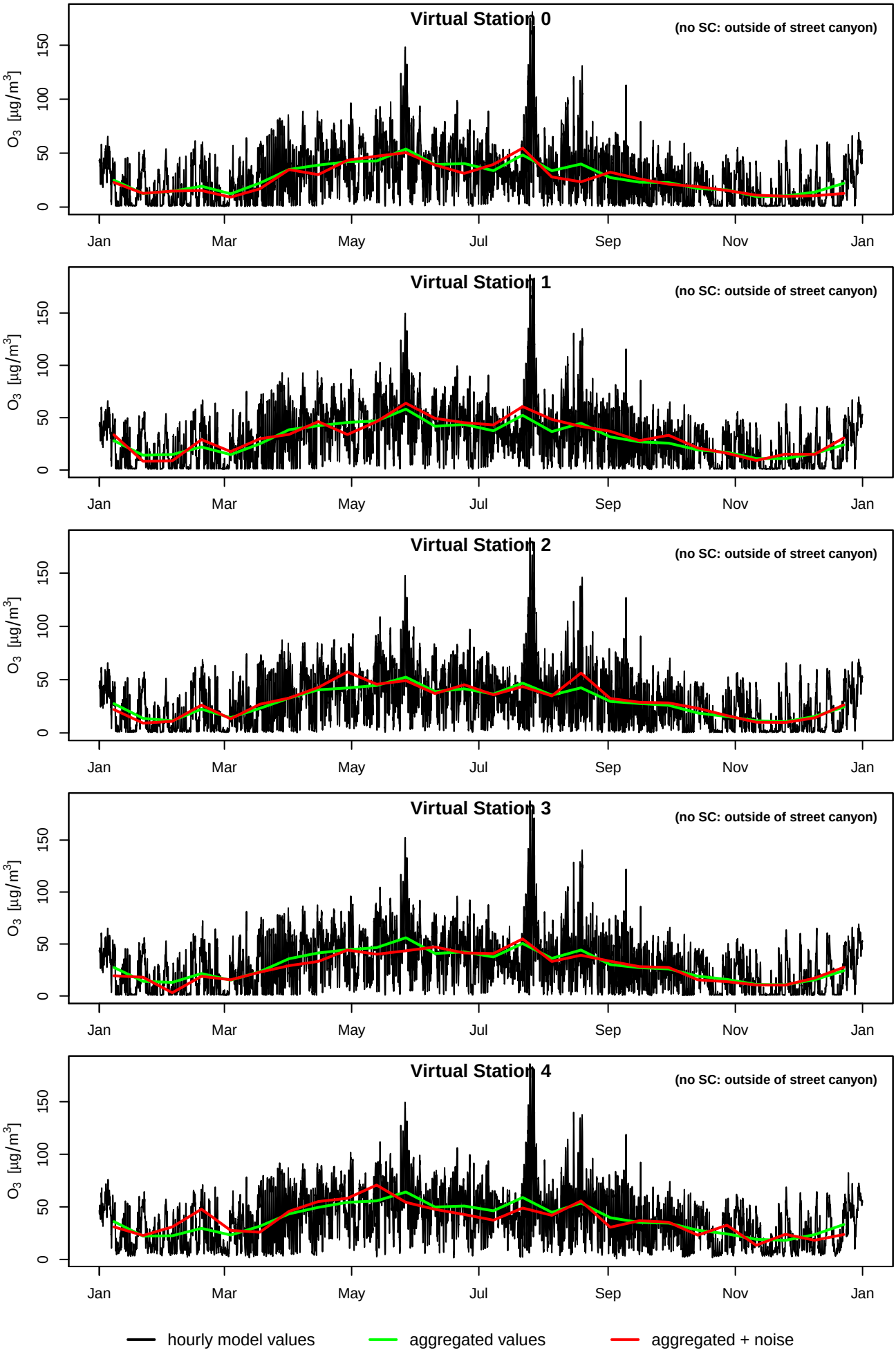

Virtual Station 329
(no SC: outside of street canyon)
NO2 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan

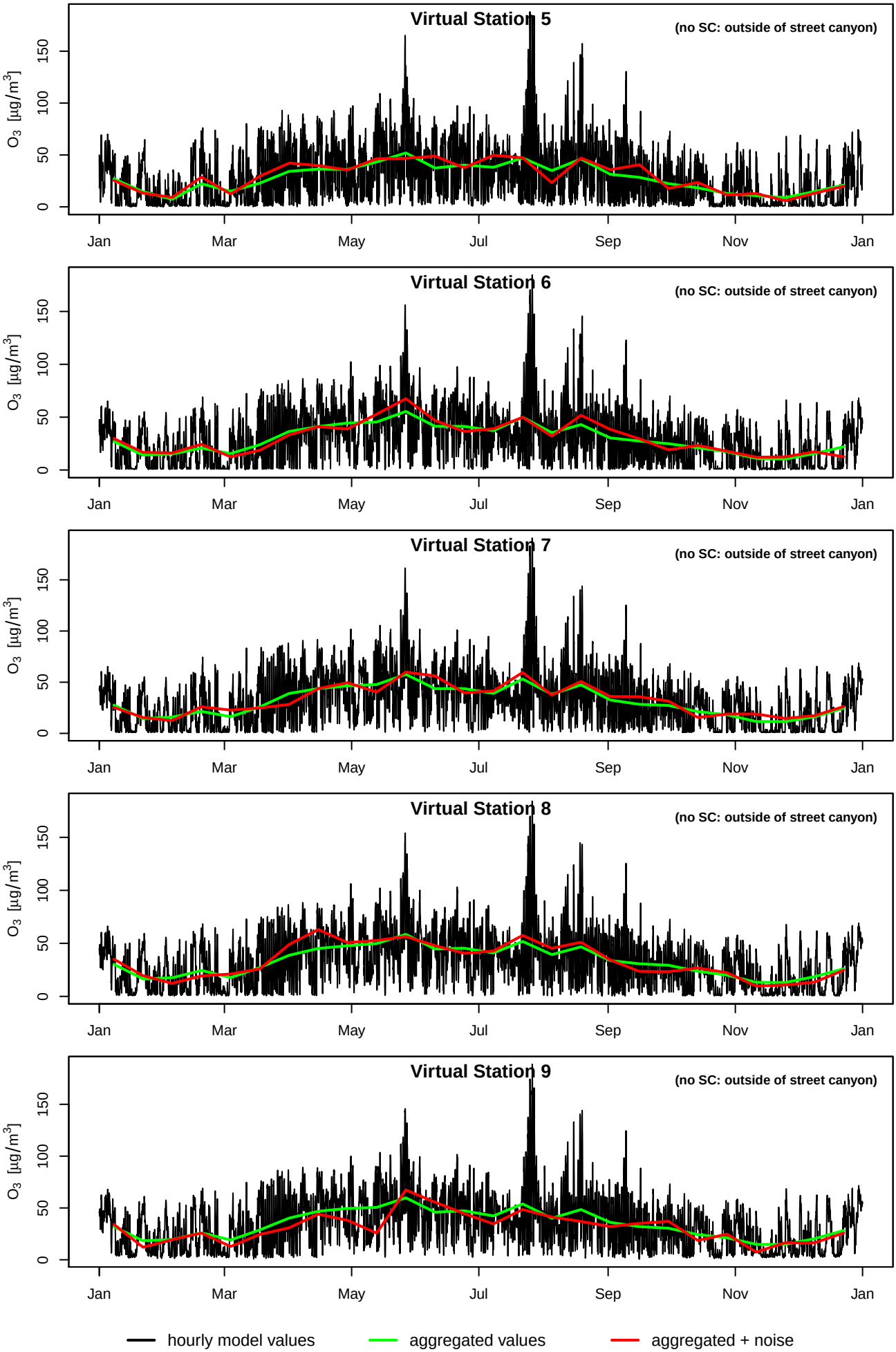

hourly model values
aggregated values
aggregated + noise

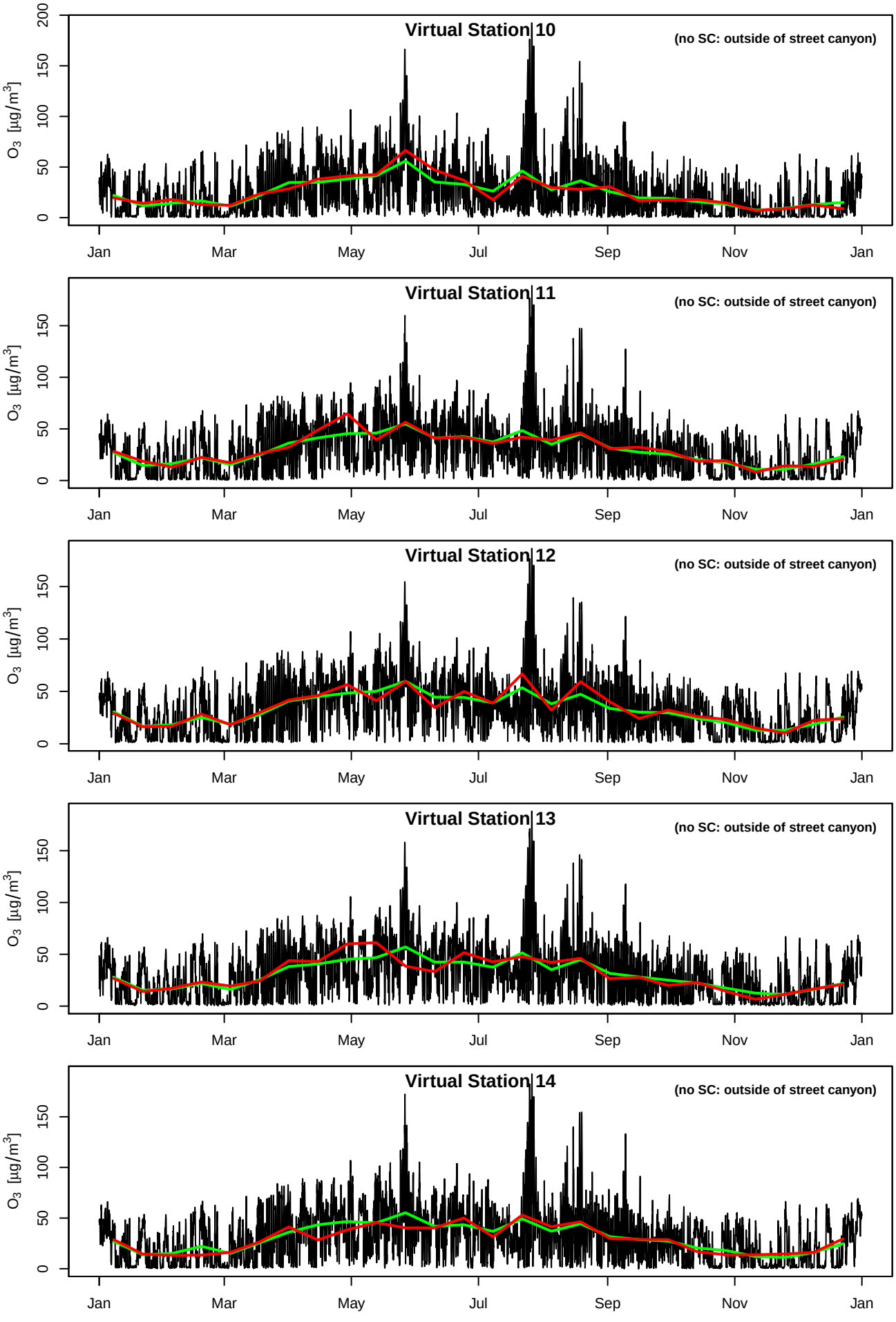

Virtual Station 330
(no SC: outside of street canyon)
Virtual Station 331
(SC: inside street canyon)
Virtual Station 332
(no SC: outside of street canyon)
Virtual Station 333
(no SC: outside of street canyon)
Virtual Station 334
(no SC: outside of street canyon)
NO2 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

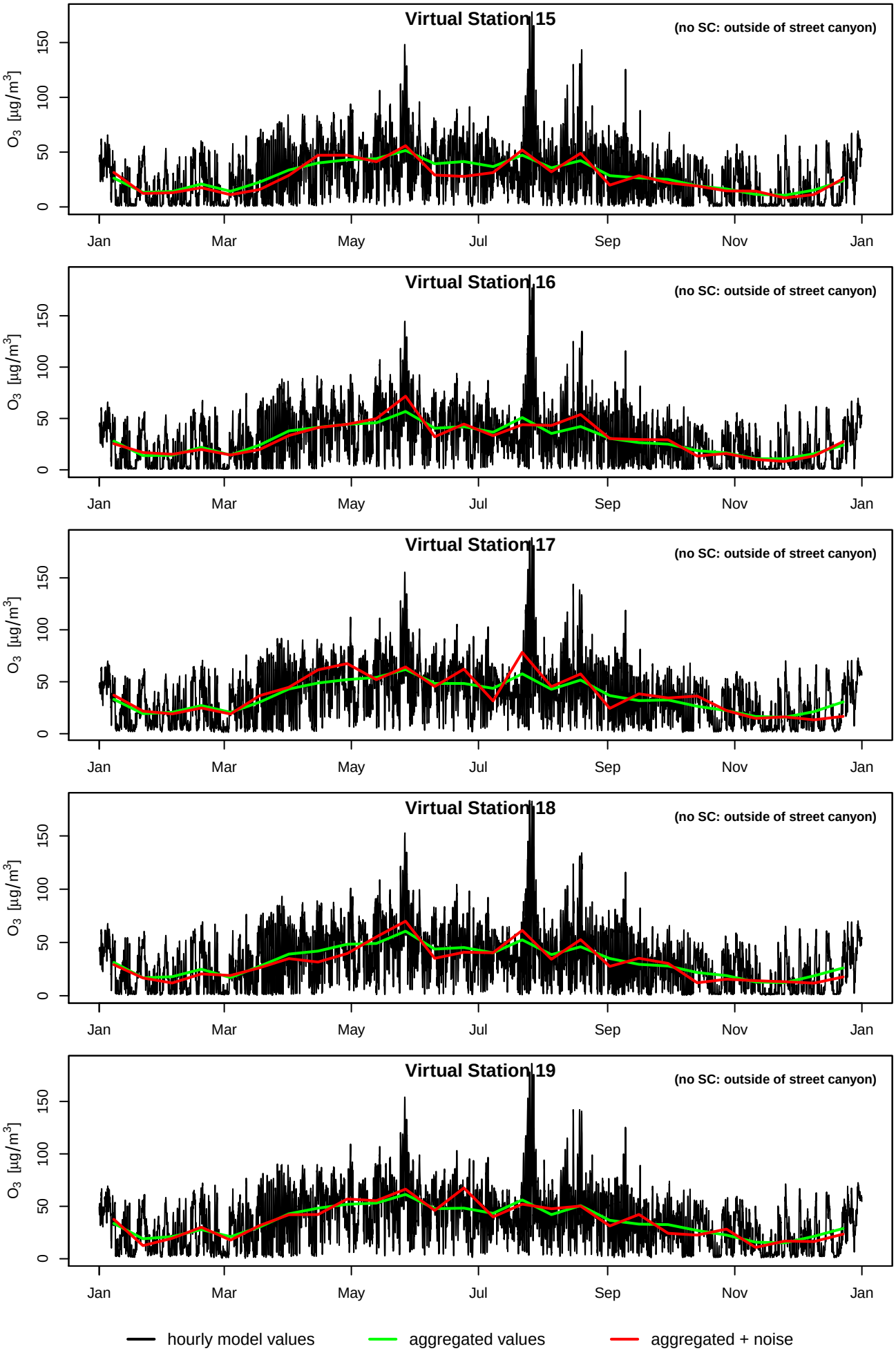

Virtual Station 335
(no SC: outside of street canyon)
Virtual Station 336
(SC: inside street canyon)
Virtual Station 337
(no SC: outside of street canyon)
Virtual Station 338
(no SC: outside of street canyon)
Virtual Station 339
(no SC: outside of street canyon)
NO2 [µg/m3]
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

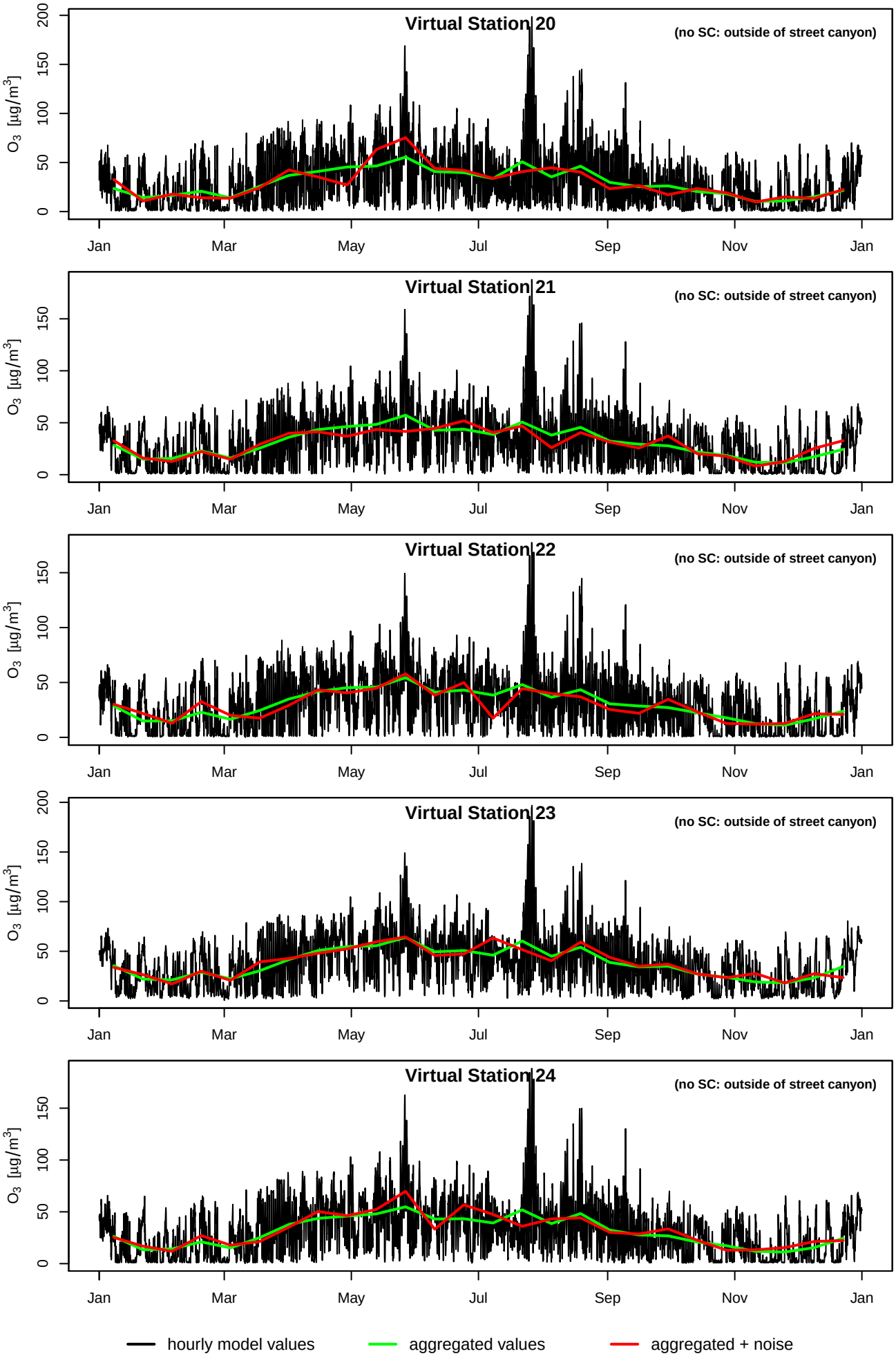

Virtual Station 340
(no SC: outside of street canyon)
NO2 [µg/m3]
150
100
50
Jan
Mar
May
Jul
Sep
Nov
Jan

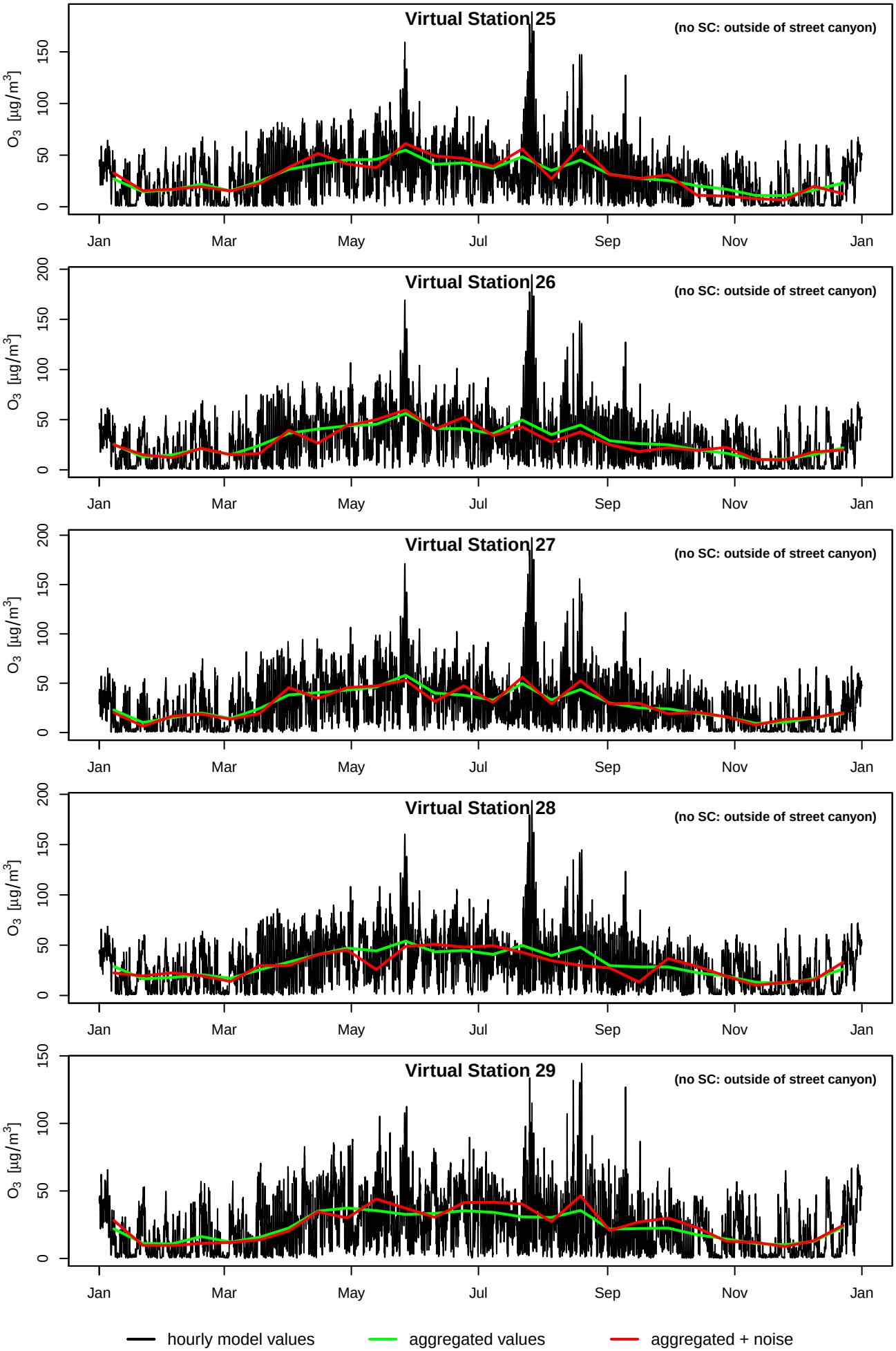

Virtual Station 0
(no SC: outside of street canyon)
Virtual Station 1
(no SC: outside of street canyon)
Virtual Station 2
(no SC: outside of street canyon)
Virtual Station 3
(no SC: outside of street canyon)
Virtual Station 4
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

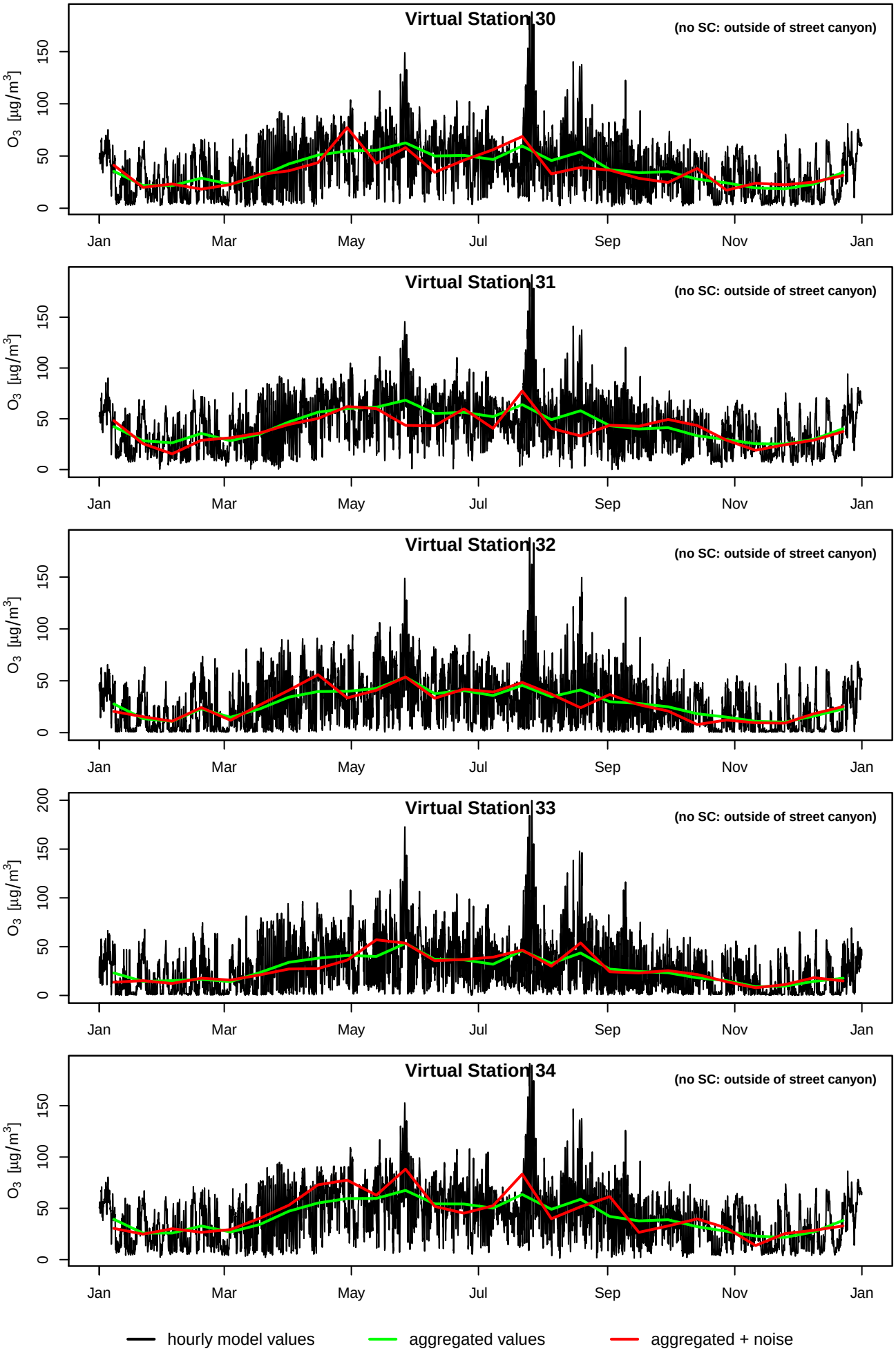

Virtual Station 5
(no SC: outside of street canyon)
Virtual Station 6
(no SC: outside of street canyon)
Virtual Station 7
(no SC: outside of street canyon)
Virtual Station 8
(no SC: outside of street canyon)
Virtual Station 9
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

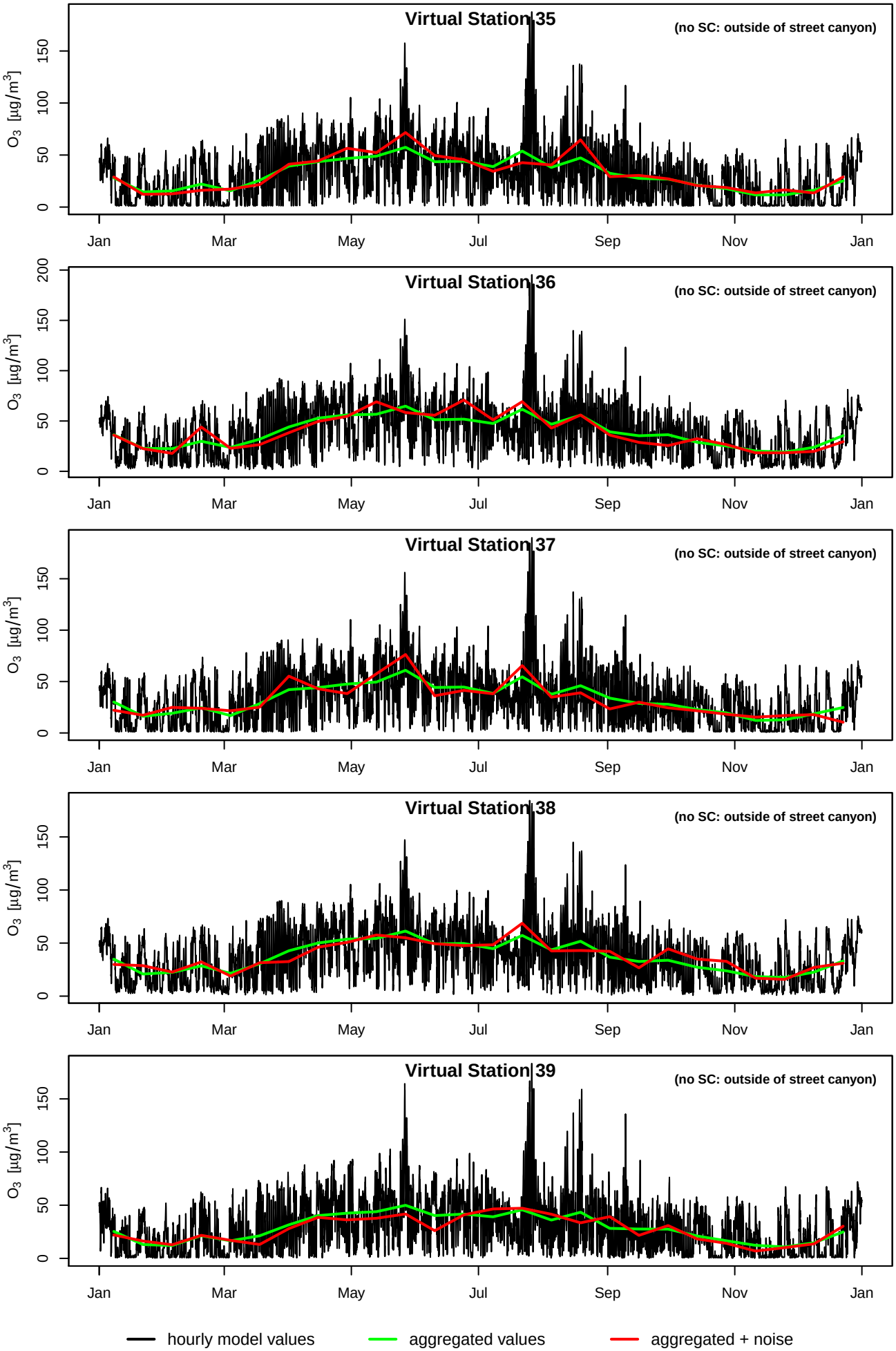

Virtual Station 10
(no SC: outside of street canyon)
Virtual Station 11
(no SC: outside of street canyon)
Virtual Station 12
(no SC: outside of street canyon)
Virtual Station 13
(no SC: outside of street canyon)
Virtual Station 14
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

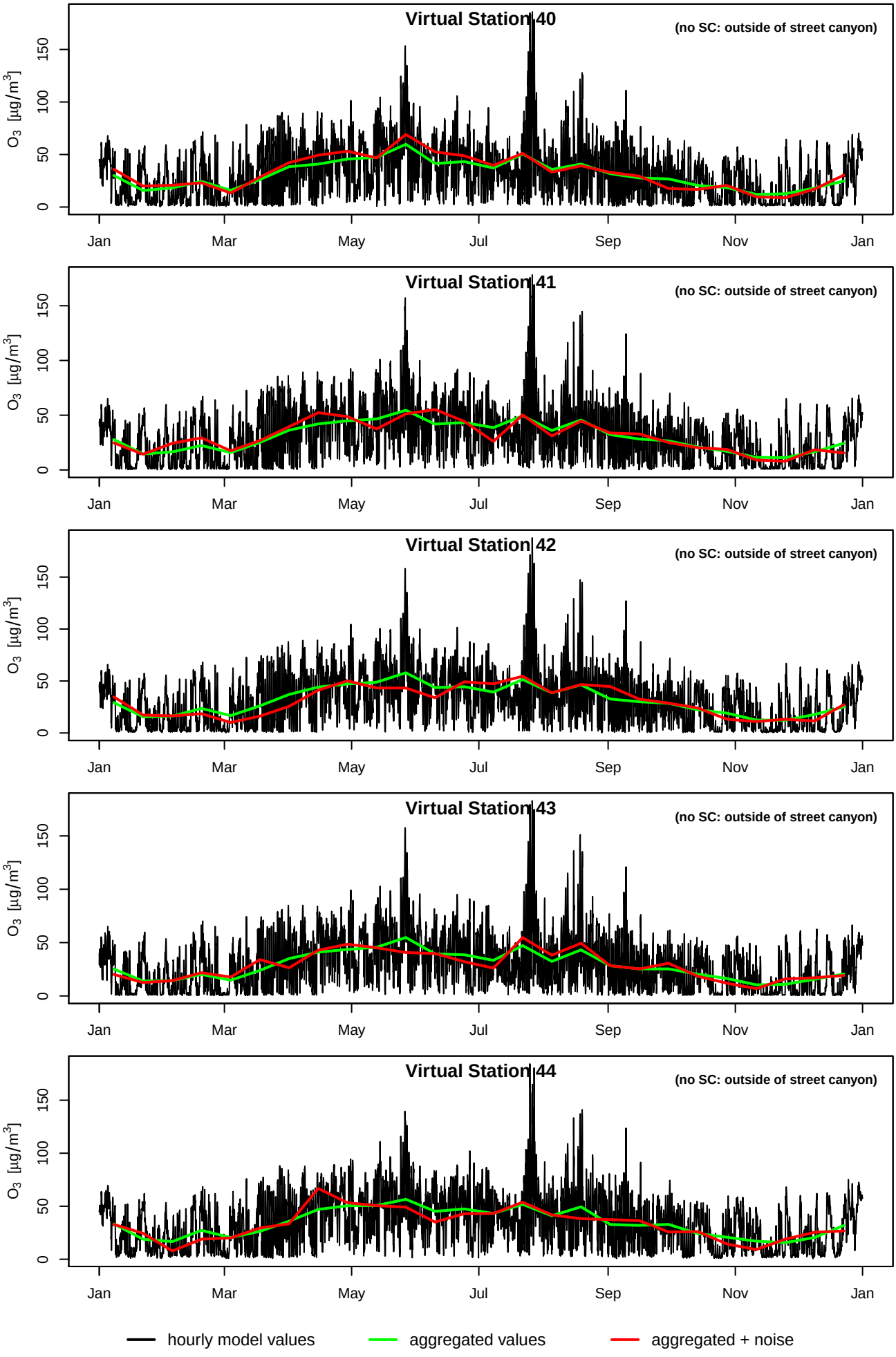

Virtual Station 15
(no SC: outside of street canyon)
Virtual Station 16
(no SC: outside of street canyon)
Virtual Station 17
(no SC: outside of street canyon)
Virtual Station 18
(no SC: outside of street canyon)
Virtual Station 19
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

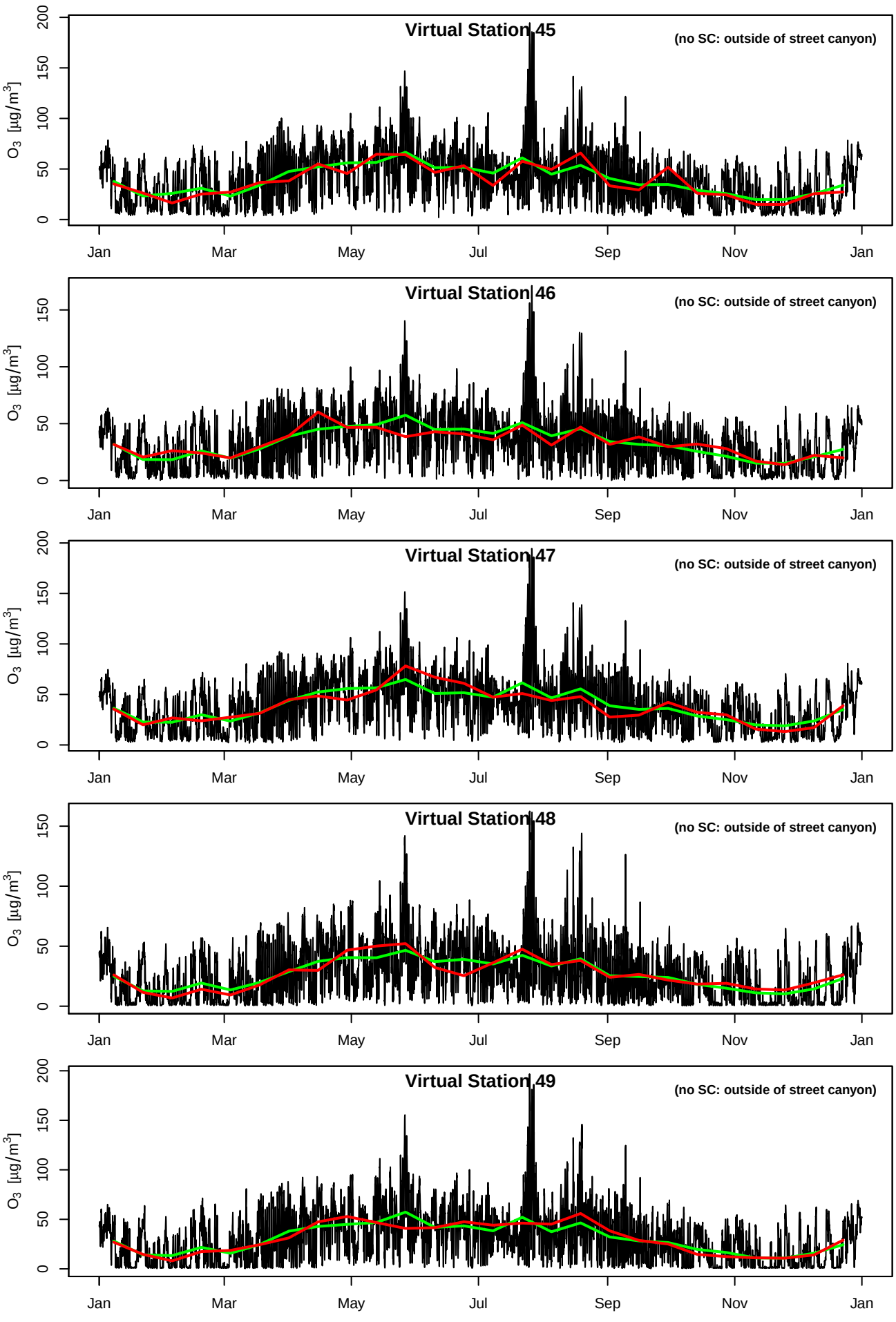

Virtual Station 20
(no SC: outside of street canyon)
Virtual Station 21
(no SC: outside of street canyon)
Virtual Station 22
(no SC: outside of street canyon)
Virtual Station 23
(no SC: outside of street canyon)
Virtual Station 24
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

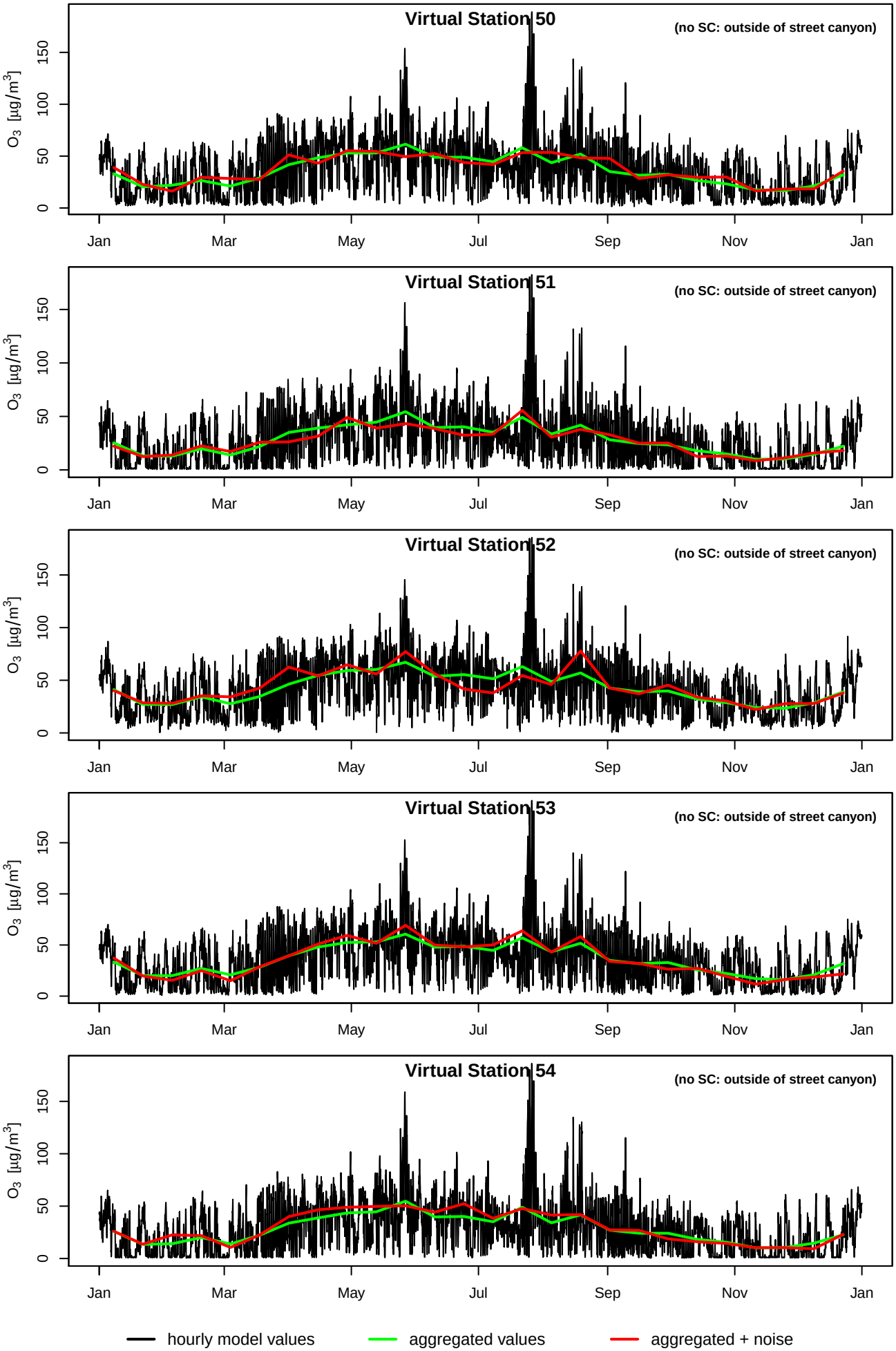

Virtual Station 25
(no SC: outside of street canyon)
Virtual Station 26
(no SC: outside of street canyon)
Virtual Station 27
(no SC: outside of street canyon)
Virtual Station 28
(no SC: outside of street canyon)
Virtual Station 29
(no SC: outside of street canyon)
O3 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

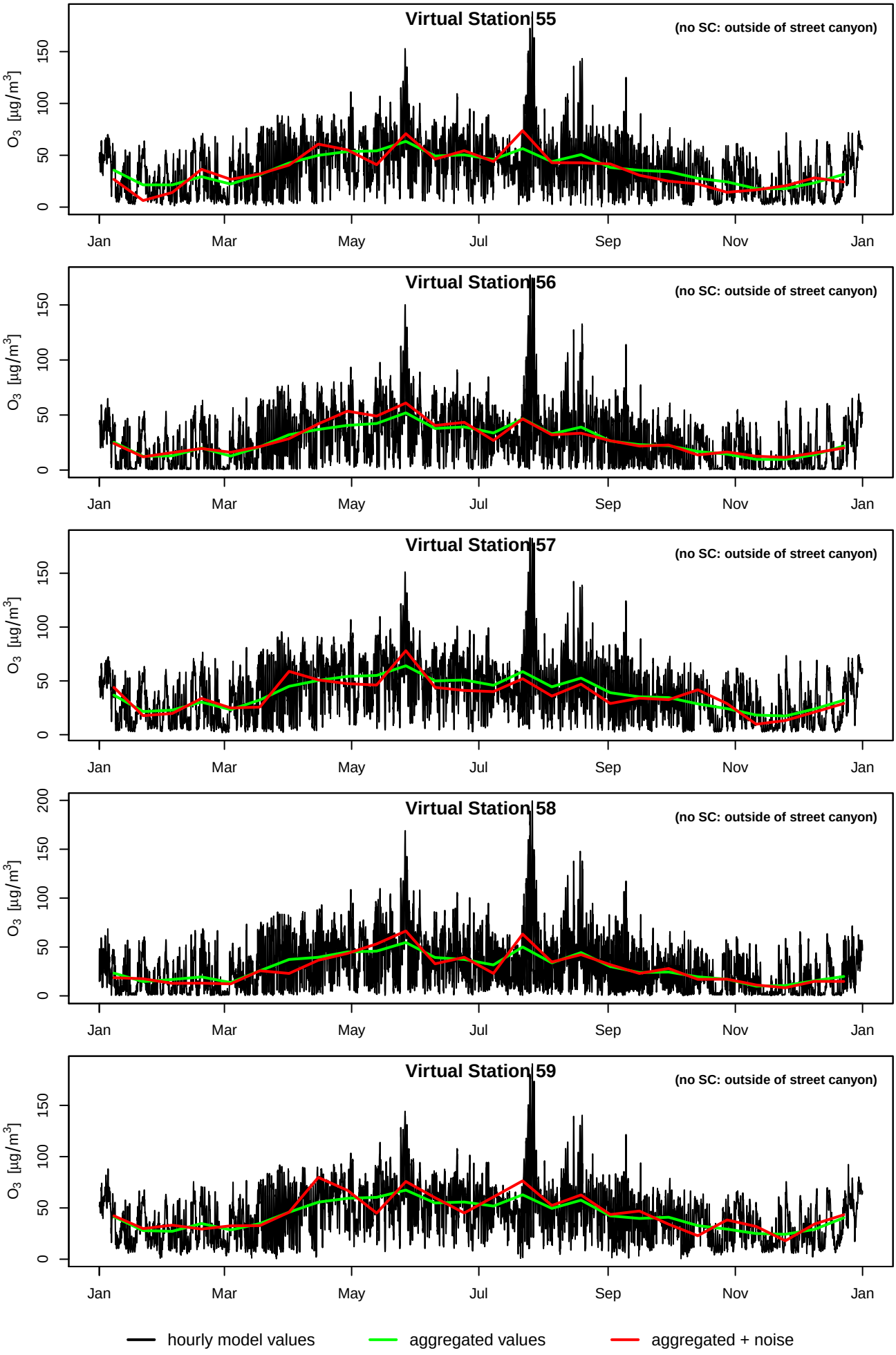

Virtual Station 30
(no SC: outside of street canyon)
Virtual Station 31
(no SC: outside of street canyon)
Virtual Station 32
(no SC: outside of street canyon)
Virtual Station 33
(no SC: outside of street canyon)
Virtual Station 34
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

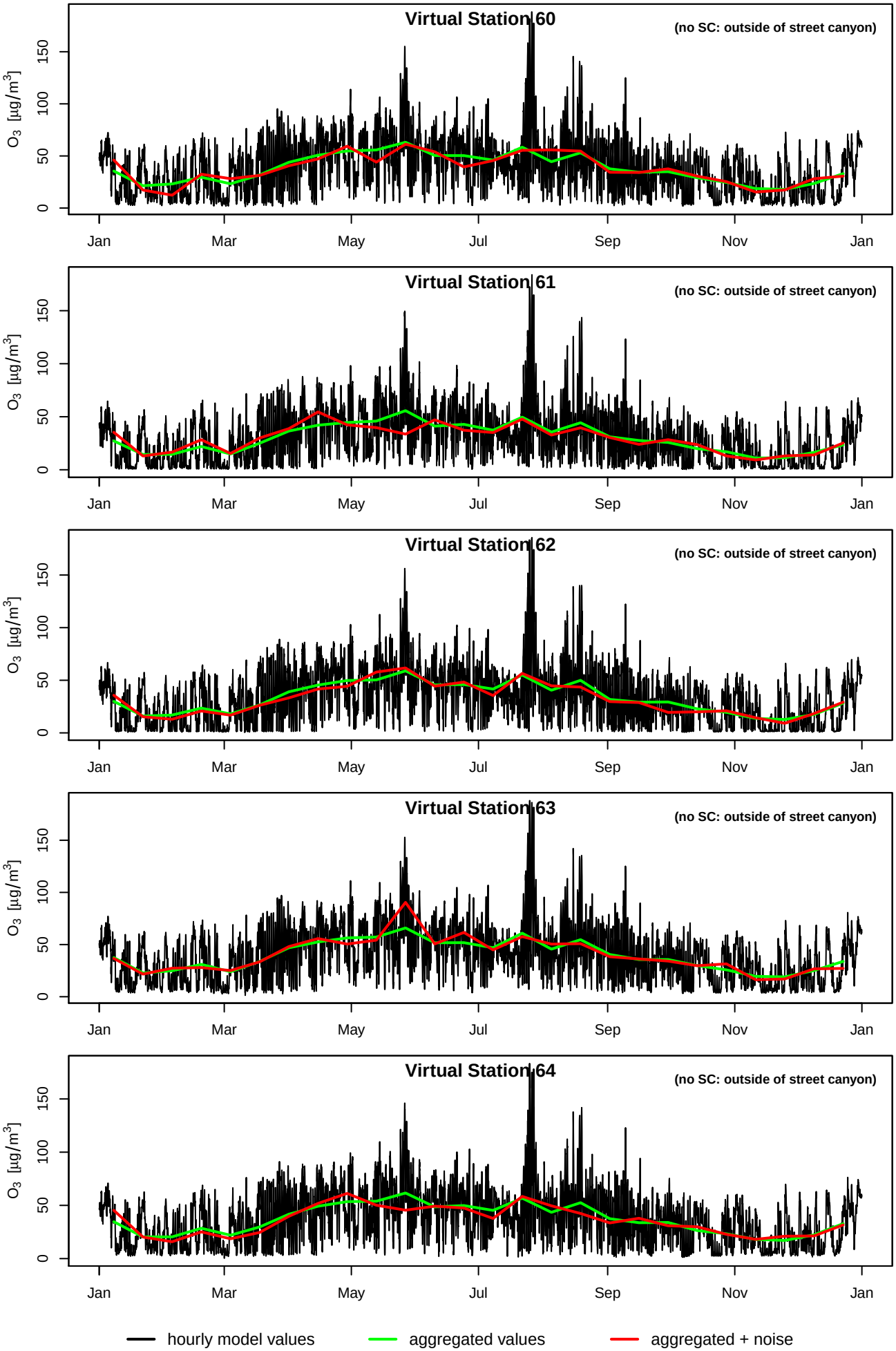

Virtual Station 35
(no SC: outside of street canyon)
Virtual Station 36
(no SC: outside of street canyon)
Virtual Station 37
(no SC: outside of street canyon)
Virtual Station 38
(no SC: outside of street canyon)
Virtual Station 39
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

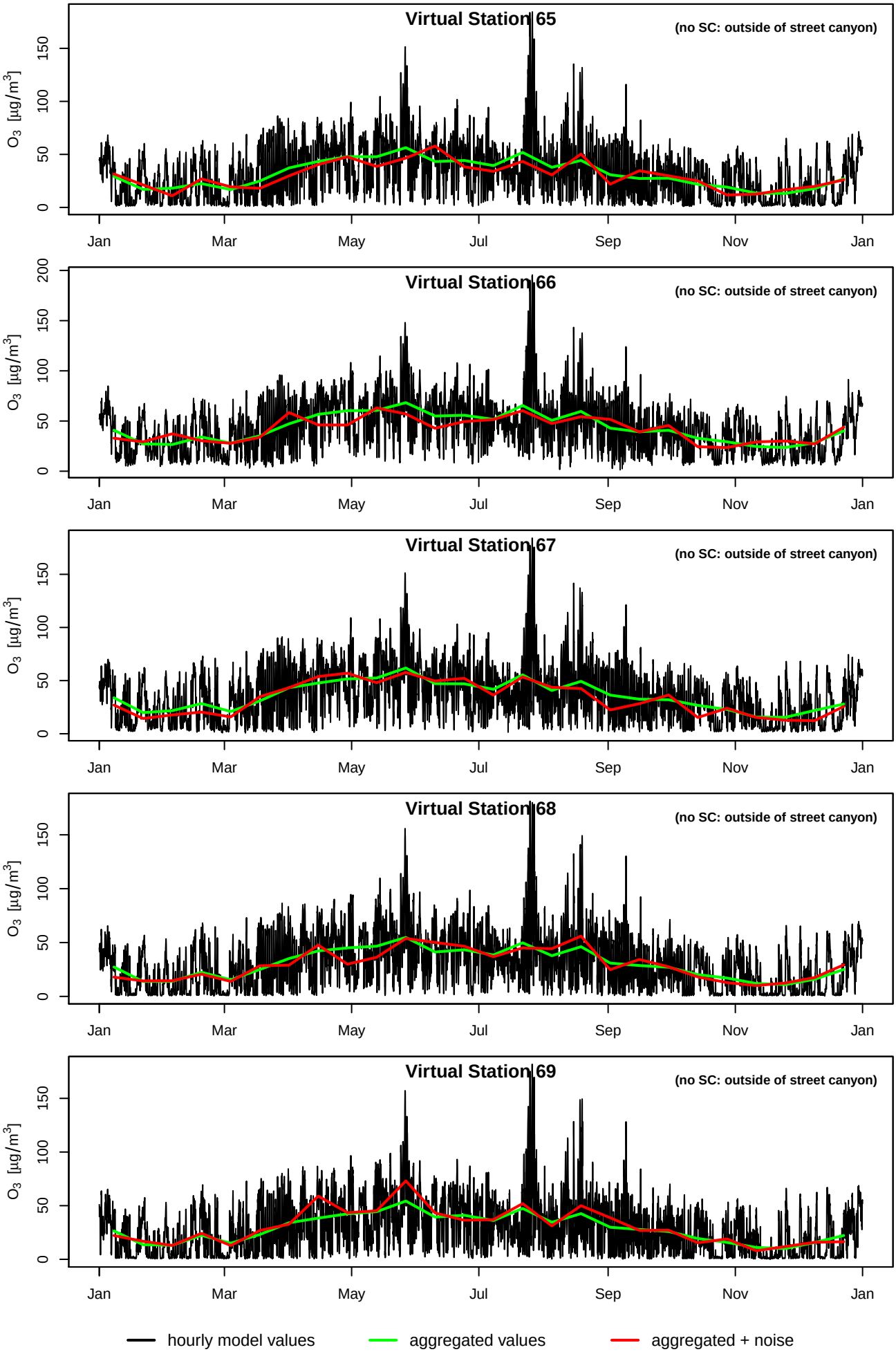

Virtual Station 40
(no SC: outside of street canyon)
Virtual Station 41
(no SC: outside of street canyon)
Virtual Station 42
(no SC: outside of street canyon)
Virtual Station 43
(no SC: outside of street canyon)
Virtual Station 44
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

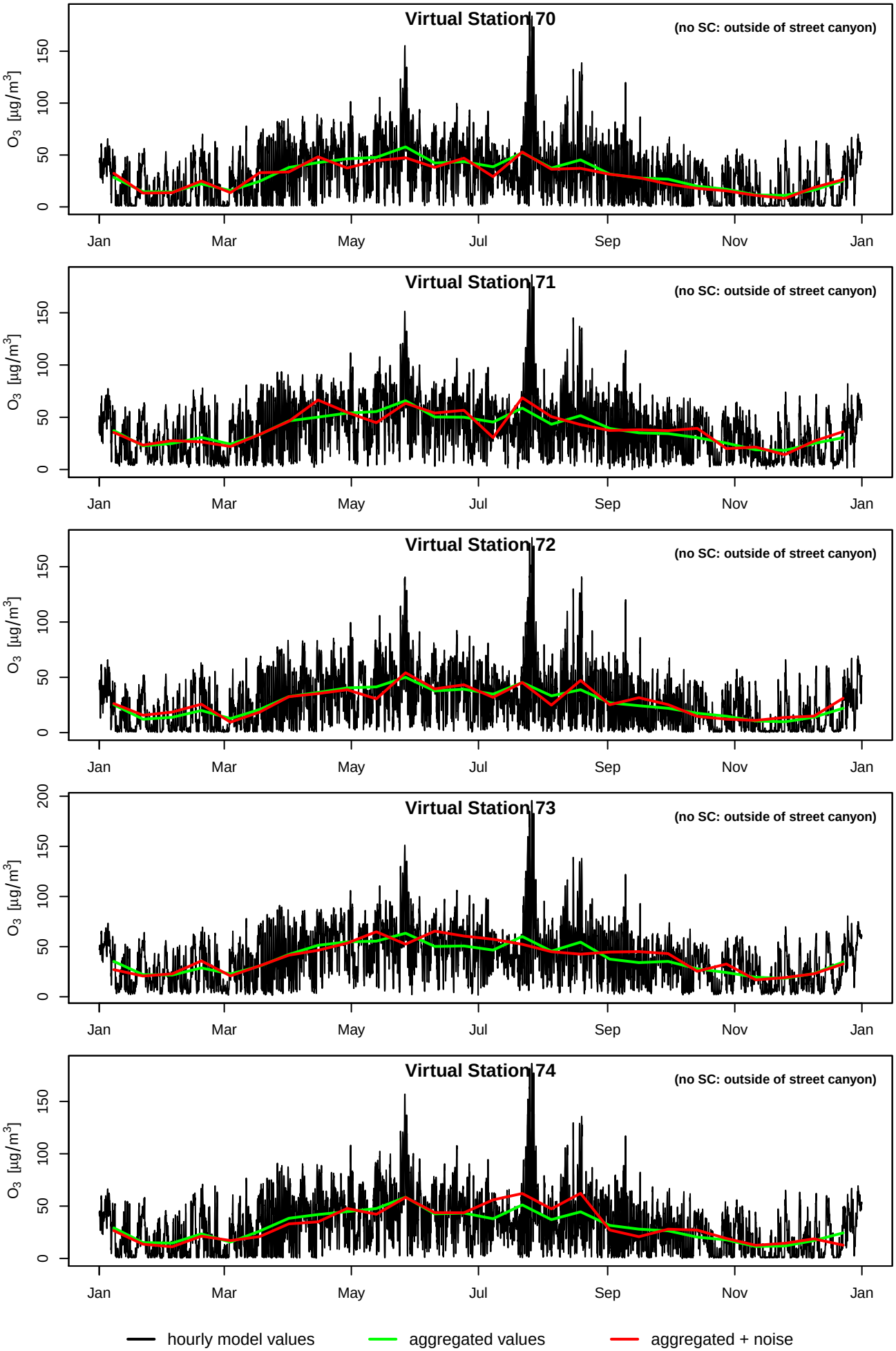

Virtual Station 45
(no SC: outside of street canyon)
Virtual Station 46
(no SC: outside of street canyon)
Virtual Station 47
(no SC: outside of street canyon)
Virtual Station 48
(no SC: outside of street canyon)
Virtual Station 49
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

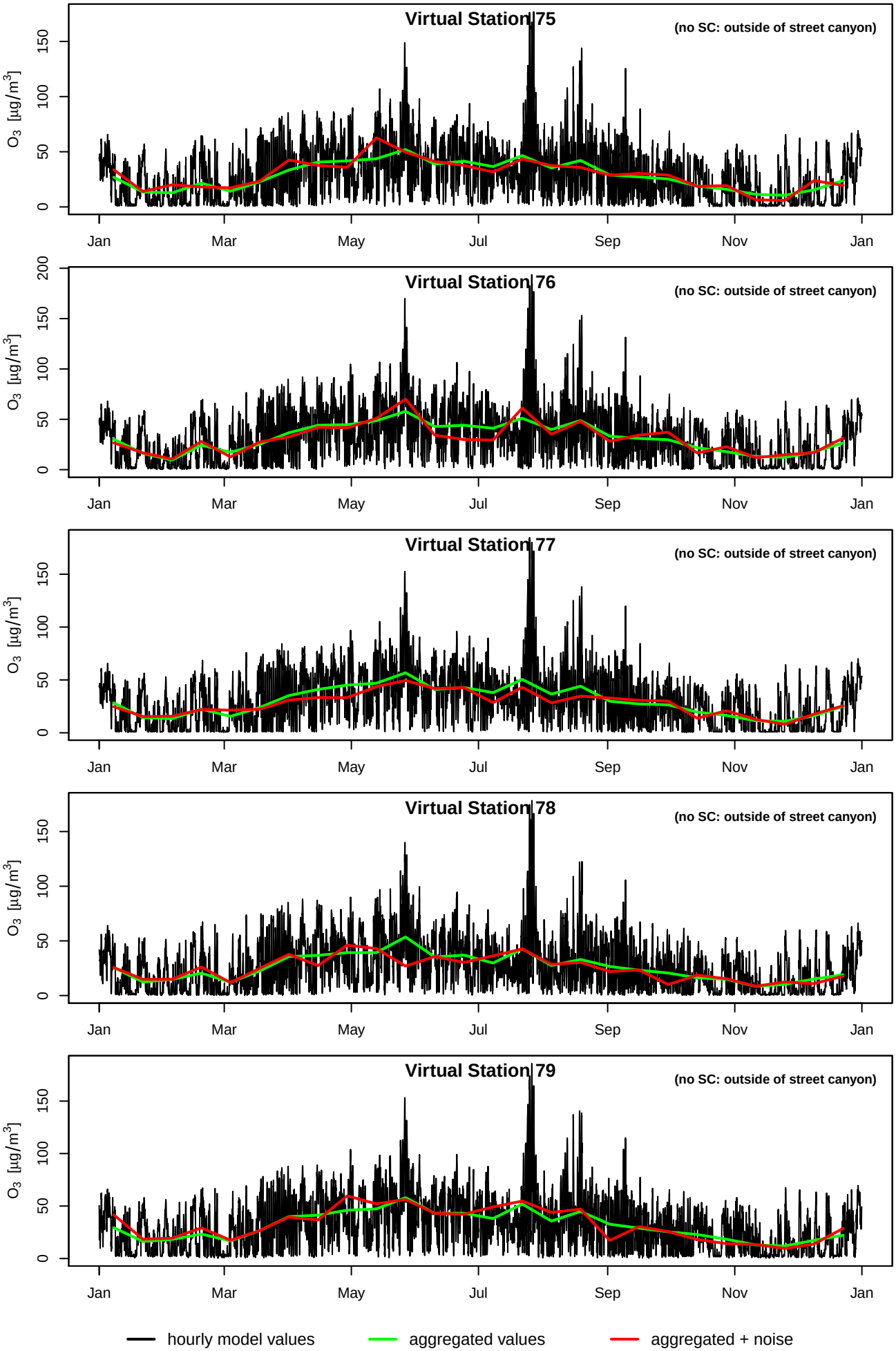

Virtual Station 50
(no SC: outside of street canyon)
Virtual Station 51
(no SC: outside of street canyon)
Virtual Station 52
(no SC: outside of street canyon)
Virtual Station 53
(no SC: outside of street canyon)
Virtual Station 54
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

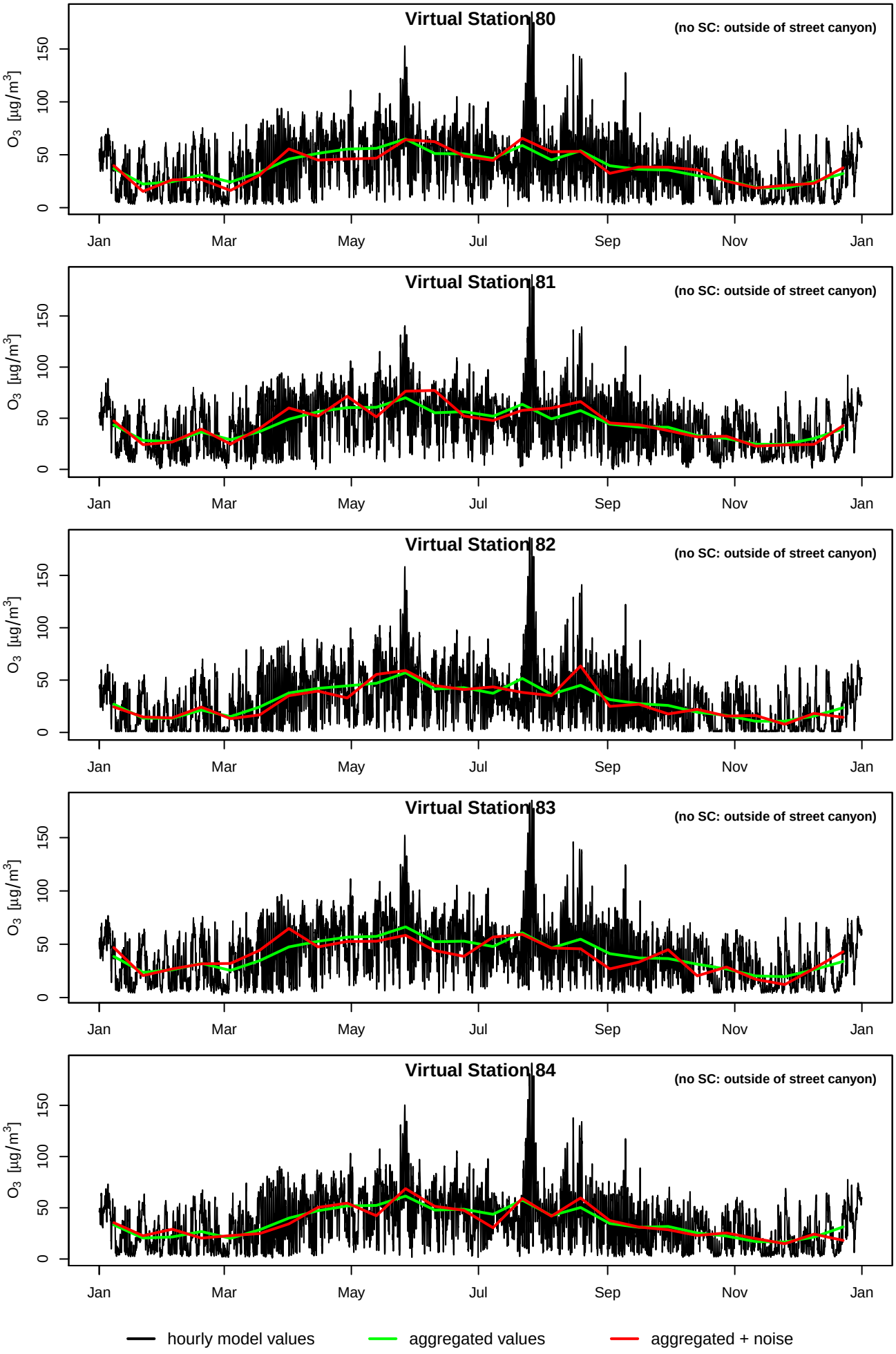

Virtual Station 55
(no SC: outside of street canyon)
Virtual Station 56
(no SC: outside of street canyon)
Virtual Station 57
(no SC: outside of street canyon)
Virtual Station 58
(no SC: outside of street canyon)
Virtual Station 59
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

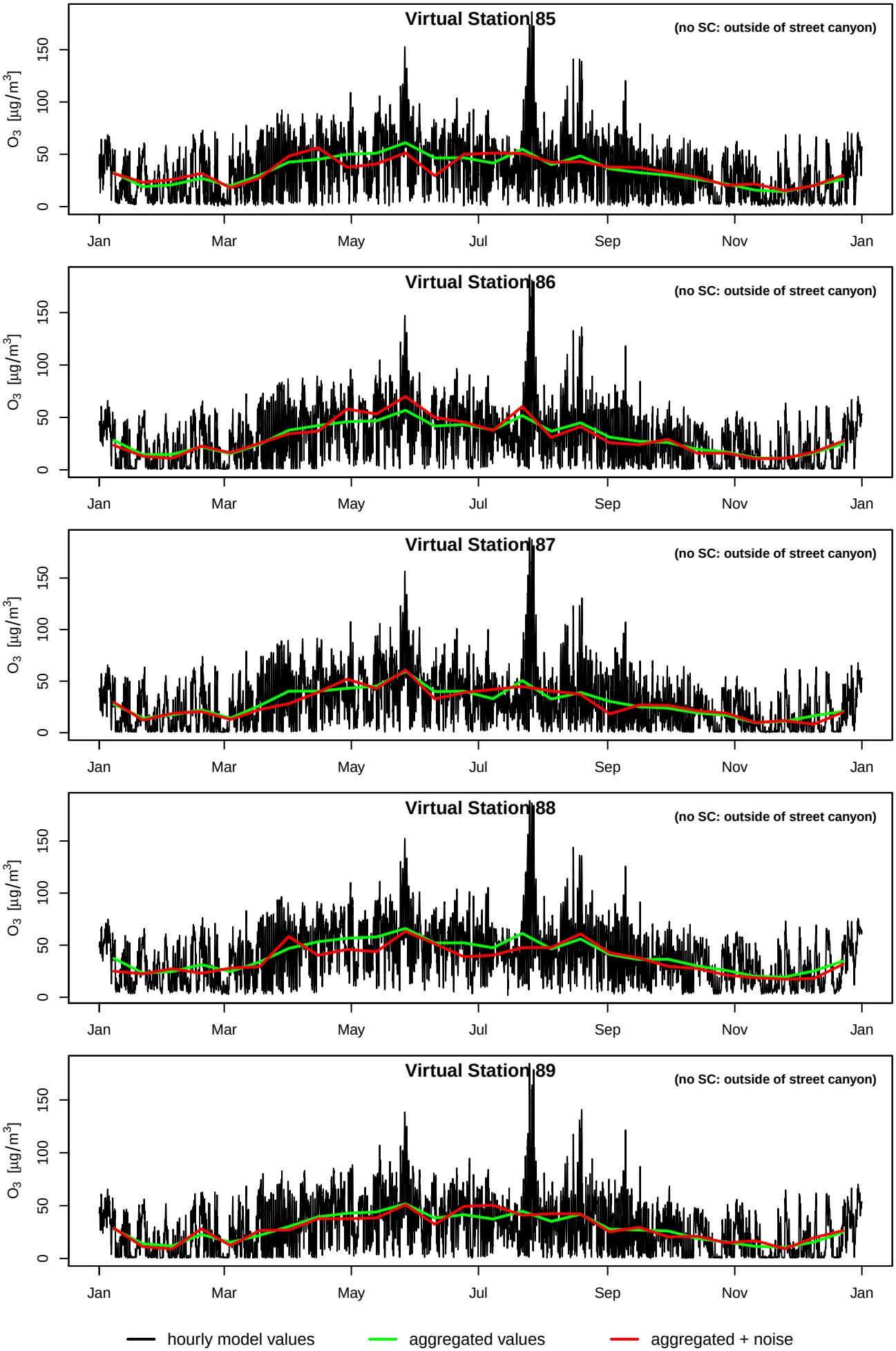

Virtual Station 60
(no SC: outside of street canyon)
Virtual Station 61
(no SC: outside of street canyon)
Virtual Station 62
(no SC: outside of street canyon)
Virtual Station 63
(no SC: outside of street canyon)
Virtual Station 64
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

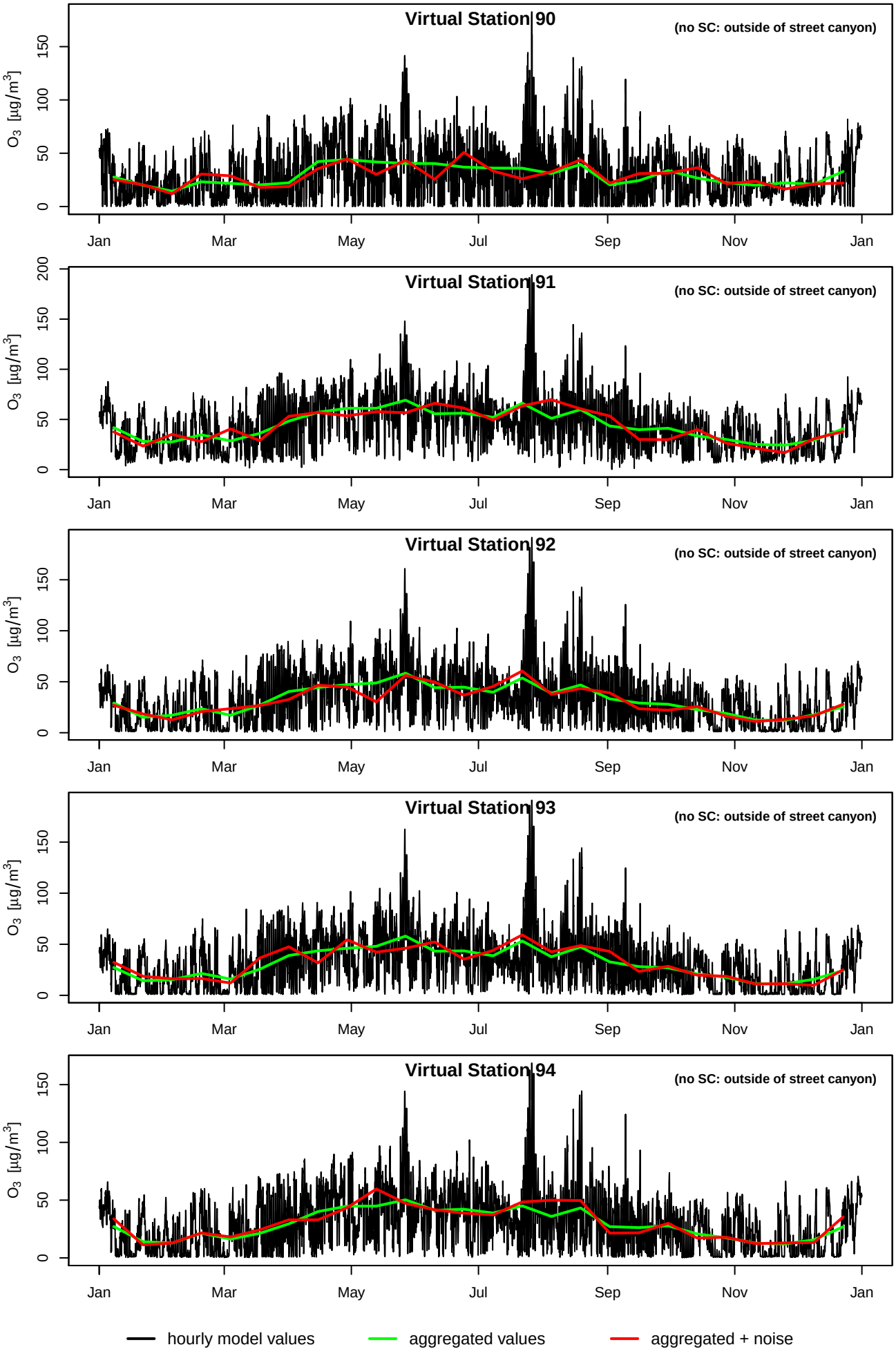

Virtual Station 65
(no SC: outside of street canyon)
Virtual Station 66
(no SC: outside of street canyon)
Virtual Station 67
(no SC: outside of street canyon)
Virtual Station 68
(no SC: outside of street canyon)
Virtual Station 69
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

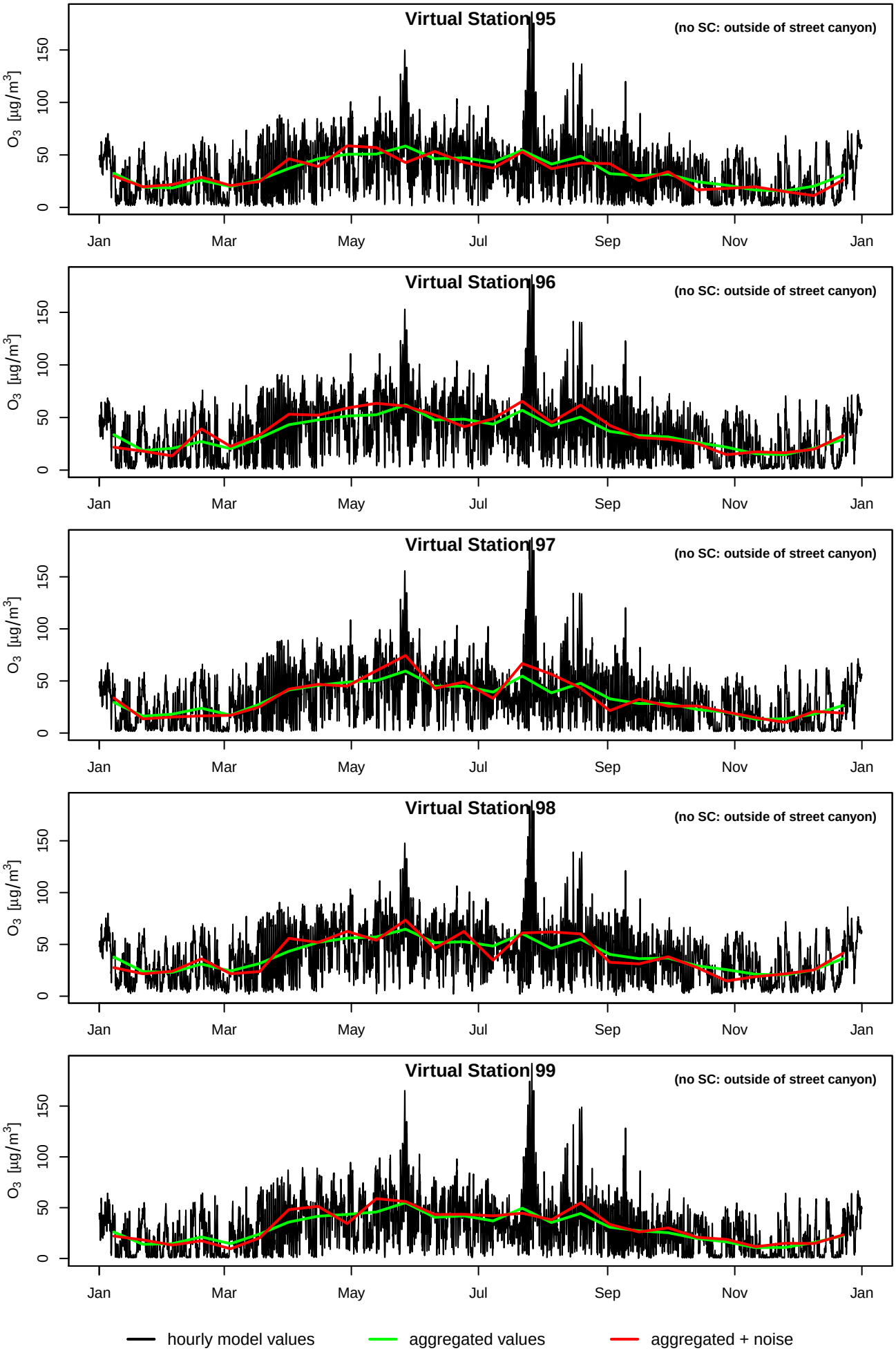

Virtual Station 70
(no SC: outside of street canyon)
Virtual Station 71
(no SC: outside of street canyon)
Virtual Station 72
(no SC: outside of street canyon)
Virtual Station 73
(no SC: outside of street canyon)
Virtual Station 74
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

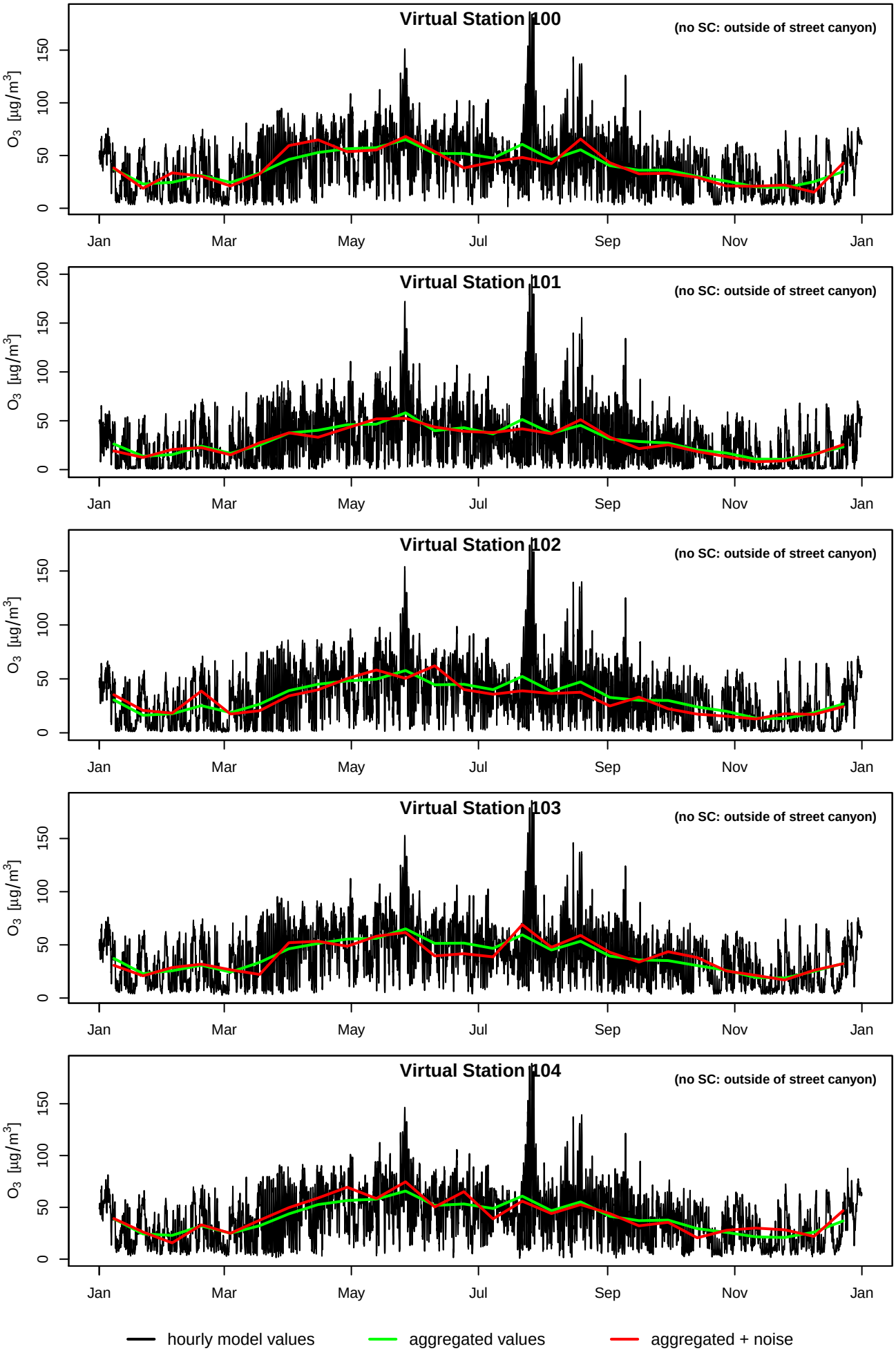

Virtual Station 75
(no SC: outside of street canyon)
Virtual Station 76
(no SC: outside of street canyon)
Virtual Station 77
(no SC: outside of street canyon)
Virtual Station 78
(no SC: outside of street canyon)
Virtual Station 79
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

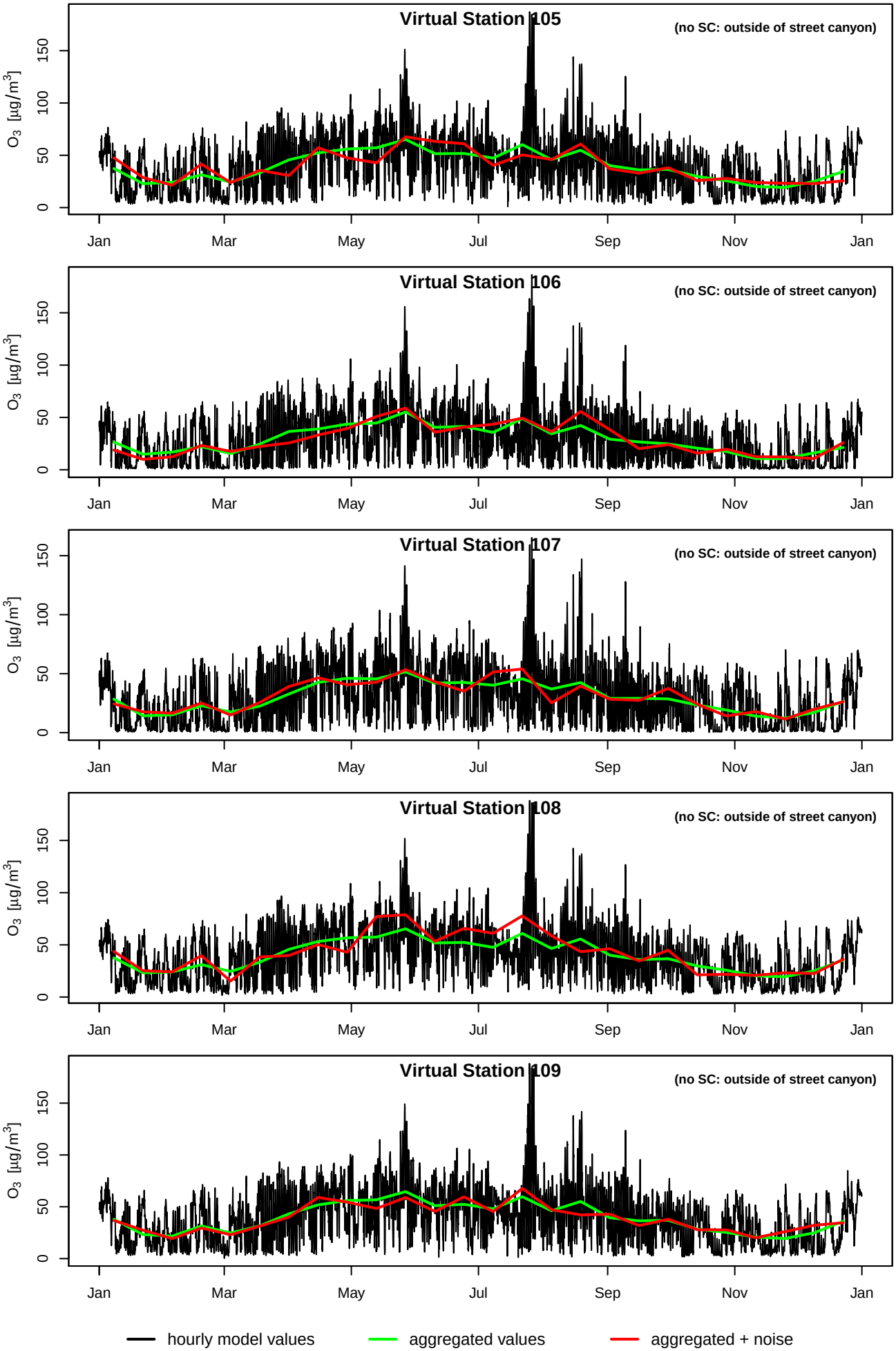

Virtual Station 80
(no SC: outside of street canyon)
Virtual Station 81
(no SC: outside of street canyon)
Virtual Station 82
(no SC: outside of street canyon)
Virtual Station 83
(no SC: outside of street canyon)
Virtual Station 84
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

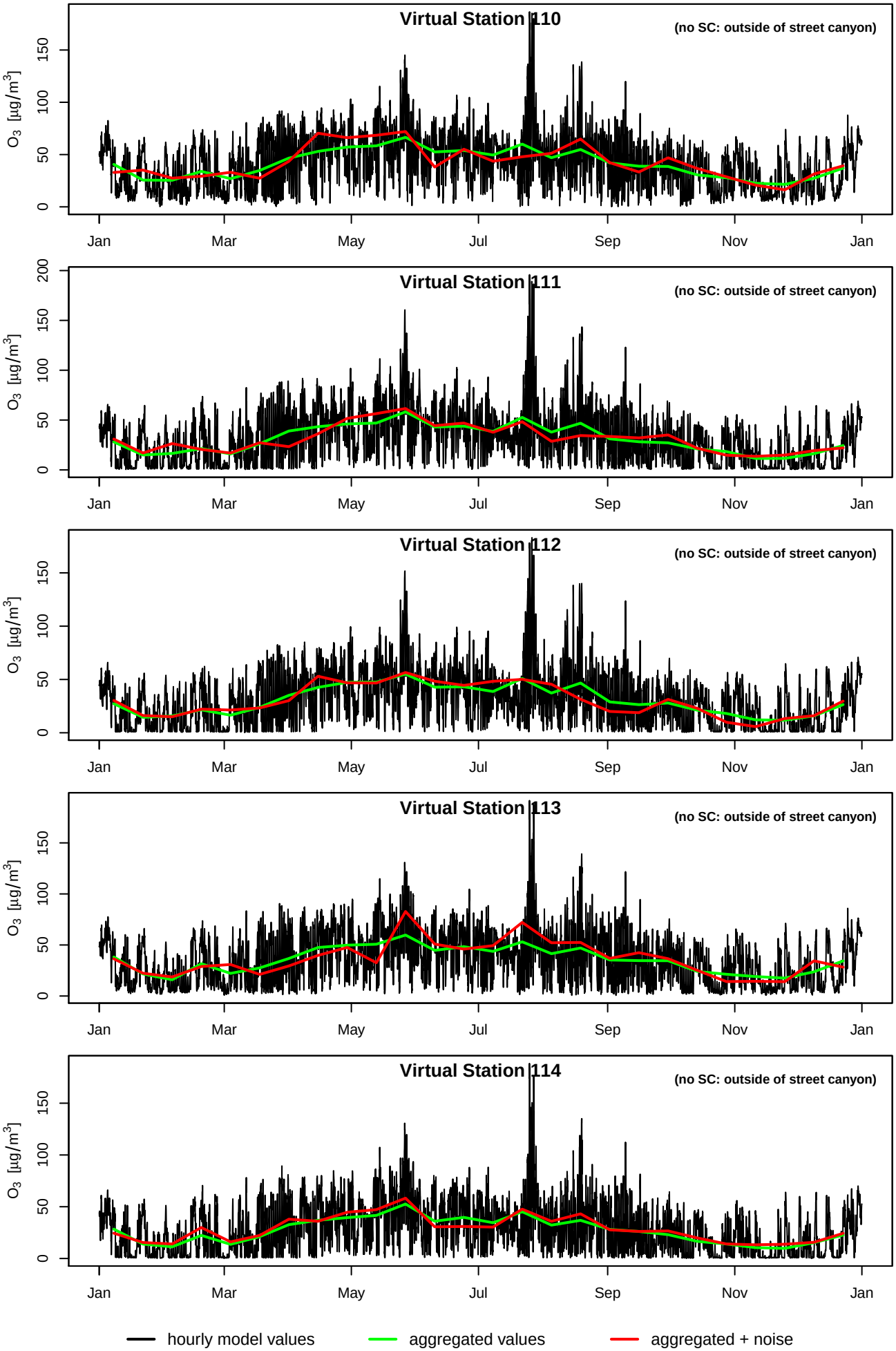

Virtual Station 85
(no SC: outside of street canyon)
Virtual Station 86
(no SC: outside of street canyon)
Virtual Station 87
(no SC: outside of street canyon)
Virtual Station 88
(no SC: outside of street canyon)
Virtual Station 89
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

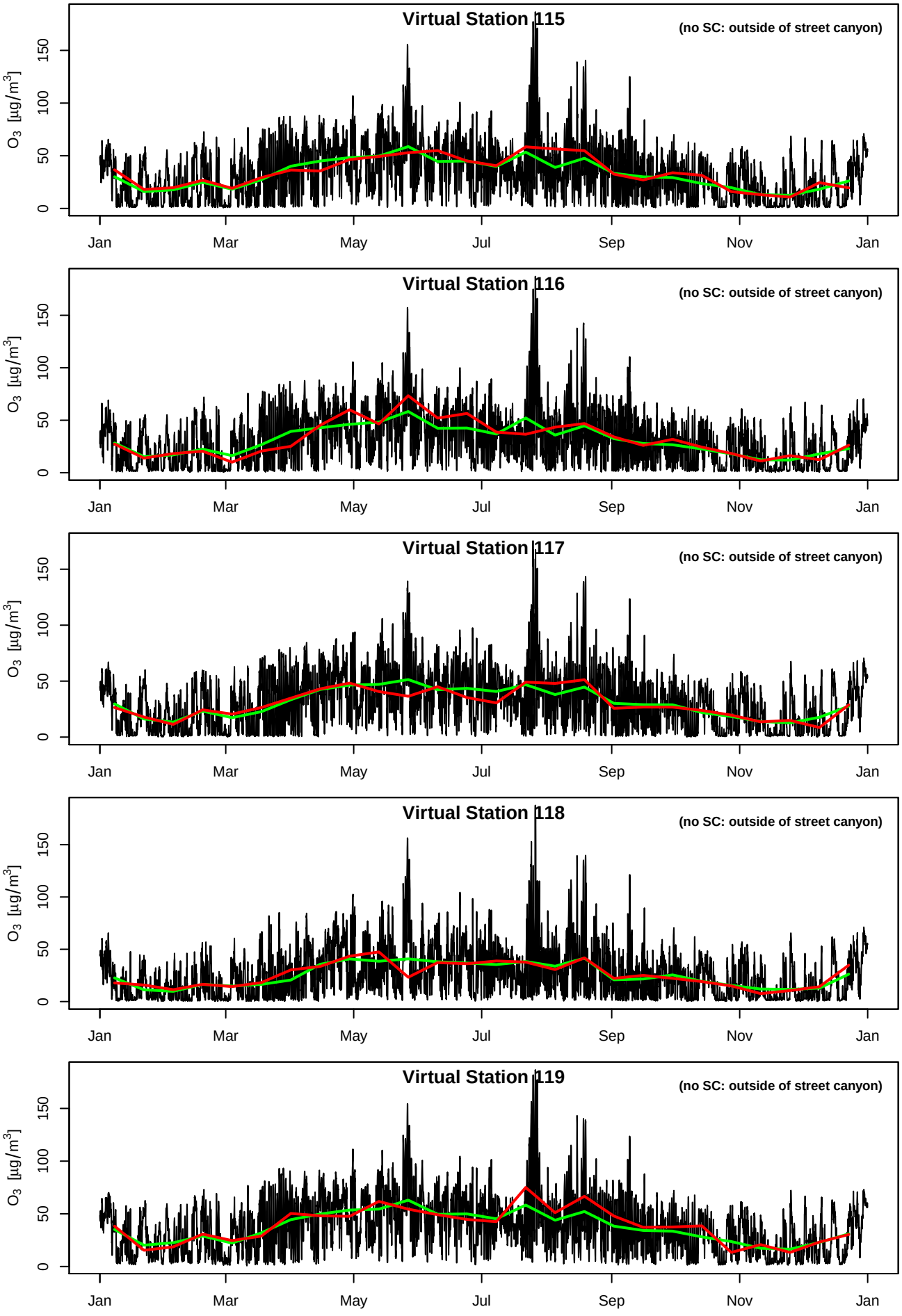

Virtual Station 90
(no SC: outside of street canyon)
Virtual Station 91
(no SC: outside of street canyon)
Virtual Station 92
(no SC: outside of street canyon)
Virtual Station 93
(no SC: outside of street canyon)
Virtual Station 94
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

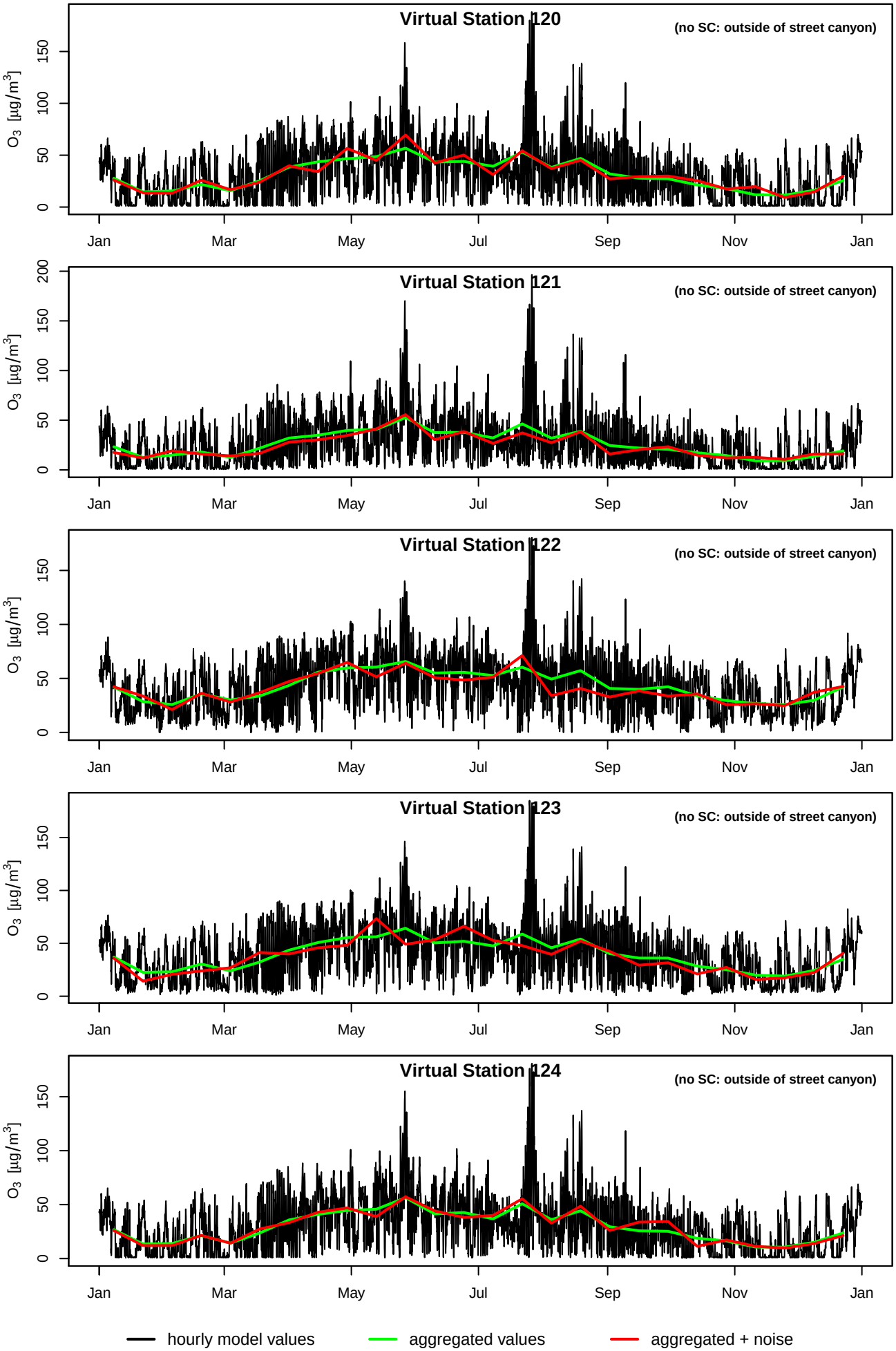

Virtual Station 95
(no SC: outside of street canyon)
Virtual Station 96
(no SC: outside of street canyon)
Virtual Station 97
(no SC: outside of street canyon)
Virtual Station 98
(no SC: outside of street canyon)
Virtual Station 99
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

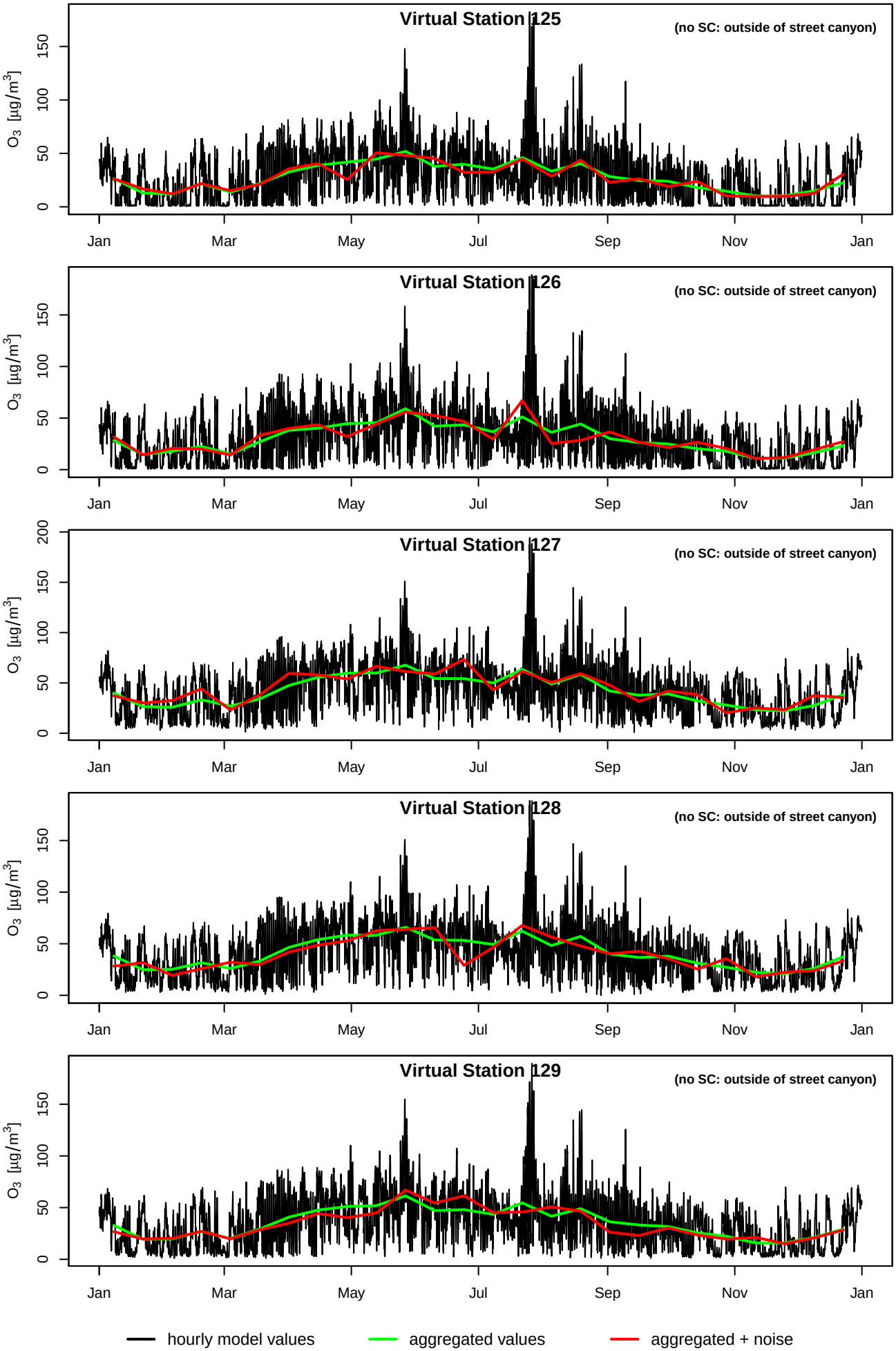

Virtual Station 100
(no SC: outside of street canyon)
Virtual Station 101
(no SC: outside of street canyon)
Virtual Station 102
(no SC: outside of street canyon)
Virtual Station 103
(no SC: outside of street canyon)
Virtual Station 104
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

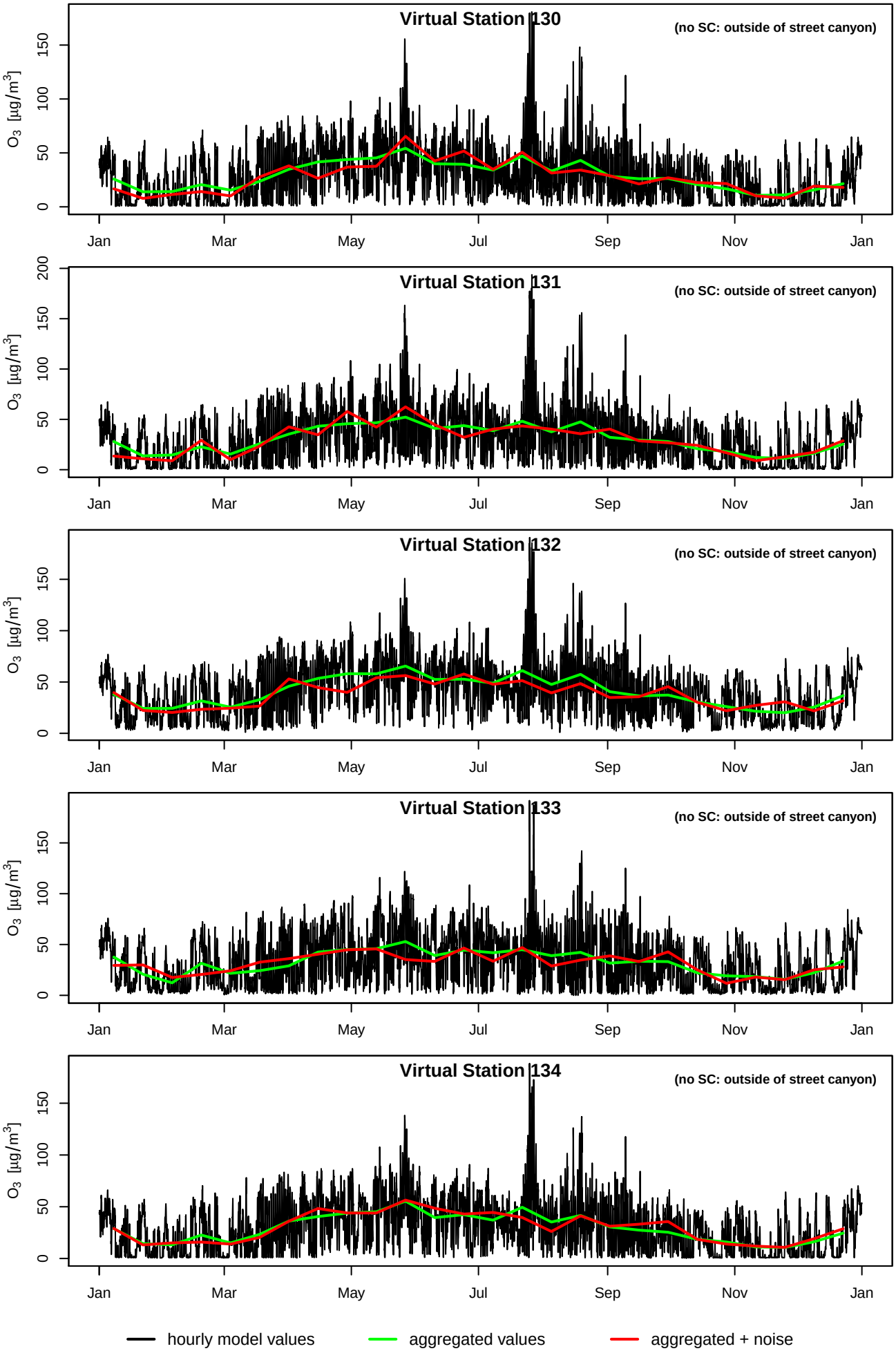

Virtual Station 105
(no SC: outside of street canyon)
Virtual Station 106
(no SC: outside of street canyon)
Virtual Station 107
(no SC: outside of street canyon)
Virtual Station 108
(no SC: outside of street canyon)
Virtual Station 109
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

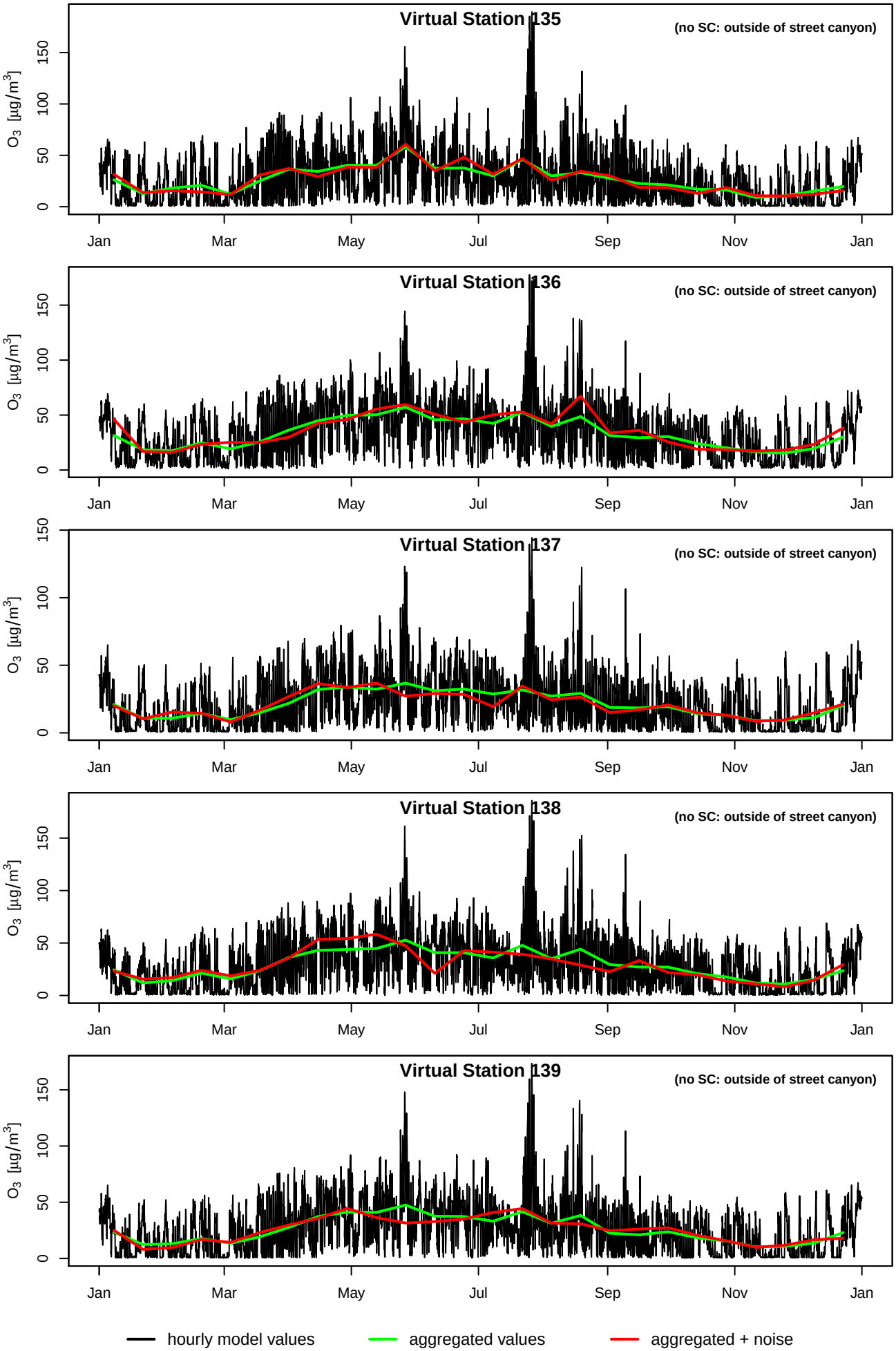

Virtual Station 110
(no SC: outside of street canyon)
Virtual Station 111
(no SC: outside of street canyon)
Virtual Station 112
(no SC: outside of street canyon)
Virtual Station 113
(no SC: outside of street canyon)
Virtual Station 114
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

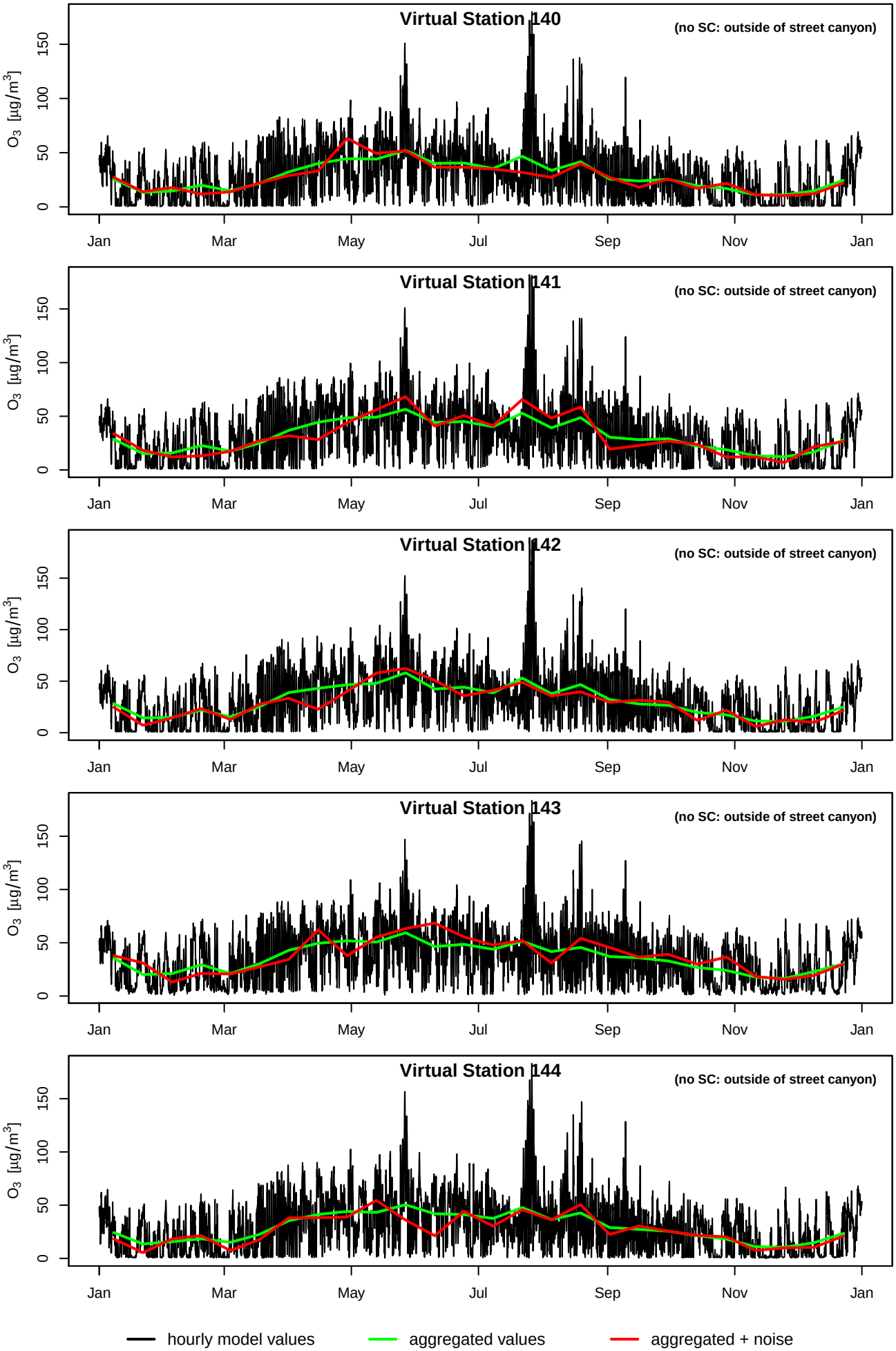

Virtual Station 115
(no SC: outside of street canyon)
Virtual Station 116
(no SC: outside of street canyon)
Virtual Station 117
(no SC: outside of street canyon)
Virtual Station 118
(no SC: outside of street canyon)
Virtual Station 119
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

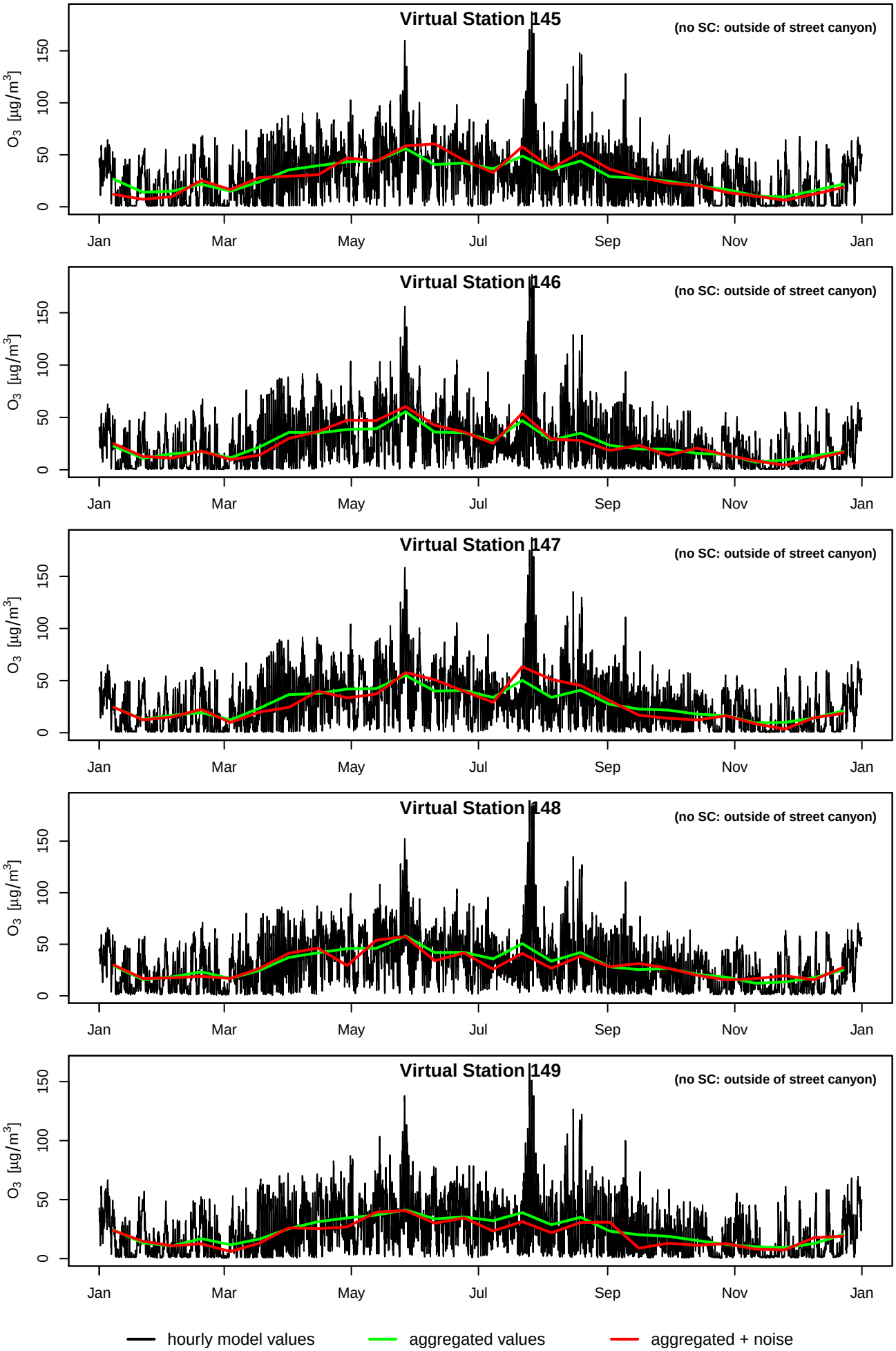

Virtual Station 120
(no SC: outside of street canyon)
Virtual Station 121
(no SC: outside of street canyon)
Virtual Station 122
(no SC: outside of street canyon)
Virtual Station 123
(no SC: outside of street canyon)
Virtual Station 124
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

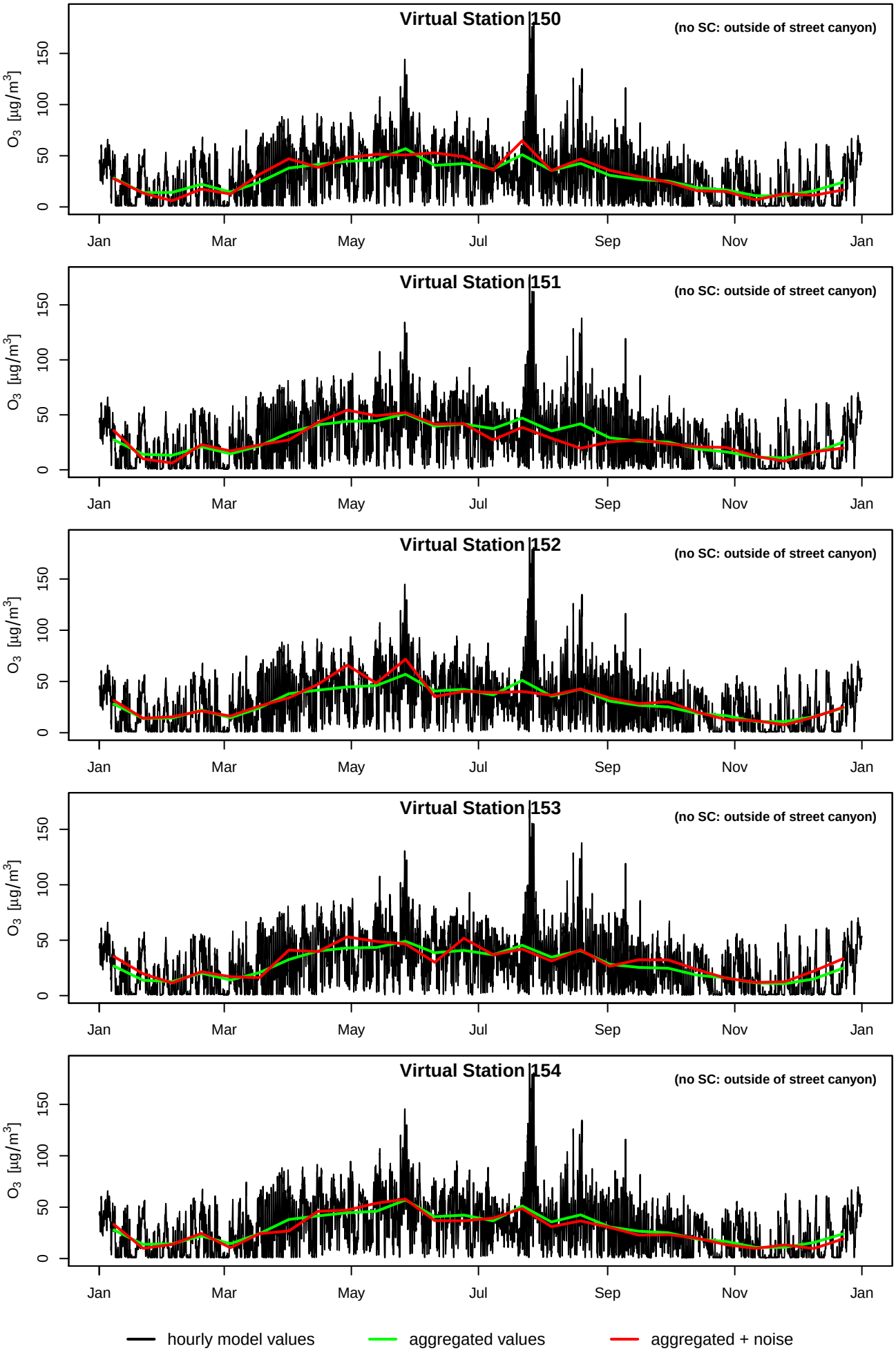

Virtual Station 125
(no SC: outside of street canyon)
Virtual Station 126
(no SC: outside of street canyon)
Virtual Station 127
(no SC: outside of street canyon)
Virtual Station 128
(no SC: outside of street canyon)
Virtual Station 129
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

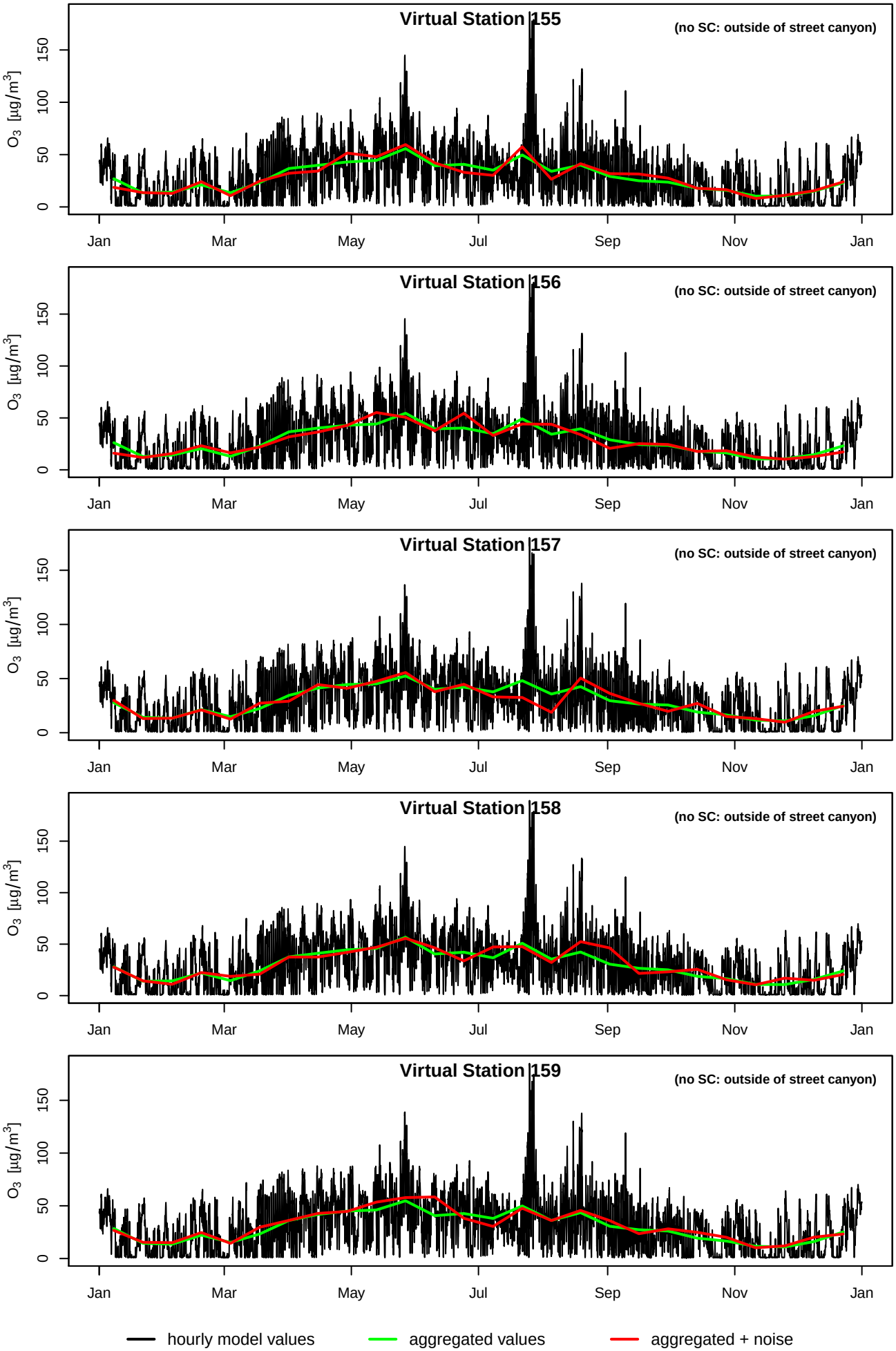

Virtual Station 130
(no SC: outside of street canyon)
Virtual Station 131
(no SC: outside of street canyon)
Virtual Station 132
(no SC: outside of street canyon)
Virtual Station 133
(no SC: outside of street canyon)
Virtual Station 134
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

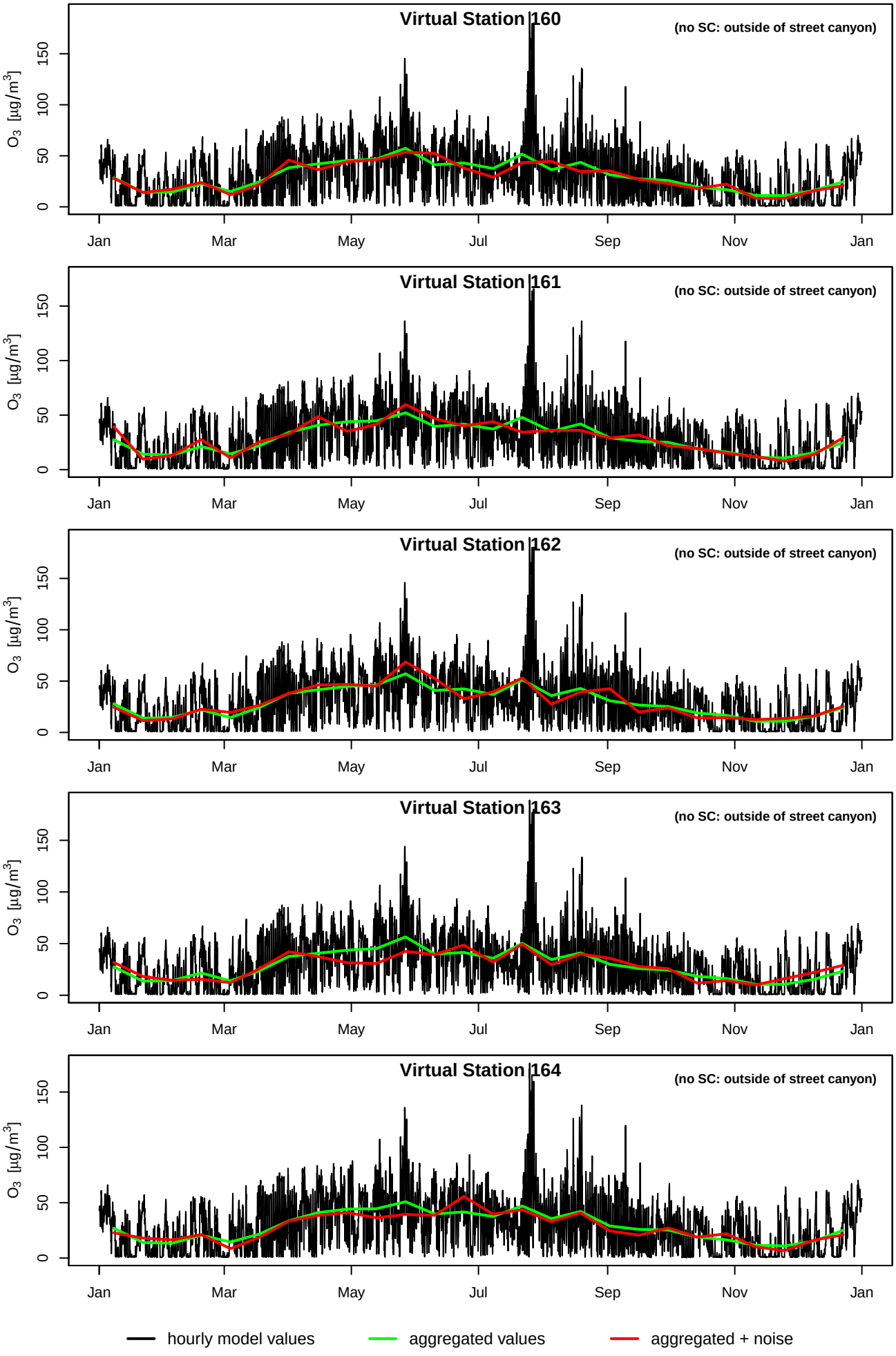

Virtual Station 135
(no SC: outside of street canyon)
Virtual Station 136
(no SC: outside of street canyon)
Virtual Station 137
(no SC: outside of street canyon)
Virtual Station 138
(no SC: outside of street canyon)
Virtual Station 139
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

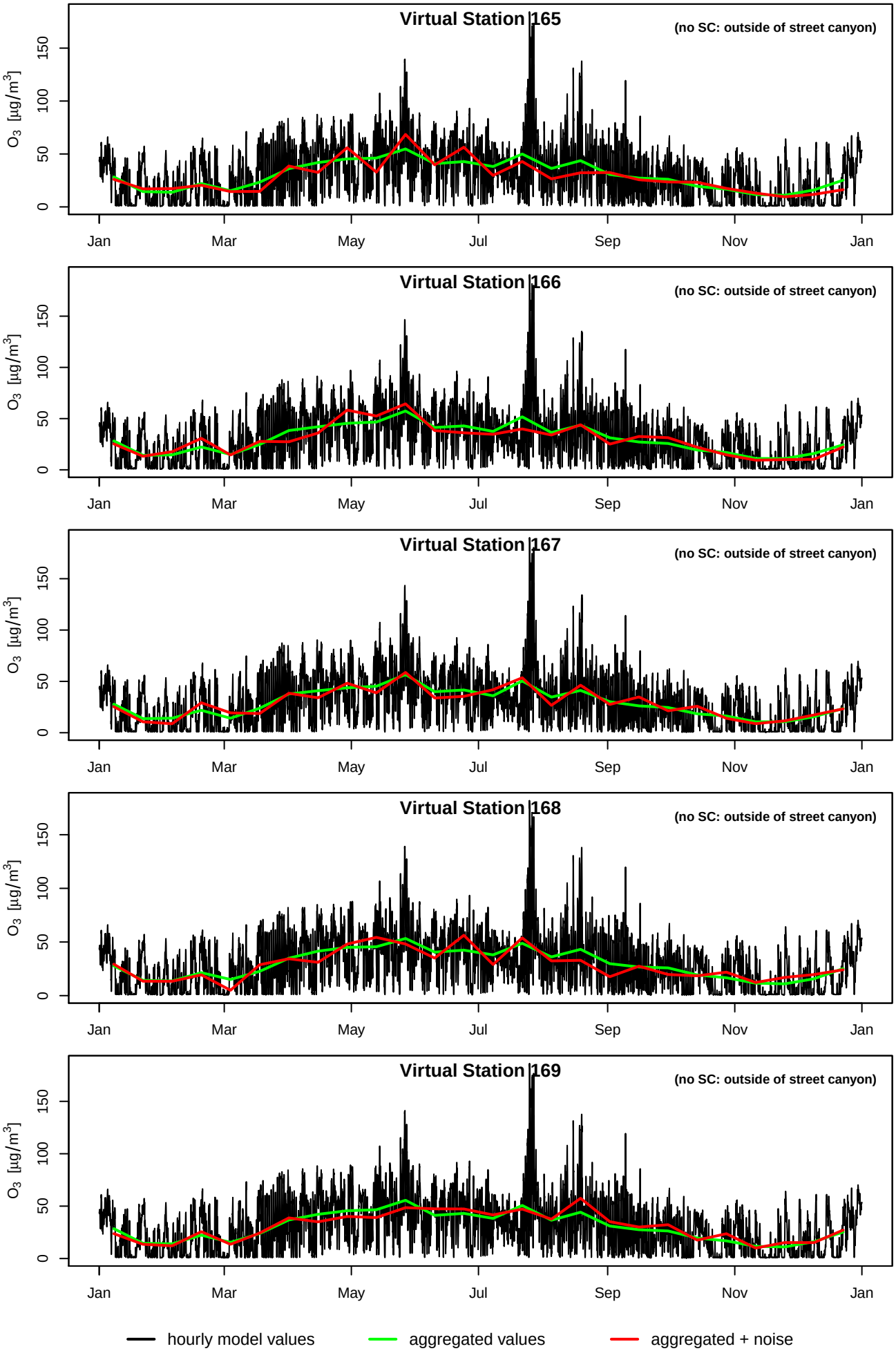

Virtual Station 140
(no SC: outside of street canyon)
Virtual Station 141
(no SC: outside of street canyon)
Virtual Station 142
(no SC: outside of street canyon)
Virtual Station 143
(no SC: outside of street canyon)
Virtual Station 144
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

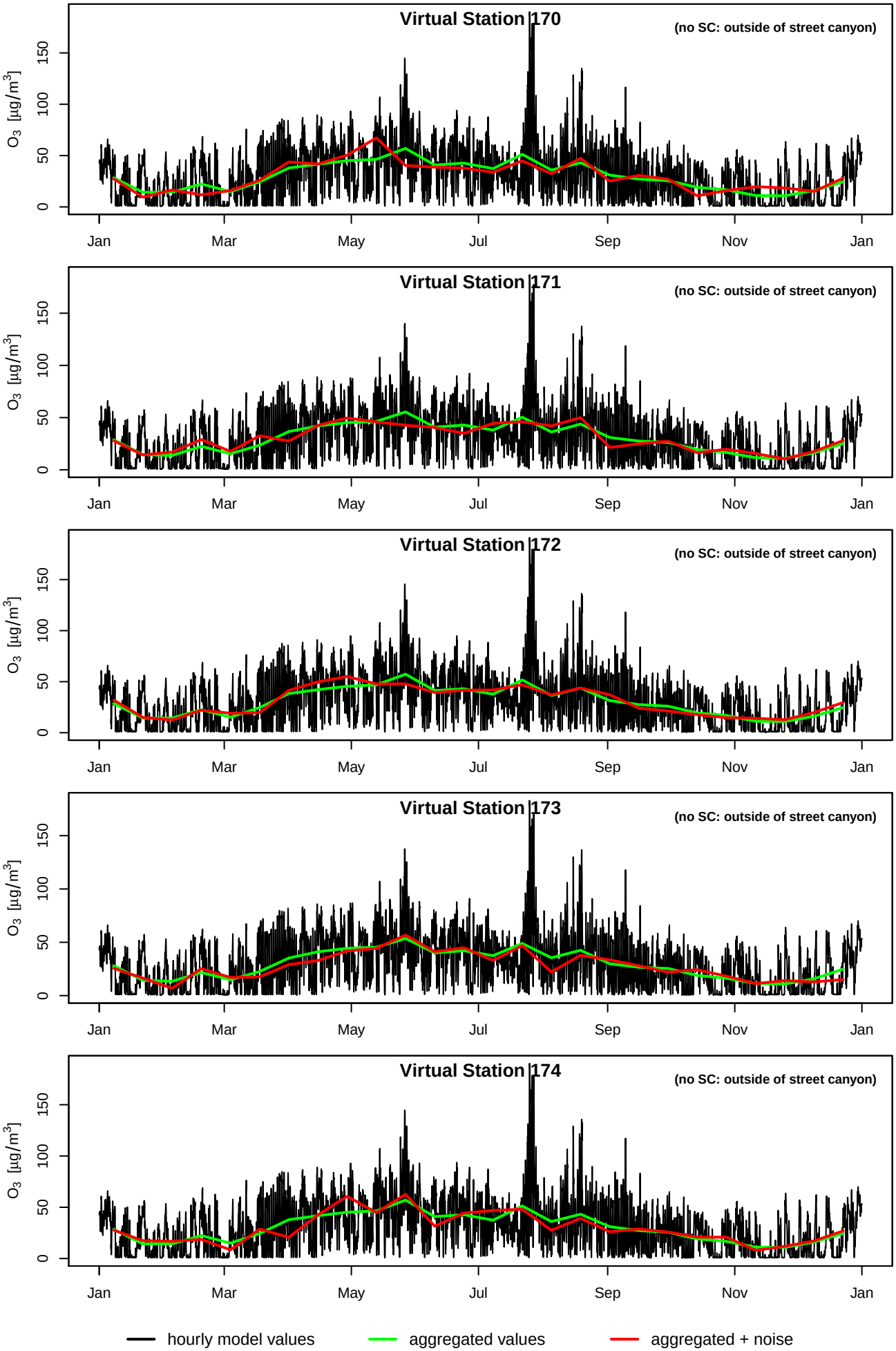

Virtual Station 145
(no SC: outside of street canyon)
Virtual Station 146
(no SC: outside of street canyon)
Virtual Station 147
(no SC: outside of street canyon)
Virtual Station 148
(no SC: outside of street canyon)
Virtual Station 149
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

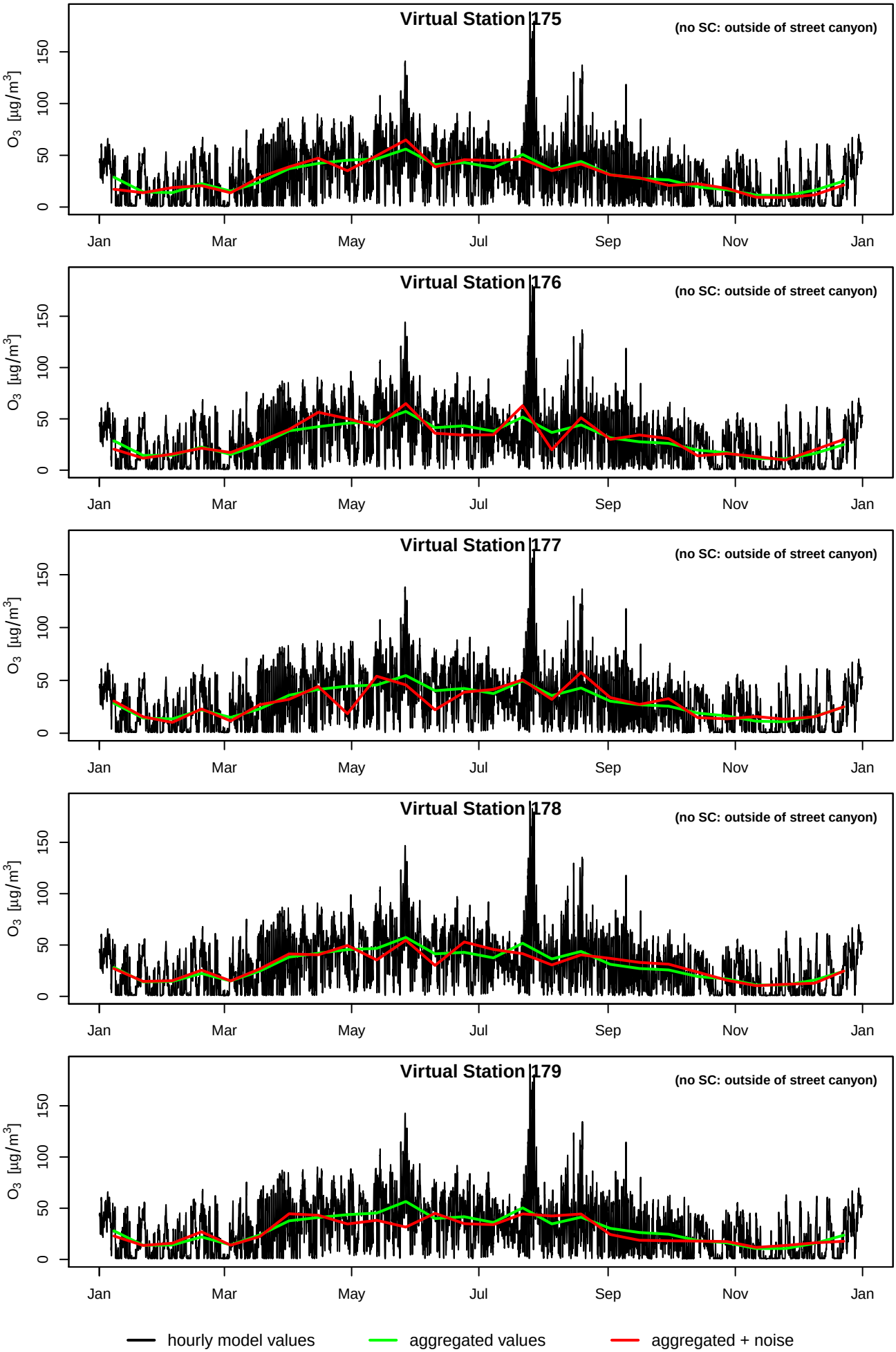

Virtual Station 150
(no SC: outside of street canyon)
Virtual Station 151
(no SC: outside of street canyon)
Virtual Station 152
(no SC: outside of street canyon)
Virtual Station 153
(no SC: outside of street canyon)
Virtual Station 154
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

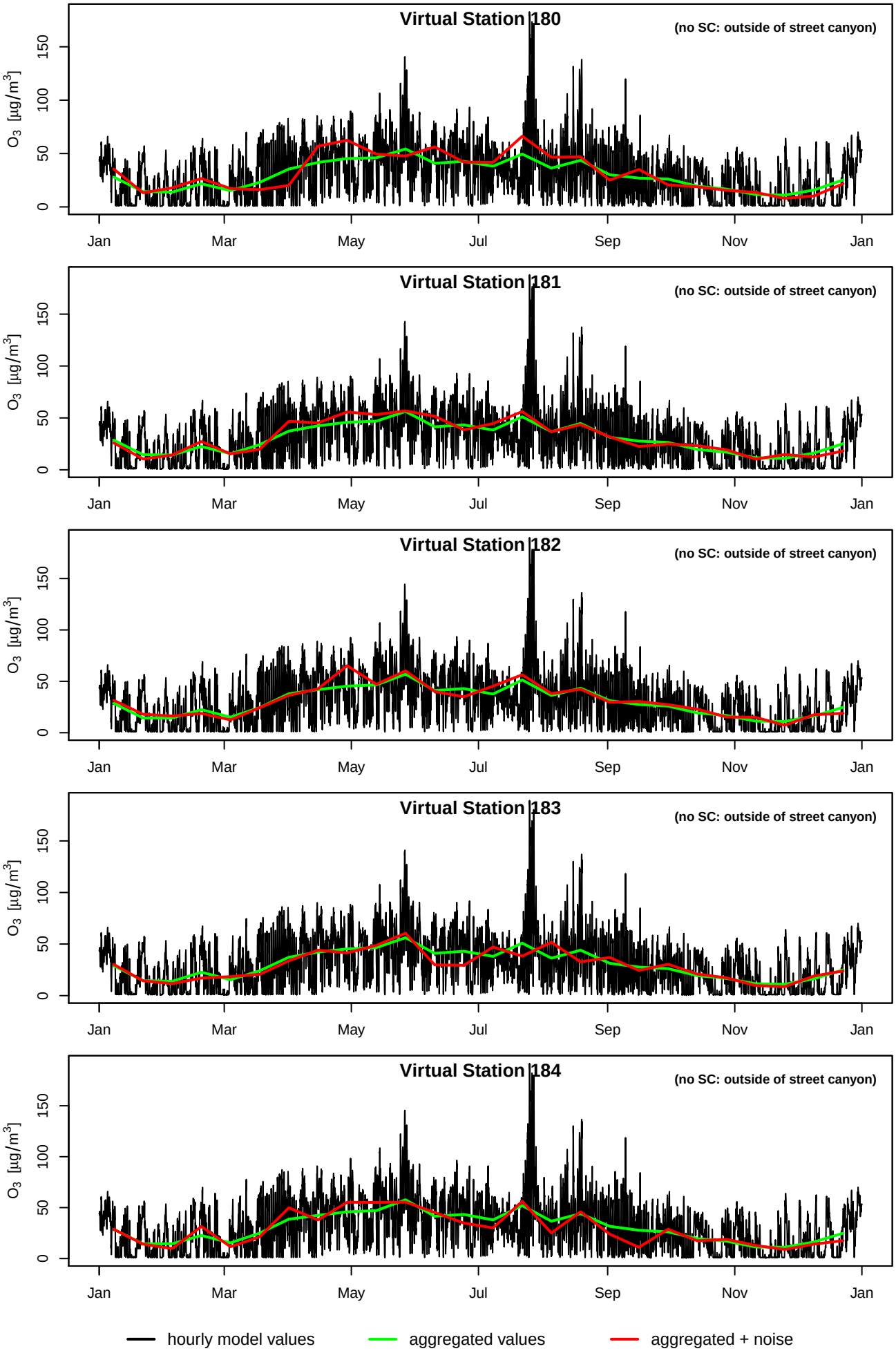

Virtual Station 155
(no SC: outside of street canyon)
Virtual Station 156
(no SC: outside of street canyon)
Virtual Station 157
(no SC: outside of street canyon)
Virtual Station 158
(no SC: outside of street canyon)
Virtual Station 159
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

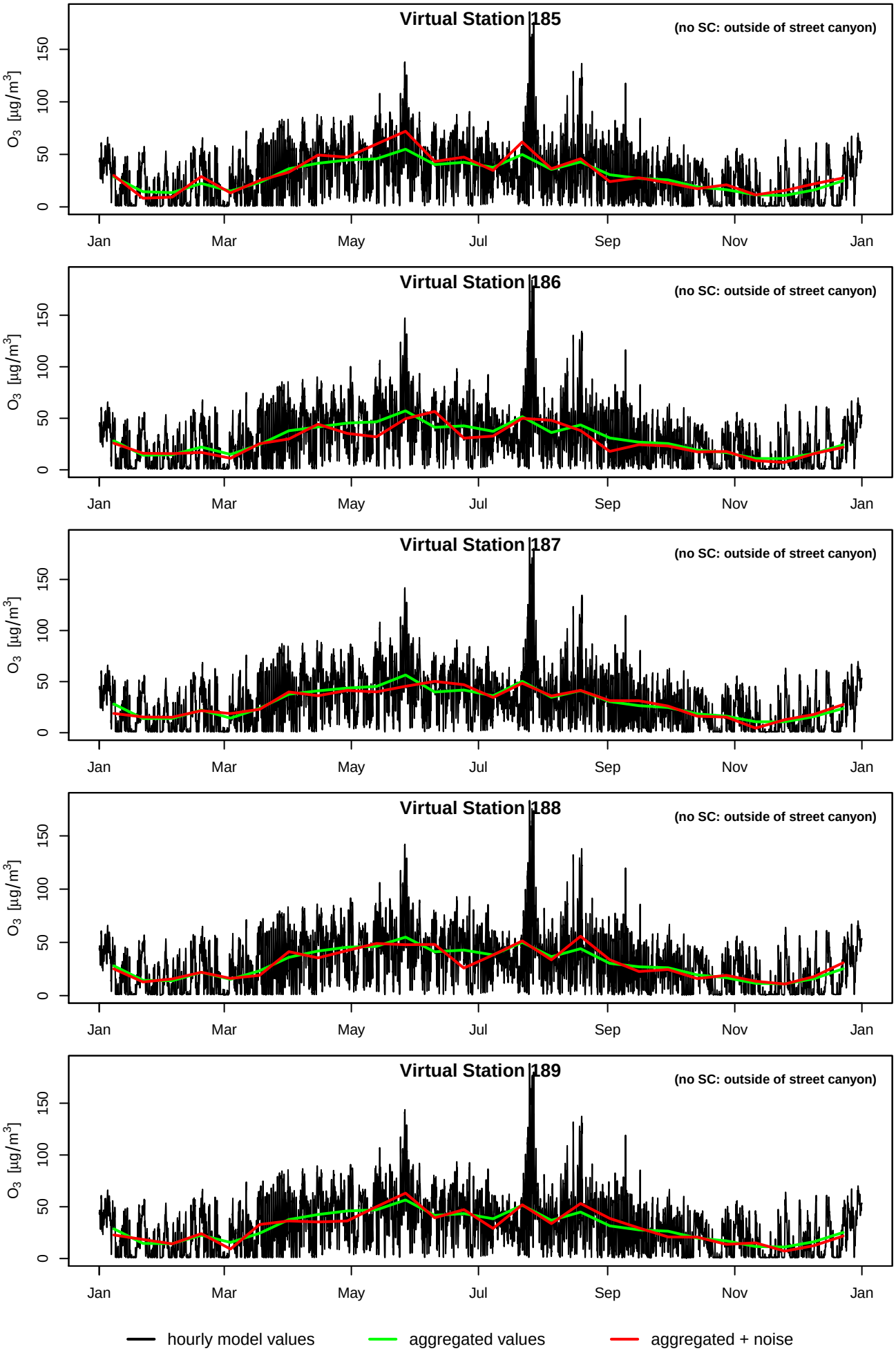

Virtual Station 160
(no SC: outside of street canyon)
Virtual Station 161
(no SC: outside of street canyon)
Virtual Station 162
(no SC: outside of street canyon)
Virtual Station 163
(no SC: outside of street canyon)
Virtual Station 164
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

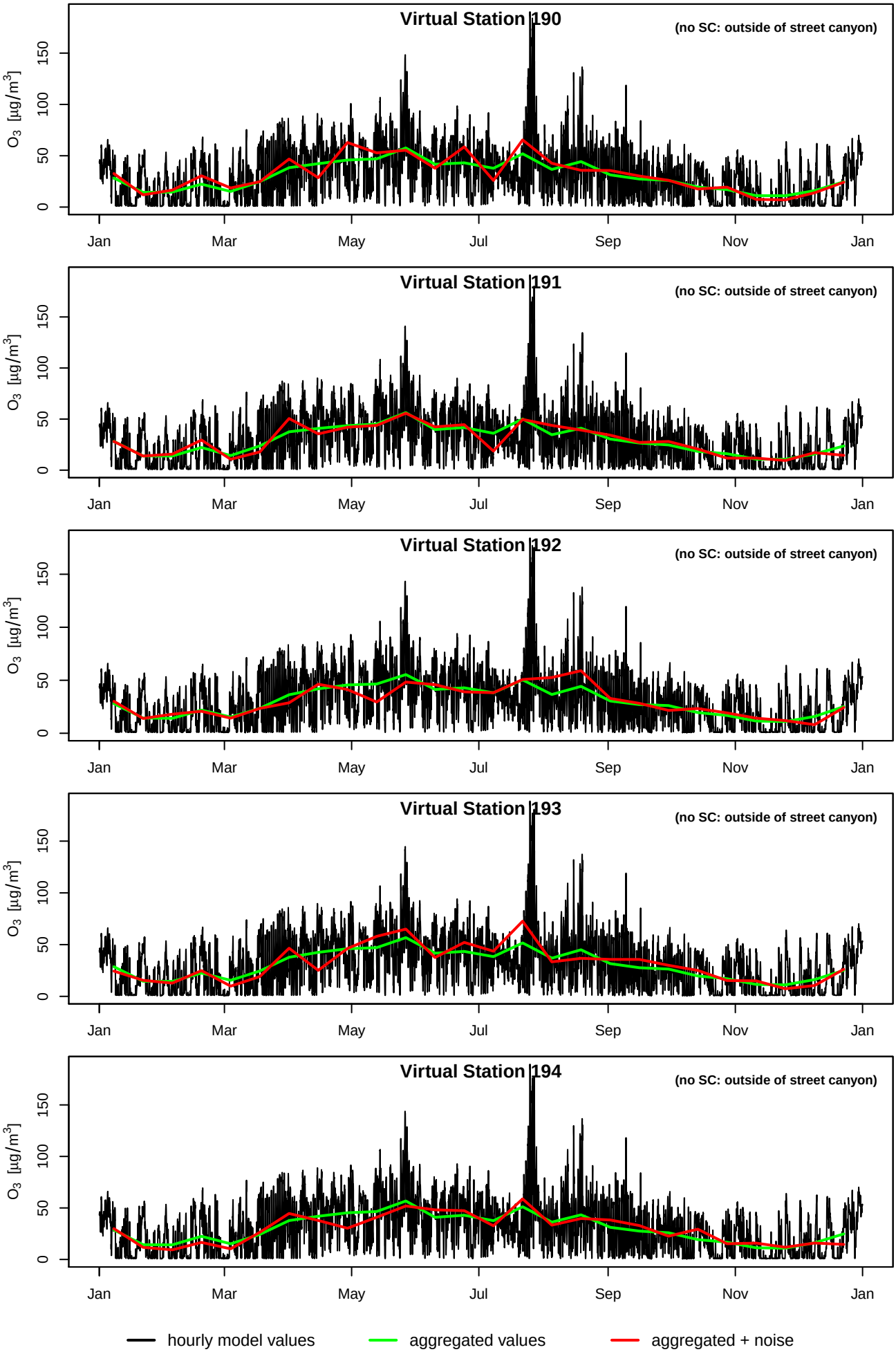

Virtual Station 165
(no SC: outside of street canyon)
Virtual Station 166
(no SC: outside of street canyon)
Virtual Station 167
(no SC: outside of street canyon)
Virtual Station 168
(no SC: outside of street canyon)
Virtual Station 169
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

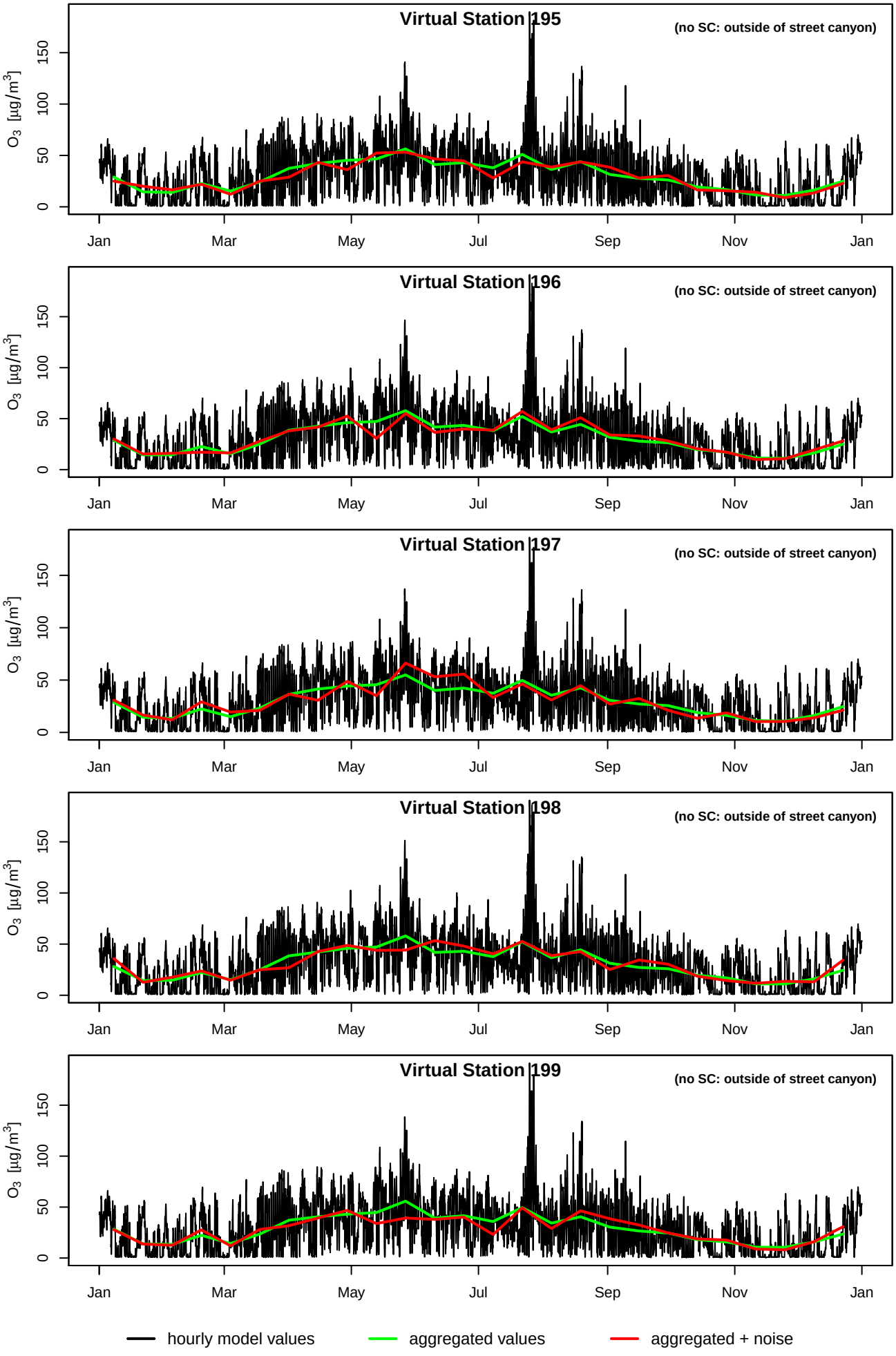

Virtual Station 170
(no SC: outside of street canyon)
Virtual Station 171
(no SC: outside of street canyon)
Virtual Station 172
(no SC: outside of street canyon)
Virtual Station 173
(no SC: outside of street canyon)
Virtual Station 174
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

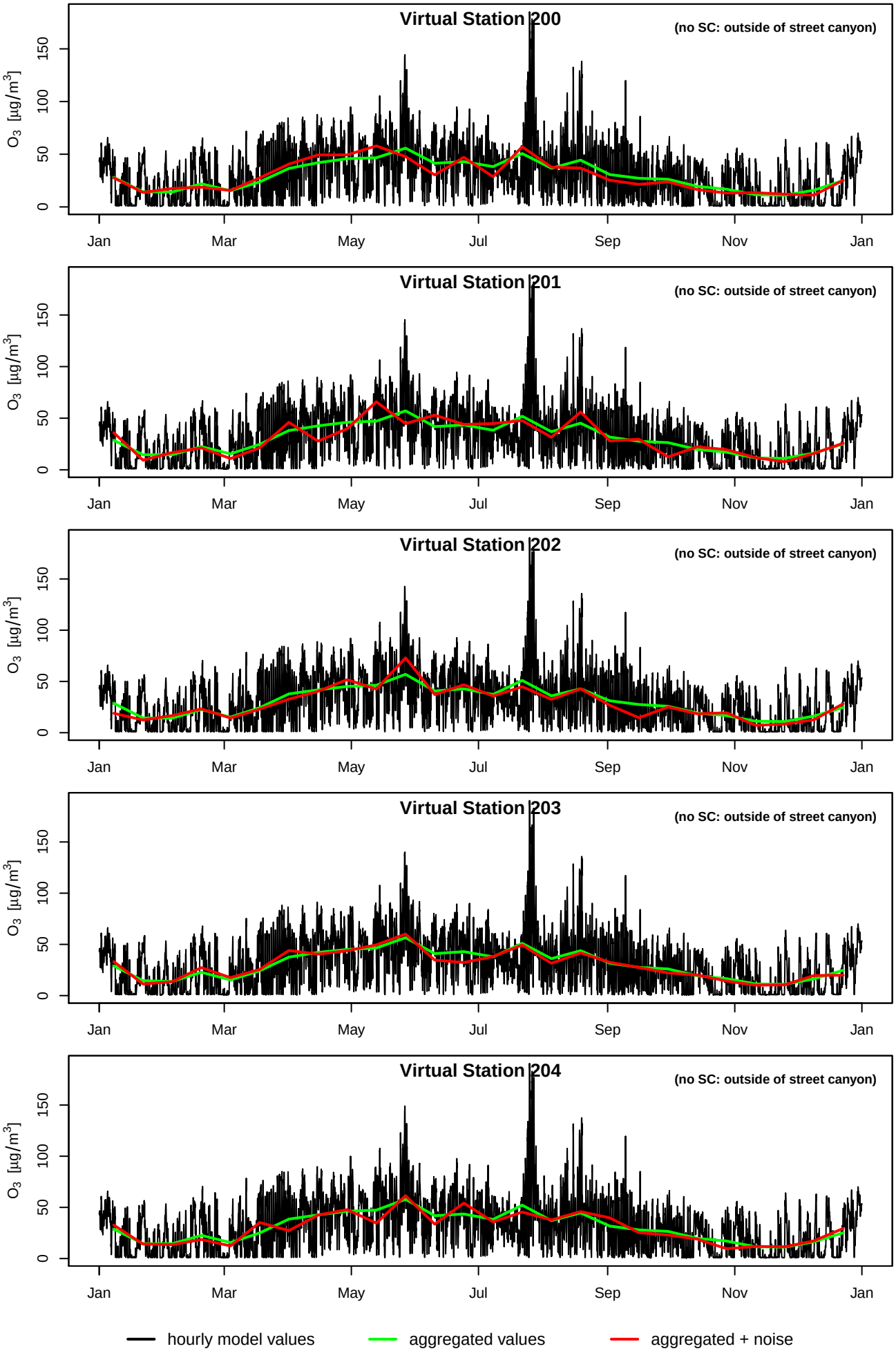

Virtual Station 175
(no SC: outside of street canyon)
Virtual Station 176
(no SC: outside of street canyon)
Virtual Station 177
(no SC: outside of street canyon)
Virtual Station 178
(no SC: outside of street canyon)
Virtual Station 179
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

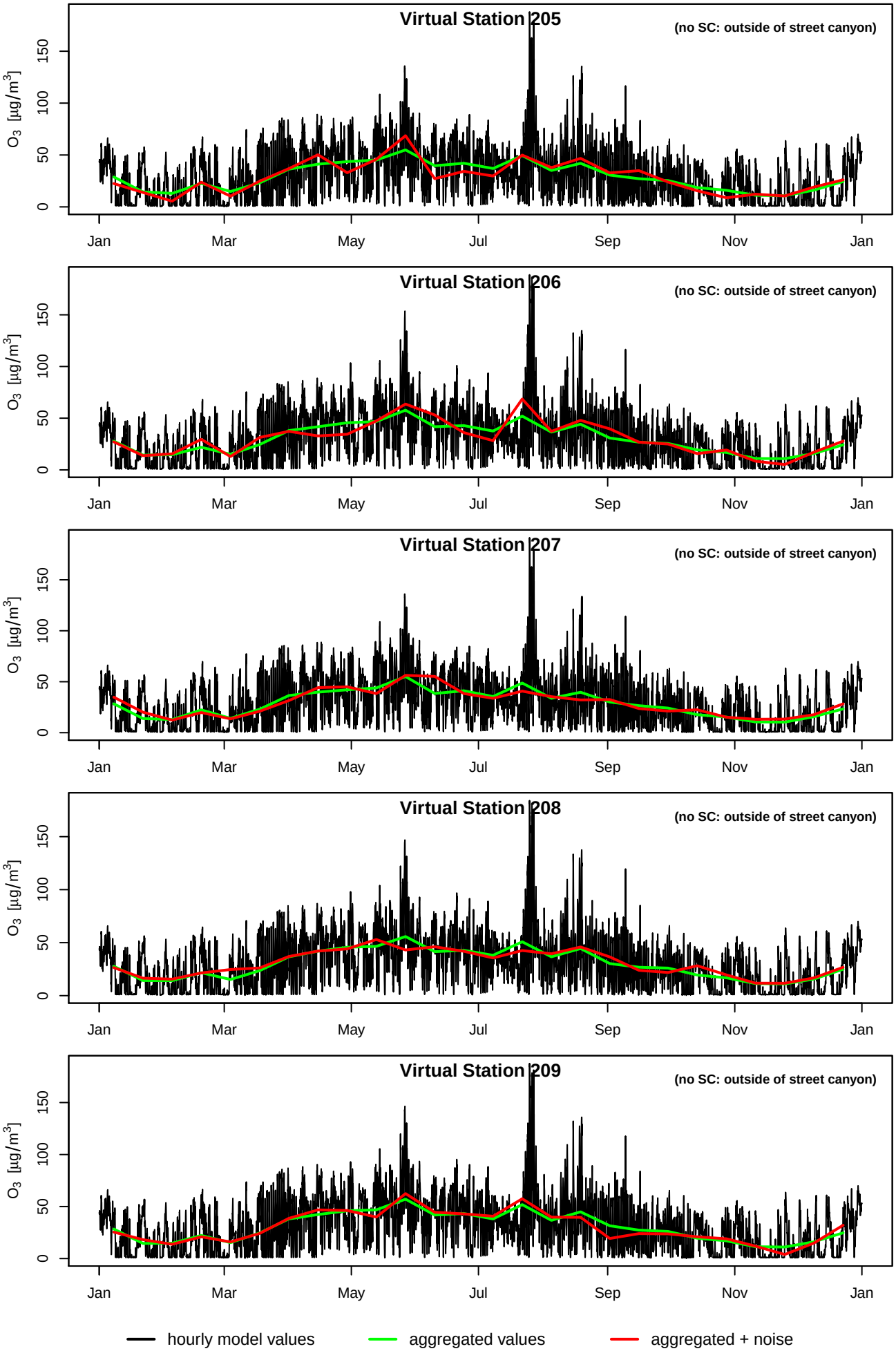

Virtual Station 180
(no SC: outside of street canyon)
Virtual Station 181
(no SC: outside of street canyon)
Virtual Station 182
(no SC: outside of street canyon)
Virtual Station 183
(no SC: outside of street canyon)
Virtual Station 184
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

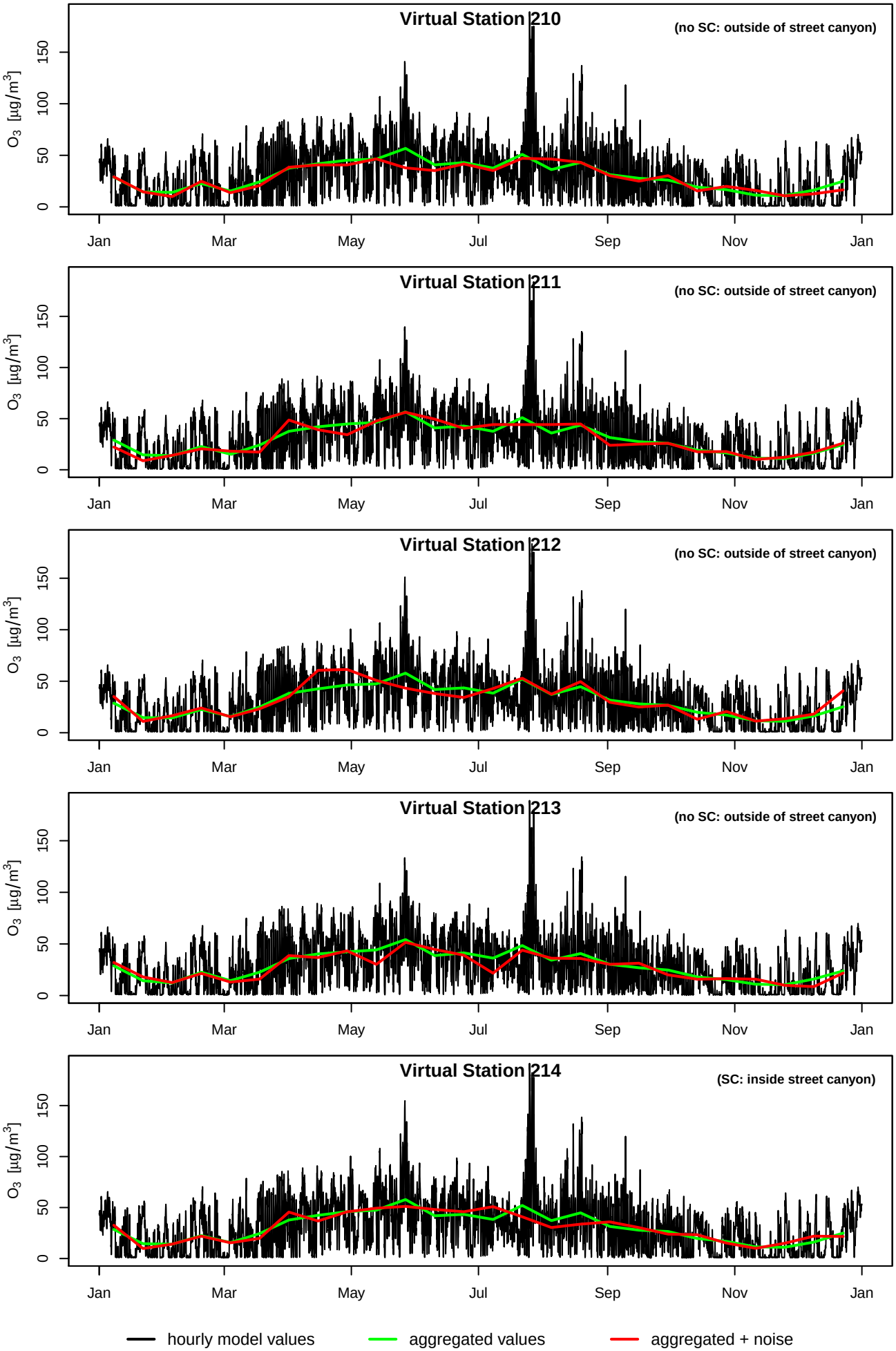

Virtual Station 185
(no SC: outside of street canyon)
Virtual Station 186
(no SC: outside of street canyon)
Virtual Station 187
(no SC: outside of street canyon)
Virtual Station 188
(no SC: outside of street canyon)
Virtual Station 189
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

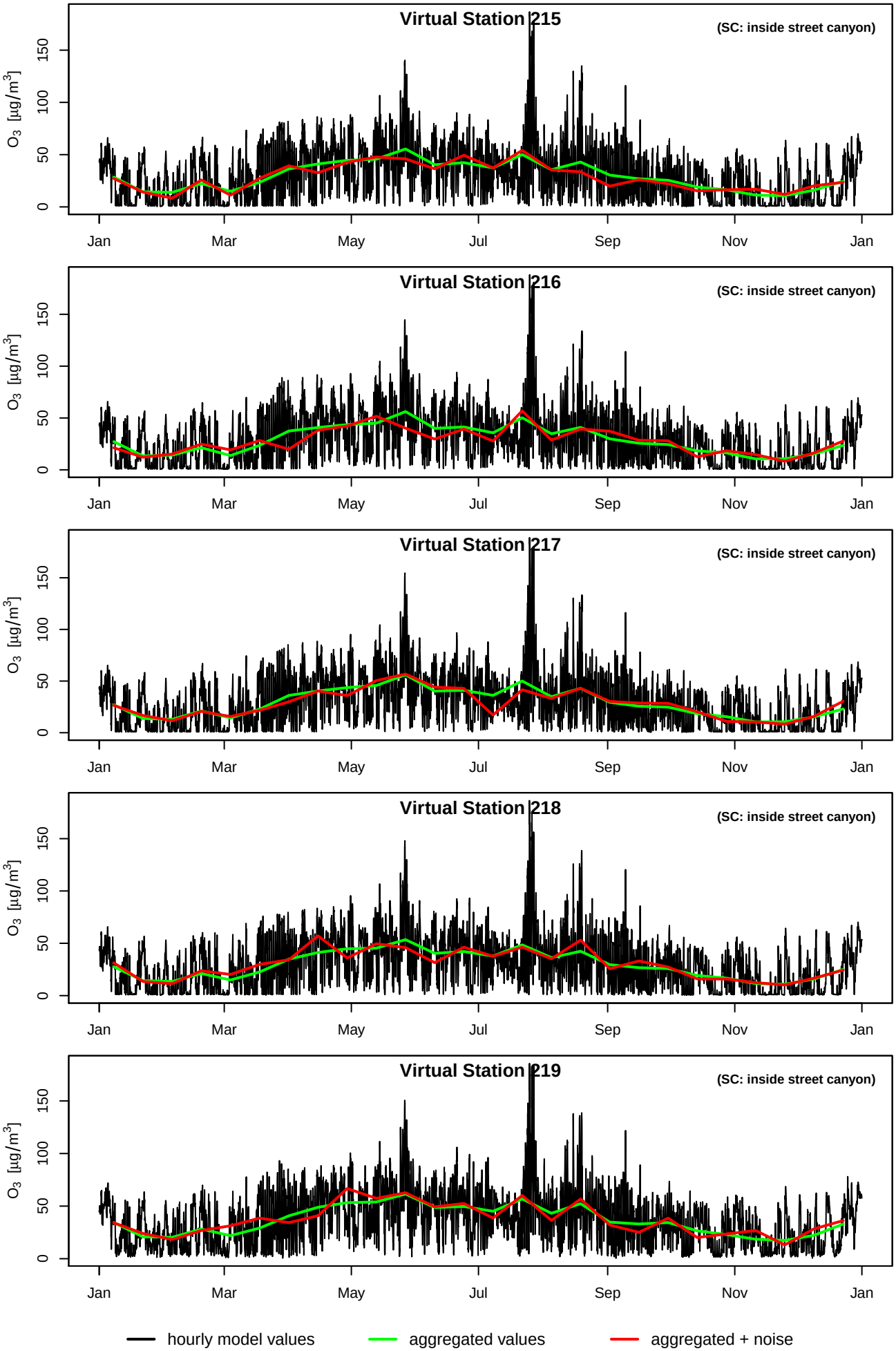

Virtual Station 190
(no SC: outside of street canyon)
Virtual Station 191
(no SC: outside of street canyon)
Virtual Station 192
(no SC: outside of street canyon)
Virtual Station 193
(no SC: outside of street canyon)
Virtual Station 194
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

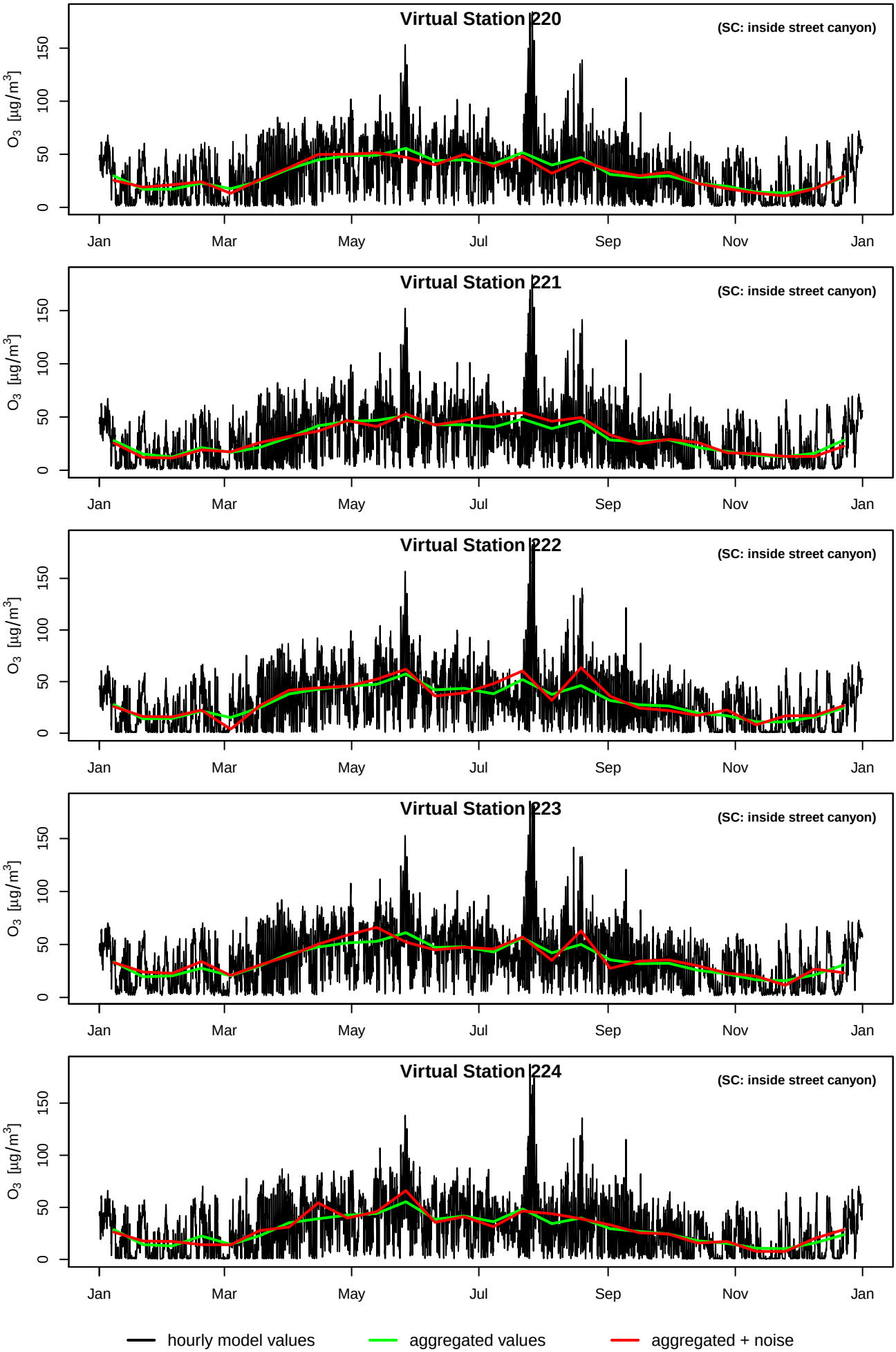

Virtual Station 195
(no SC: outside of street canyon)
Virtual Station 196
(no SC: outside of street canyon)
Virtual Station 197
(no SC: outside of street canyon)
Virtual Station 198
(no SC: outside of street canyon)
Virtual Station 199
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

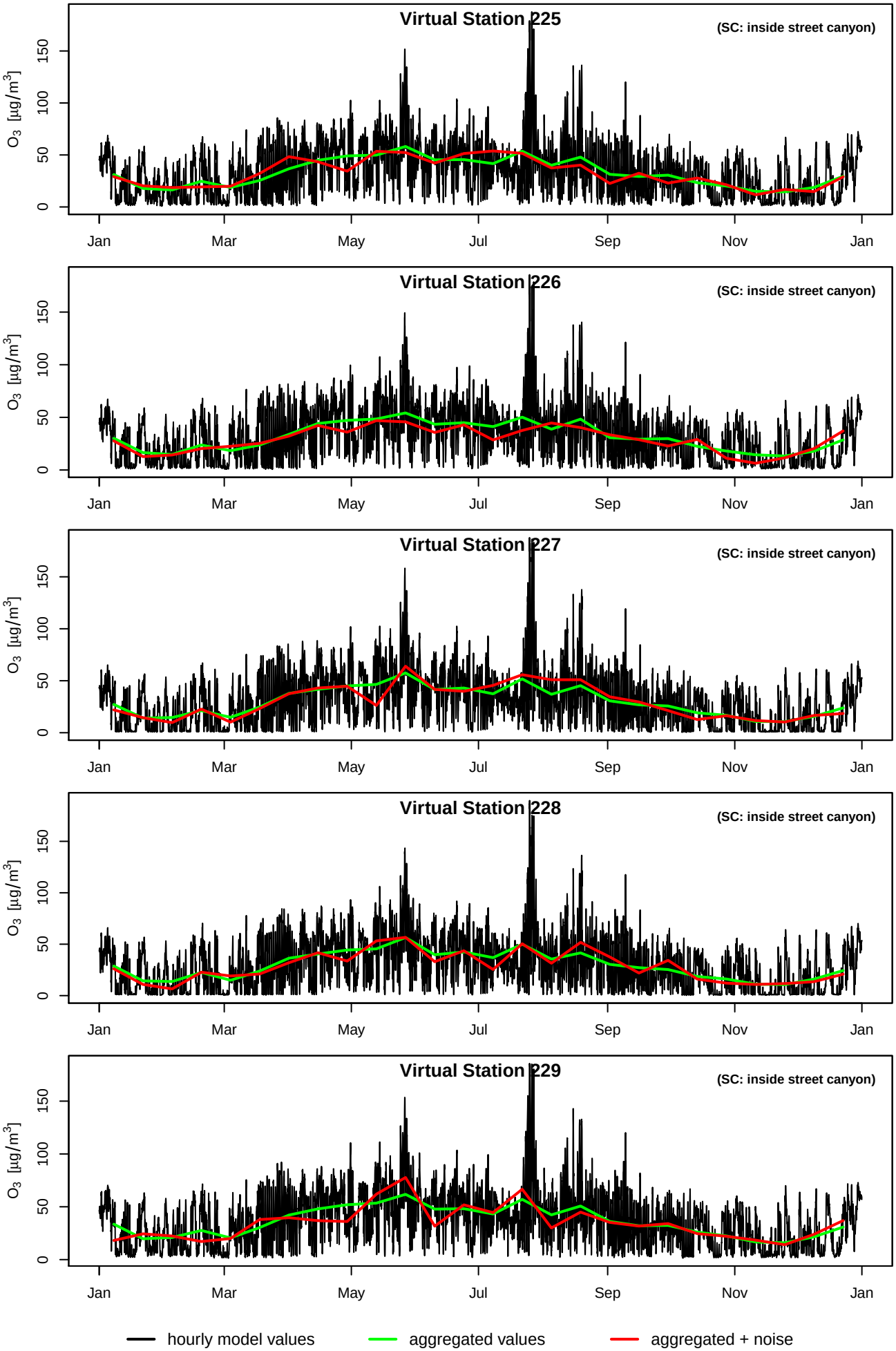

Virtual Station 200
(no SC: outside of street canyon)
Virtual Station 201
(no SC: outside of street canyon)
Virtual Station 202
(no SC: outside of street canyon)
Virtual Station 203
(no SC: outside of street canyon)
Virtual Station 204
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

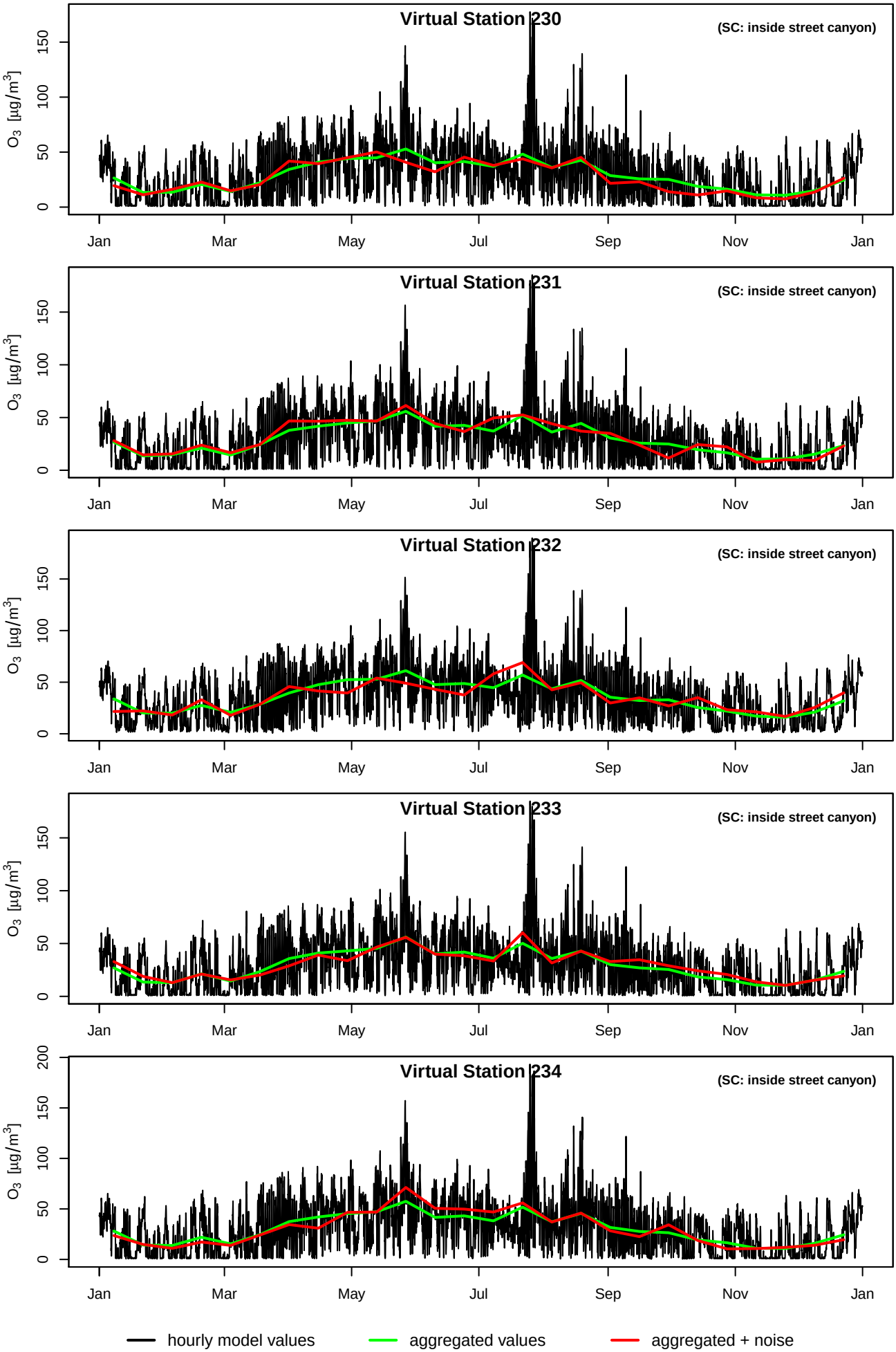

Virtual Station 205
(no SC: outside of street canyon)
Virtual Station 206
(no SC: outside of street canyon)
Virtual Station 207
(no SC: outside of street canyon)
Virtual Station 208
(no SC: outside of street canyon)
Virtual Station 209
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

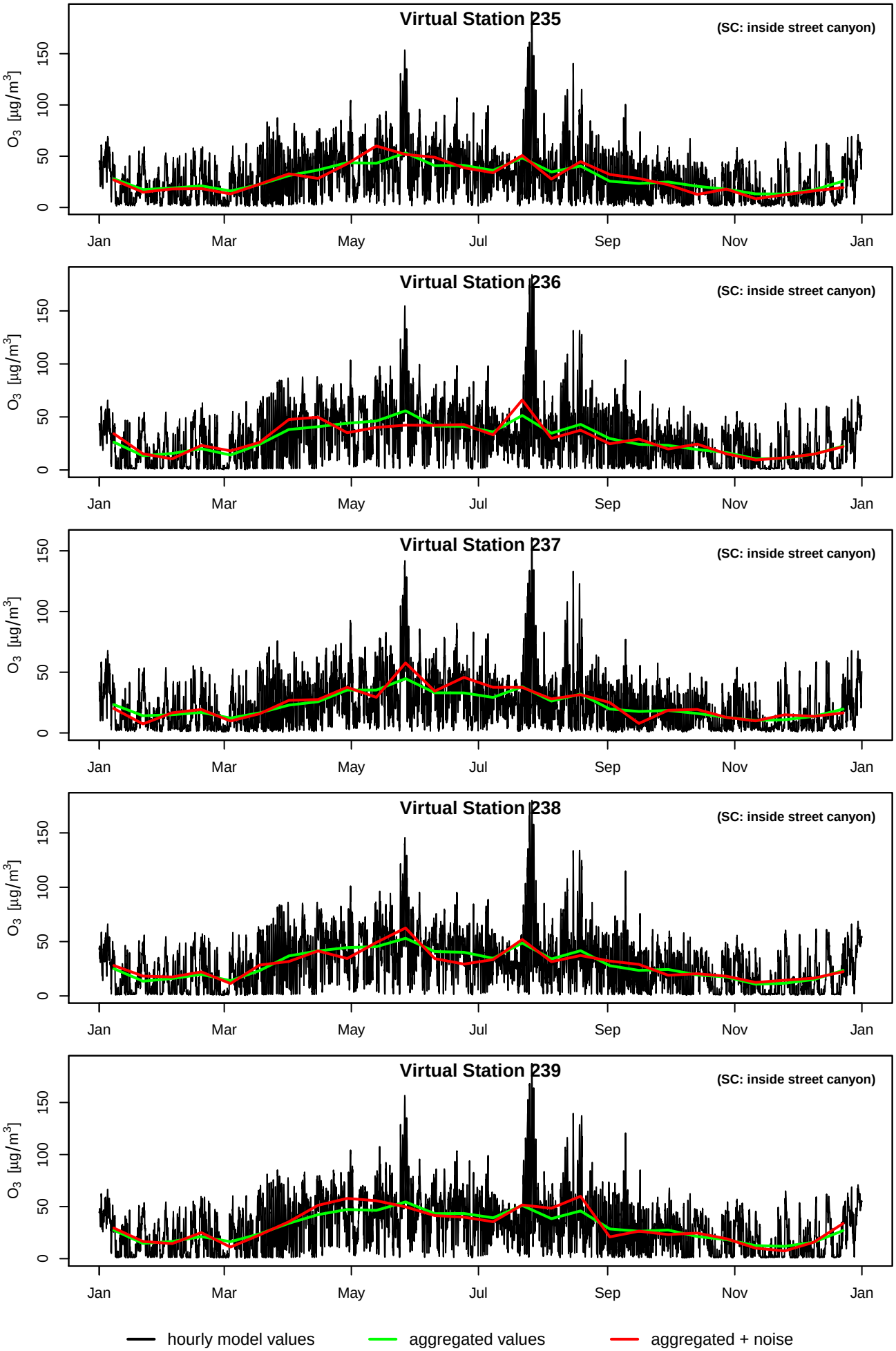

Virtual Station 210
(no SC: outside of street canyon)
Virtual Station 211
(no SC: outside of street canyon)
Virtual Station 212
(no SC: outside of street canyon)
Virtual Station 213
(no SC: outside of street canyon)
Virtual Station 214
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

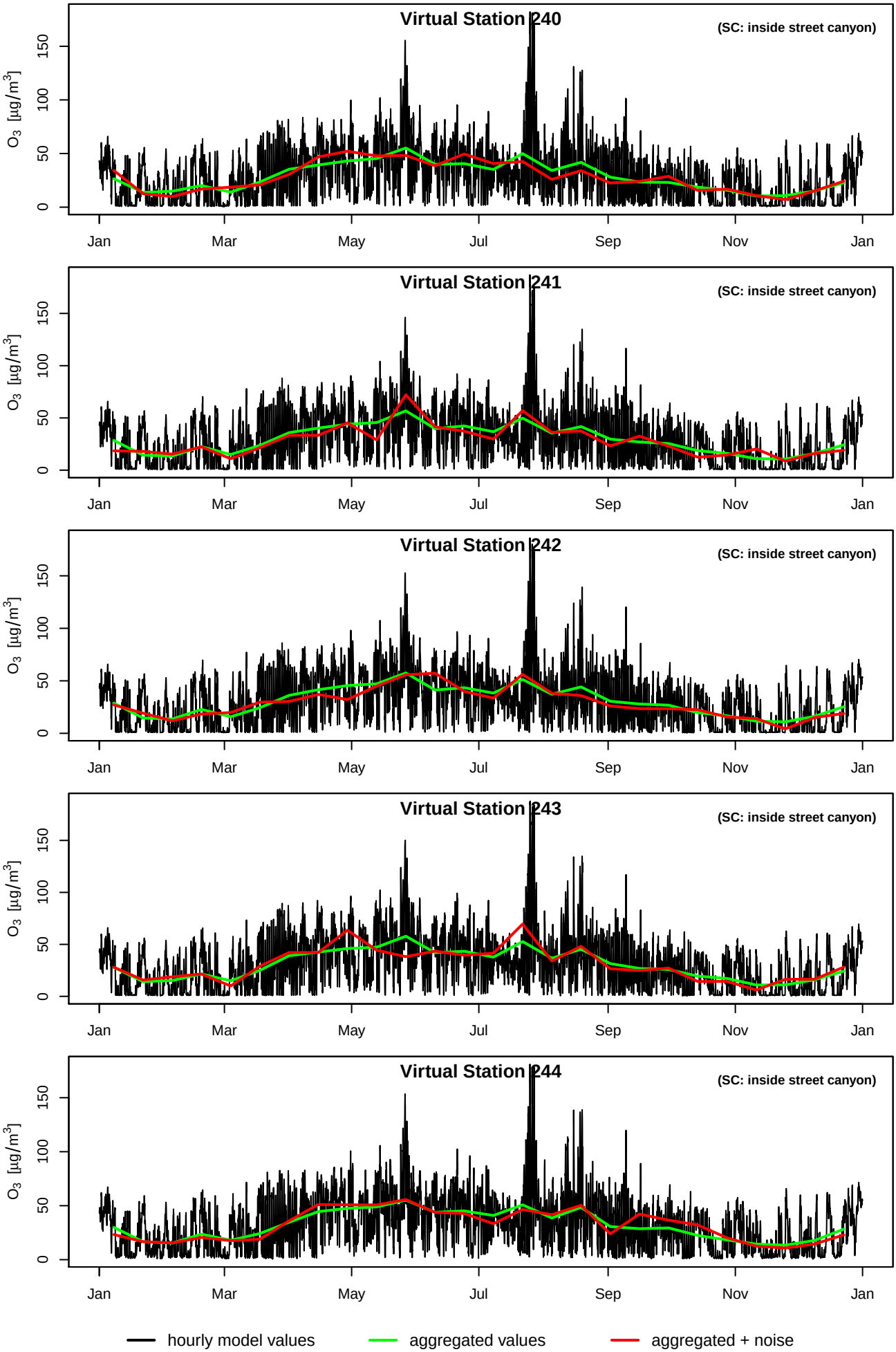

Virtual Station 215
(SC: inside street canyon)
Virtual Station 216
(SC: inside street canyon)
Virtual Station 217
(SC: inside street canyon)
Virtual Station 218
(SC: inside street canyon)
Virtual Station 219
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

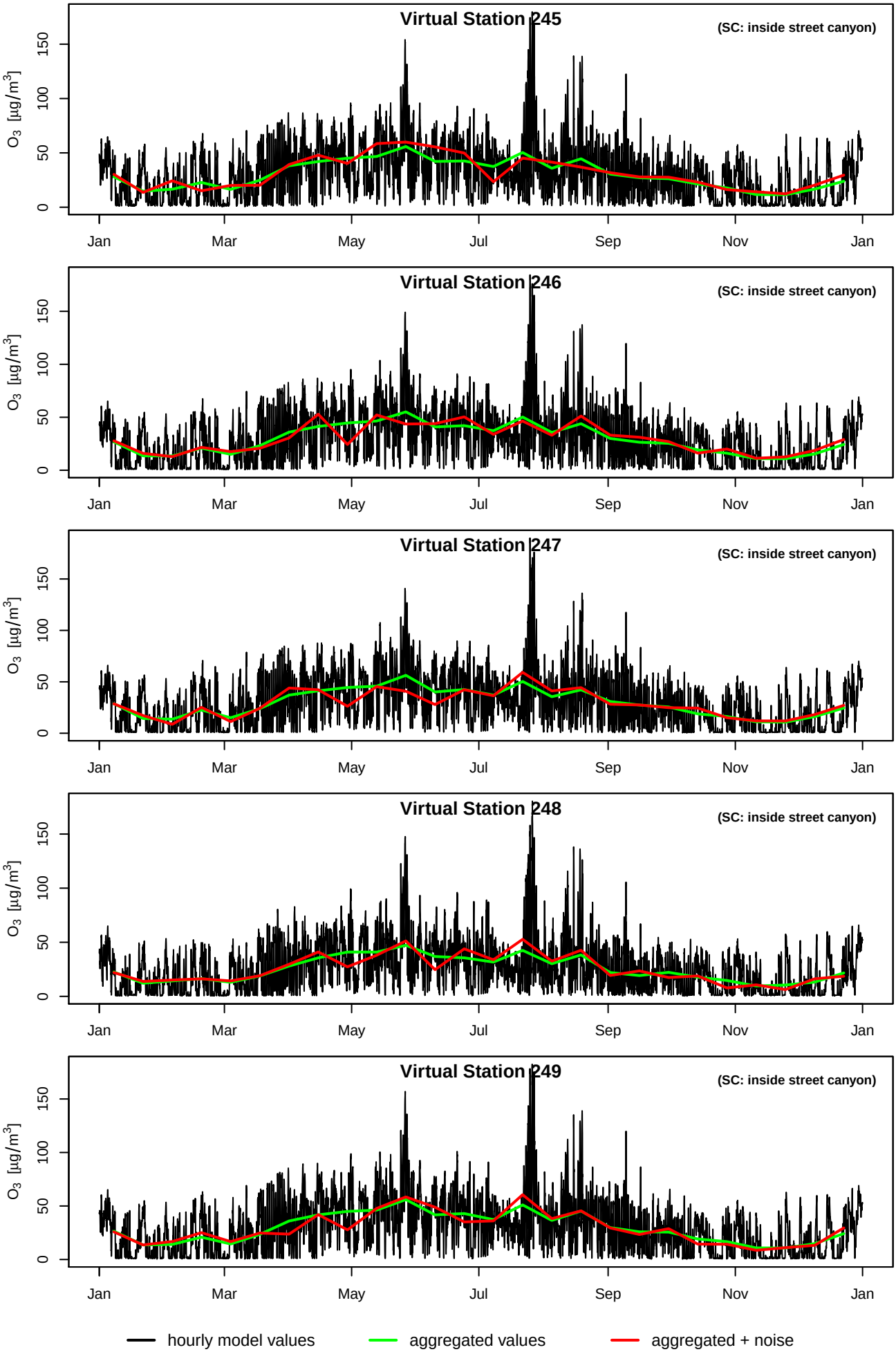

Virtual Station 220
(SC: inside street canyon)
Virtual Station 221
(SC: inside street canyon)
Virtual Station 222
(SC: inside street canyon)
Virtual Station 223
(SC: inside street canyon)
Virtual Station 224
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

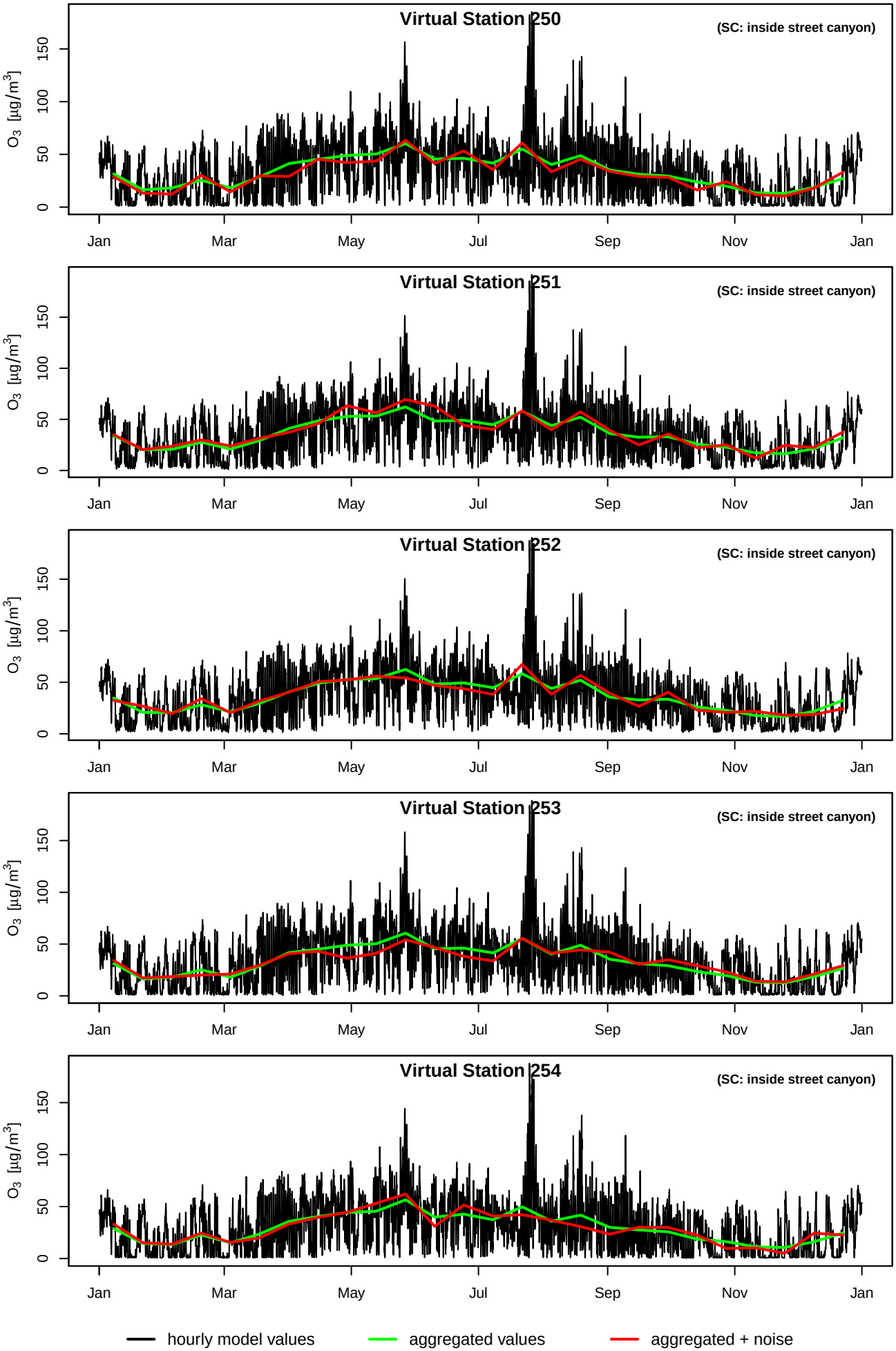

Virtual Station 225
(SC: inside street canyon)
Virtual Station 226
(SC: inside street canyon)
Virtual Station 227
(SC: inside street canyon)
Virtual Station 228
(SC: inside street canyon)
Virtual Station 229
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

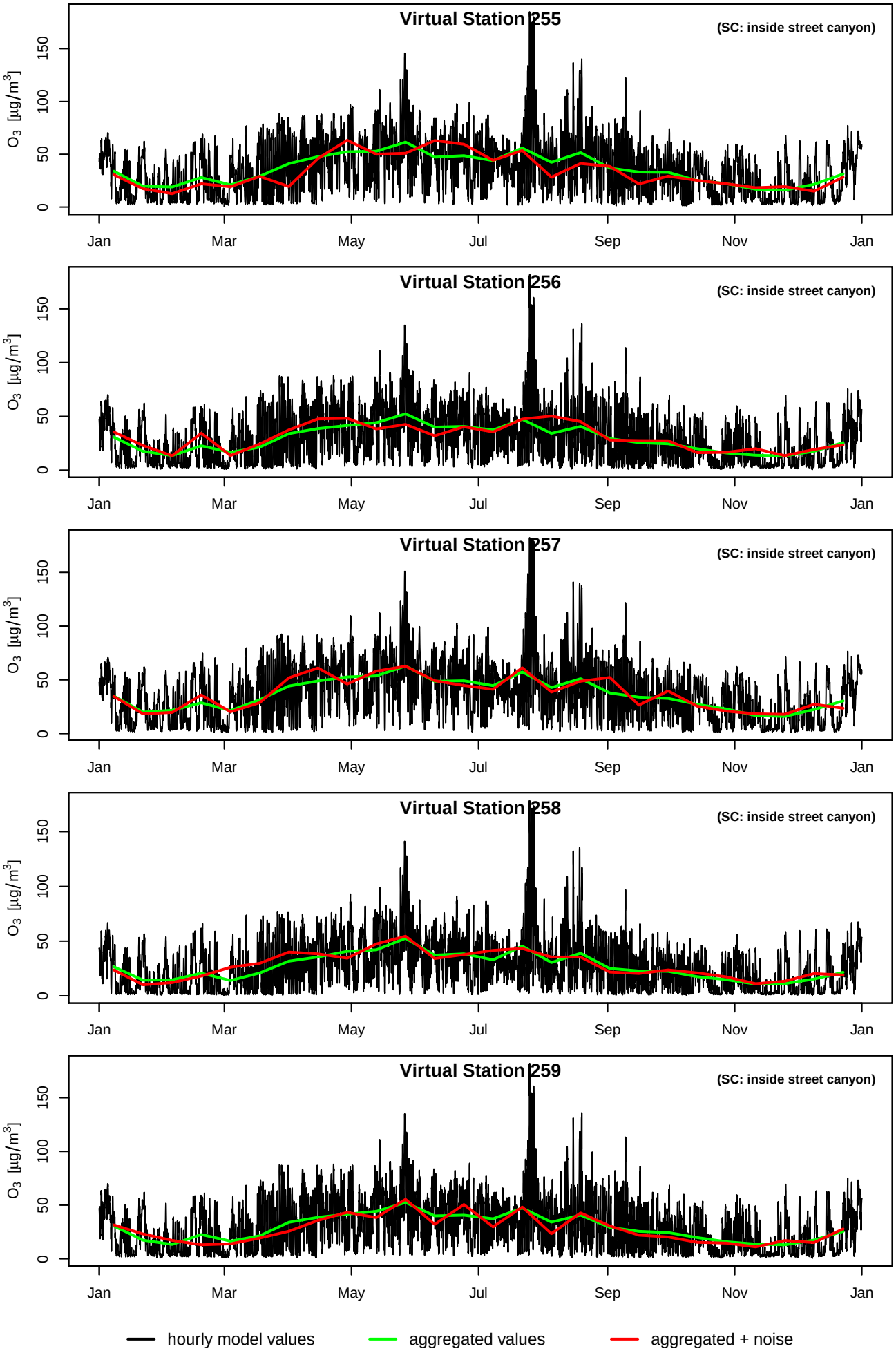

Virtual Station 230
(SC: inside street canyon)
Virtual Station 231
(SC: inside street canyon)
Virtual Station 232
(SC: inside street canyon)
Virtual Station 233
(SC: inside street canyon)
Virtual Station 234
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
200
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

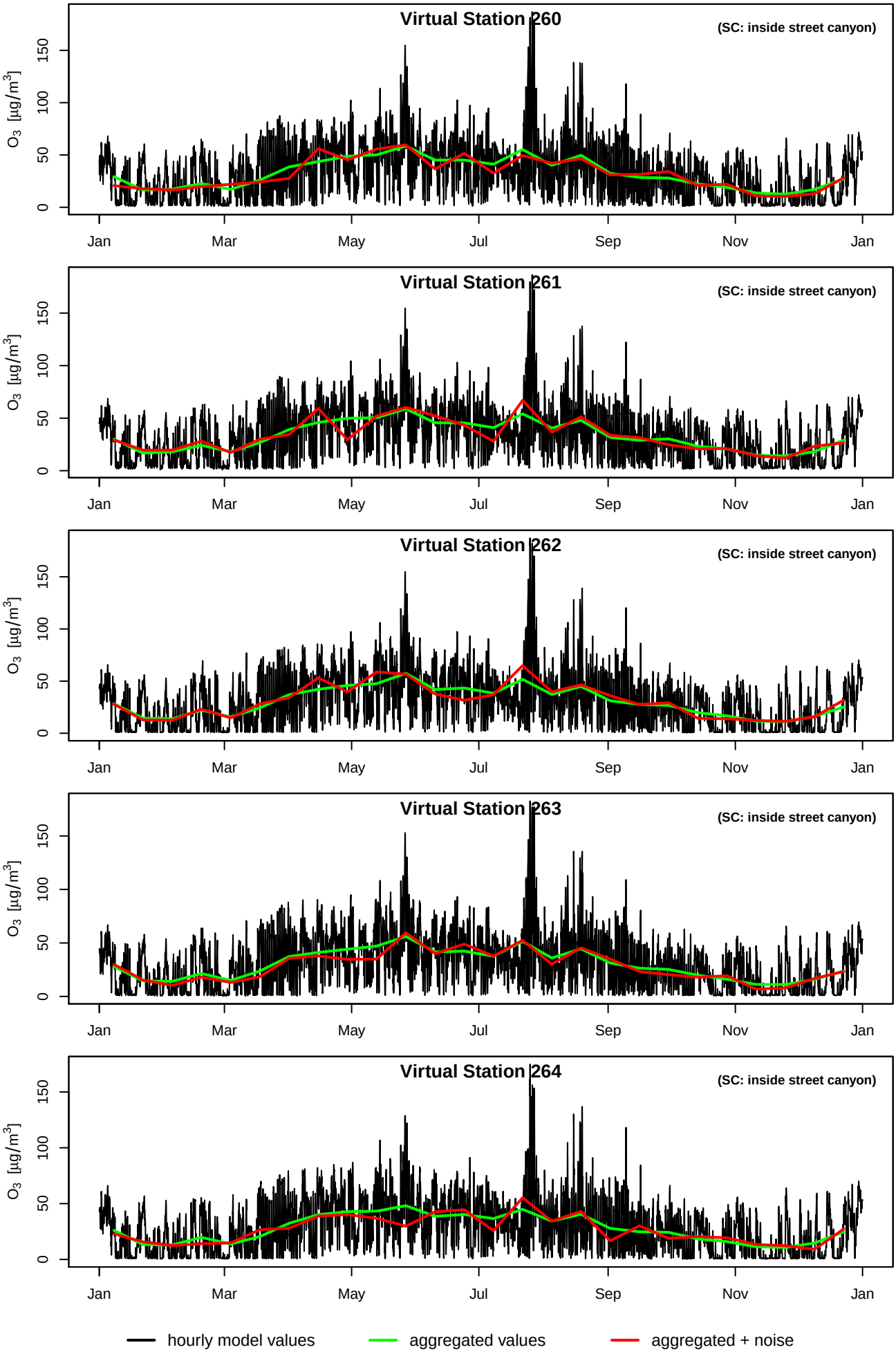

Virtual Station 235
(SC: inside street canyon)
Virtual Station 236
(SC: inside street canyon)
Virtual Station 237
(SC: inside street canyon)
Virtual Station 238
(SC: inside street canyon)
Virtual Station 239
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

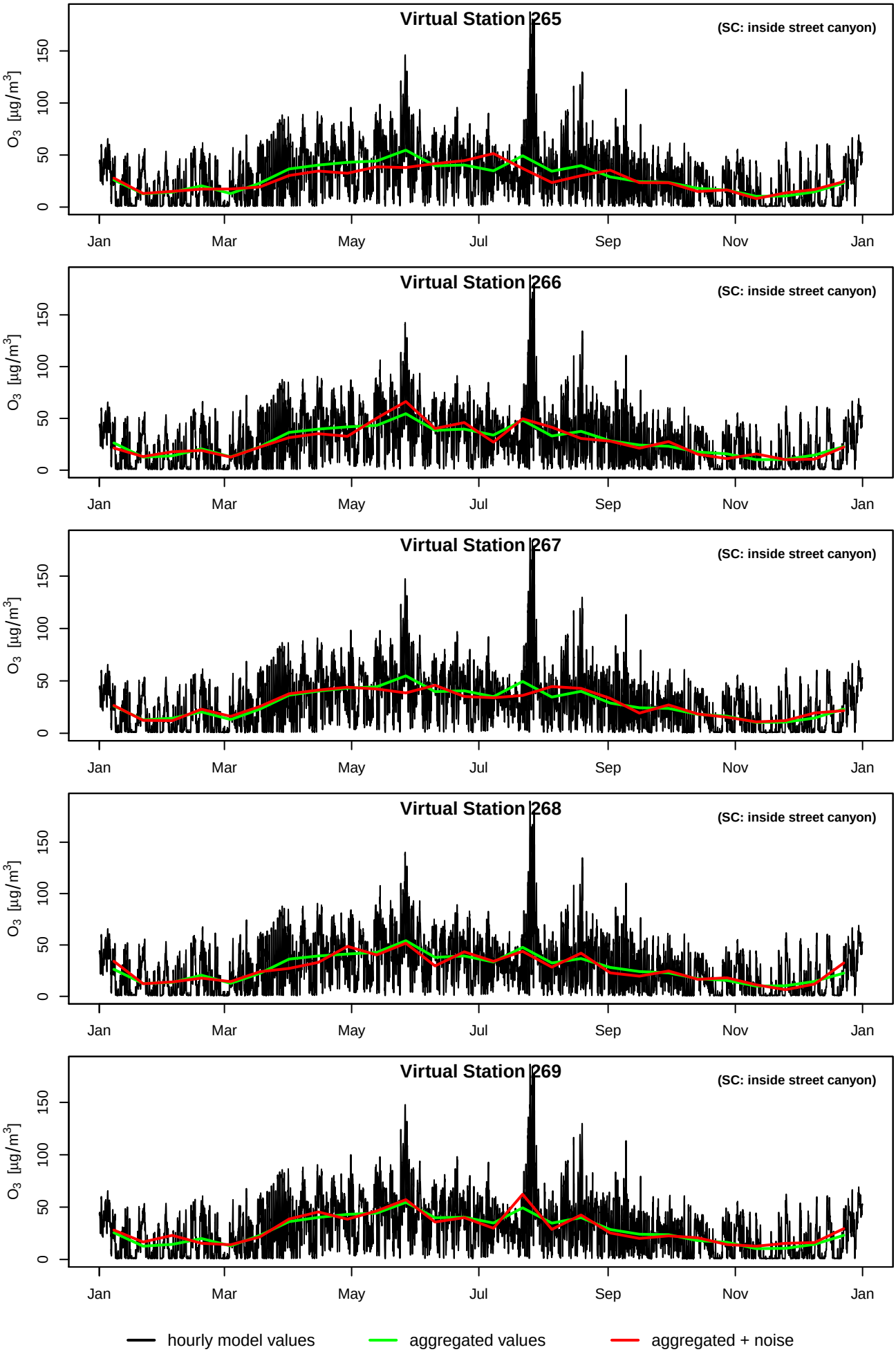

Virtual Station 240
(SC: inside street canyon)
Virtual Station 241
(SC: inside street canyon)
Virtual Station 242
(SC: inside street canyon)
Virtual Station 243
(SC: inside street canyon)
Virtual Station 244
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

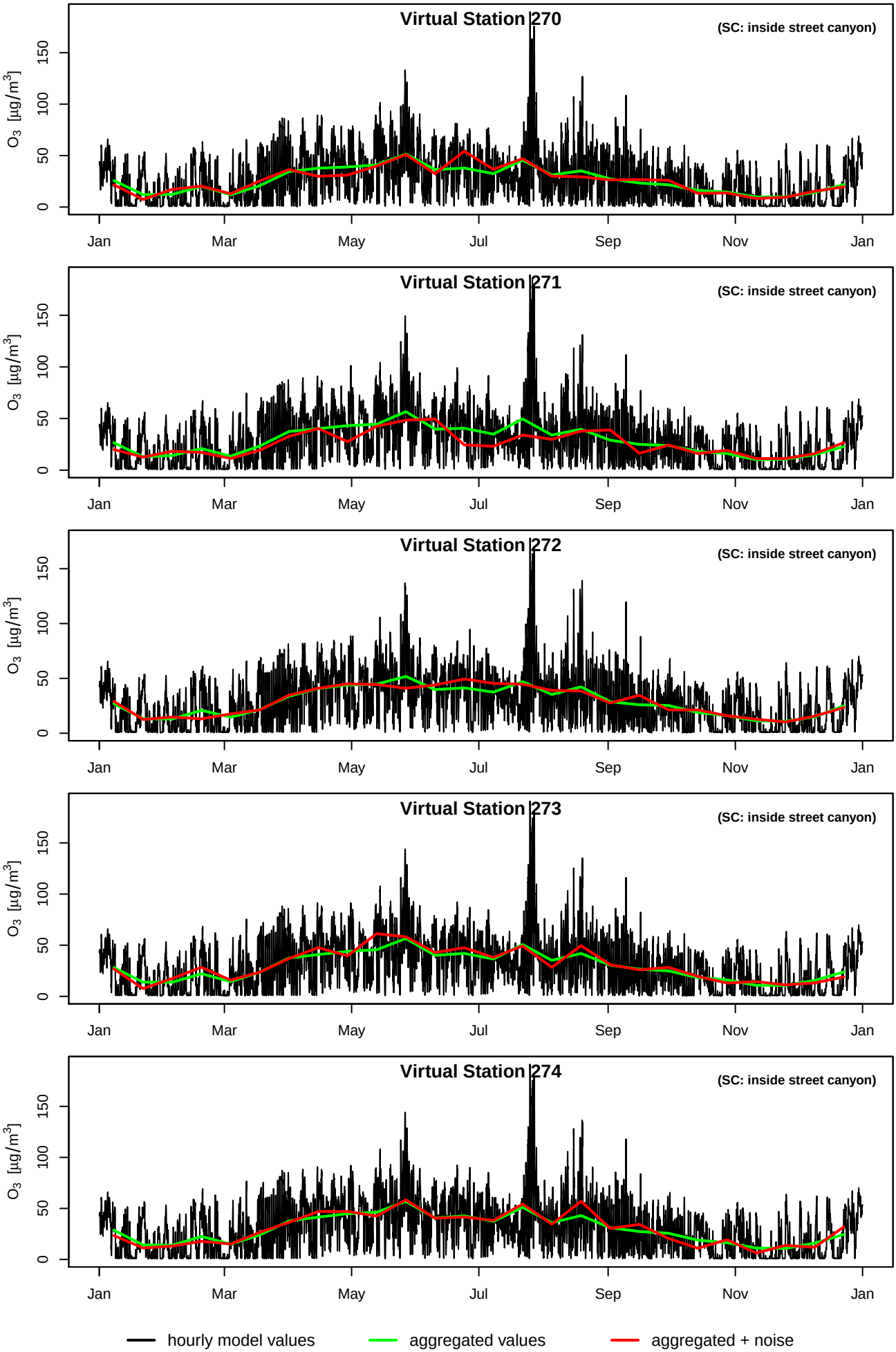

Virtual Station 245
(SC: inside street canyon)
Virtual Station 246
(SC: inside street canyon)
Virtual Station 247
(SC: inside street canyon)
Virtual Station 248
(SC: inside street canyon)
Virtual Station 249
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

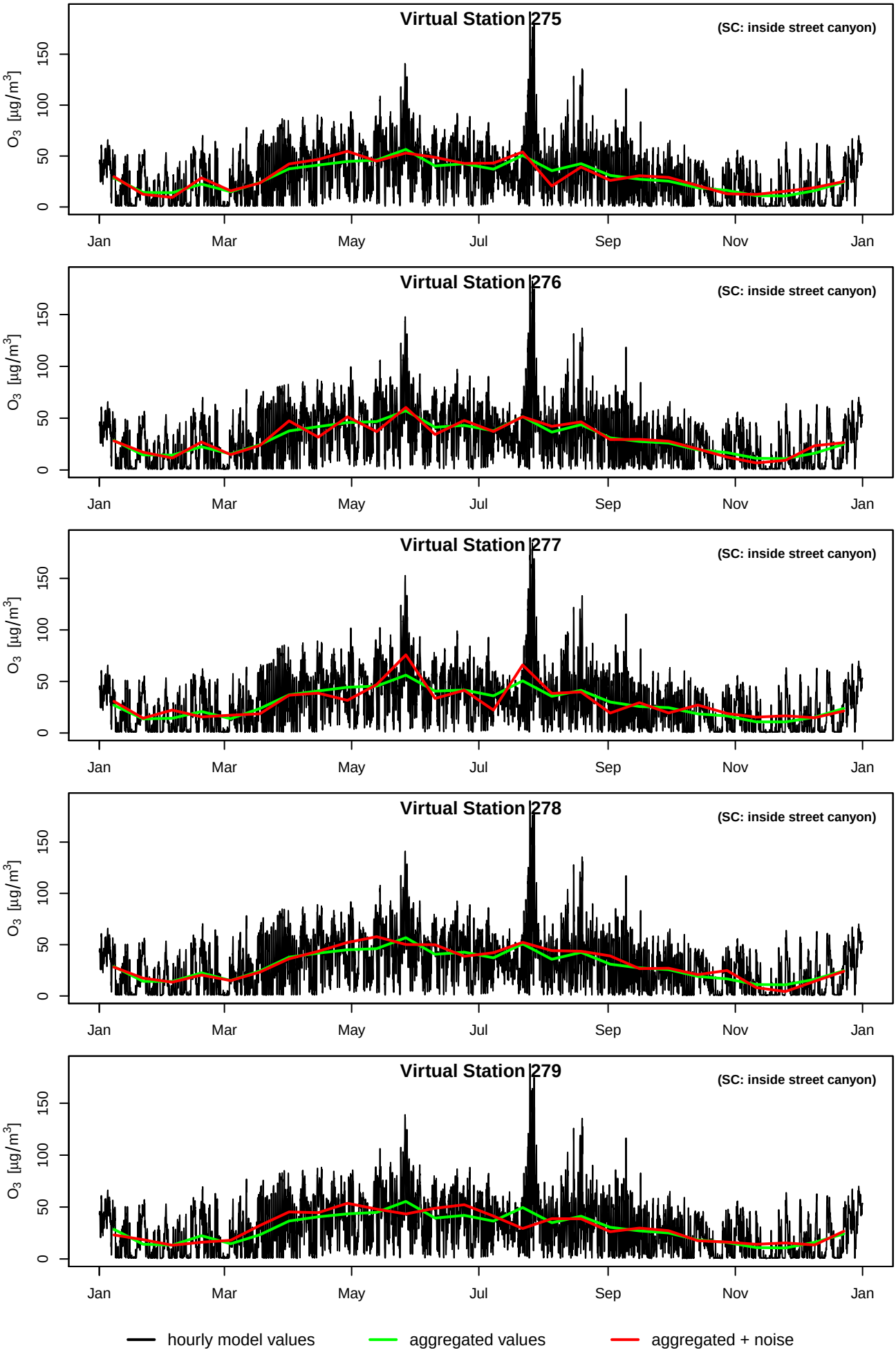

Virtual Station 250
(SC: inside street canyon)
Virtual Station 251
(SC: inside street canyon)
Virtual Station 252
(SC: inside street canyon)
Virtual Station 253
(SC: inside street canyon)
Virtual Station 254
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

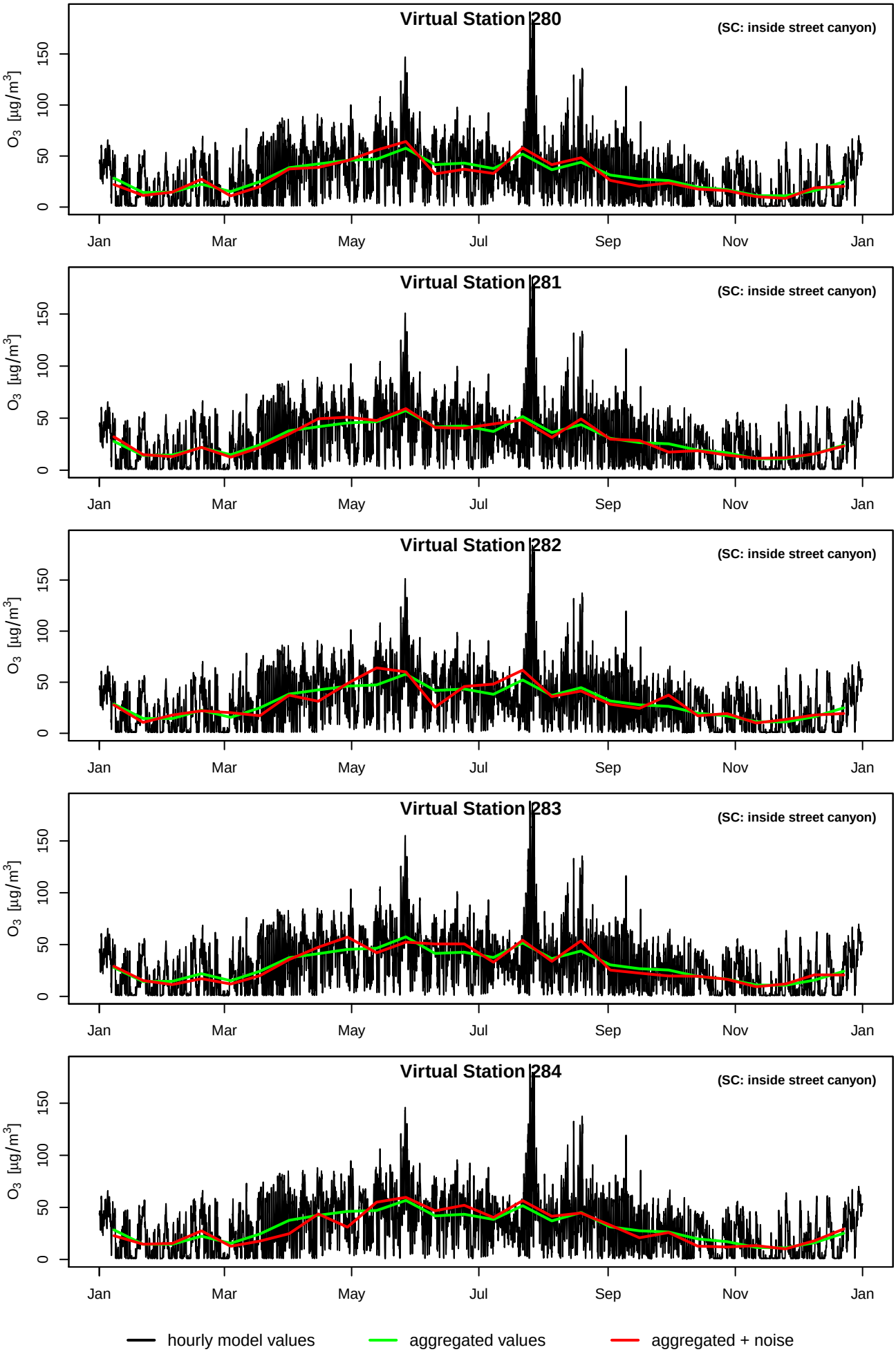

Virtual Station 255
(SC: inside street canyon)
Virtual Station 256
(SC: inside street canyon)
Virtual Station 257
(SC: inside street canyon)
Virtual Station 258
(SC: inside street canyon)
Virtual Station 259
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

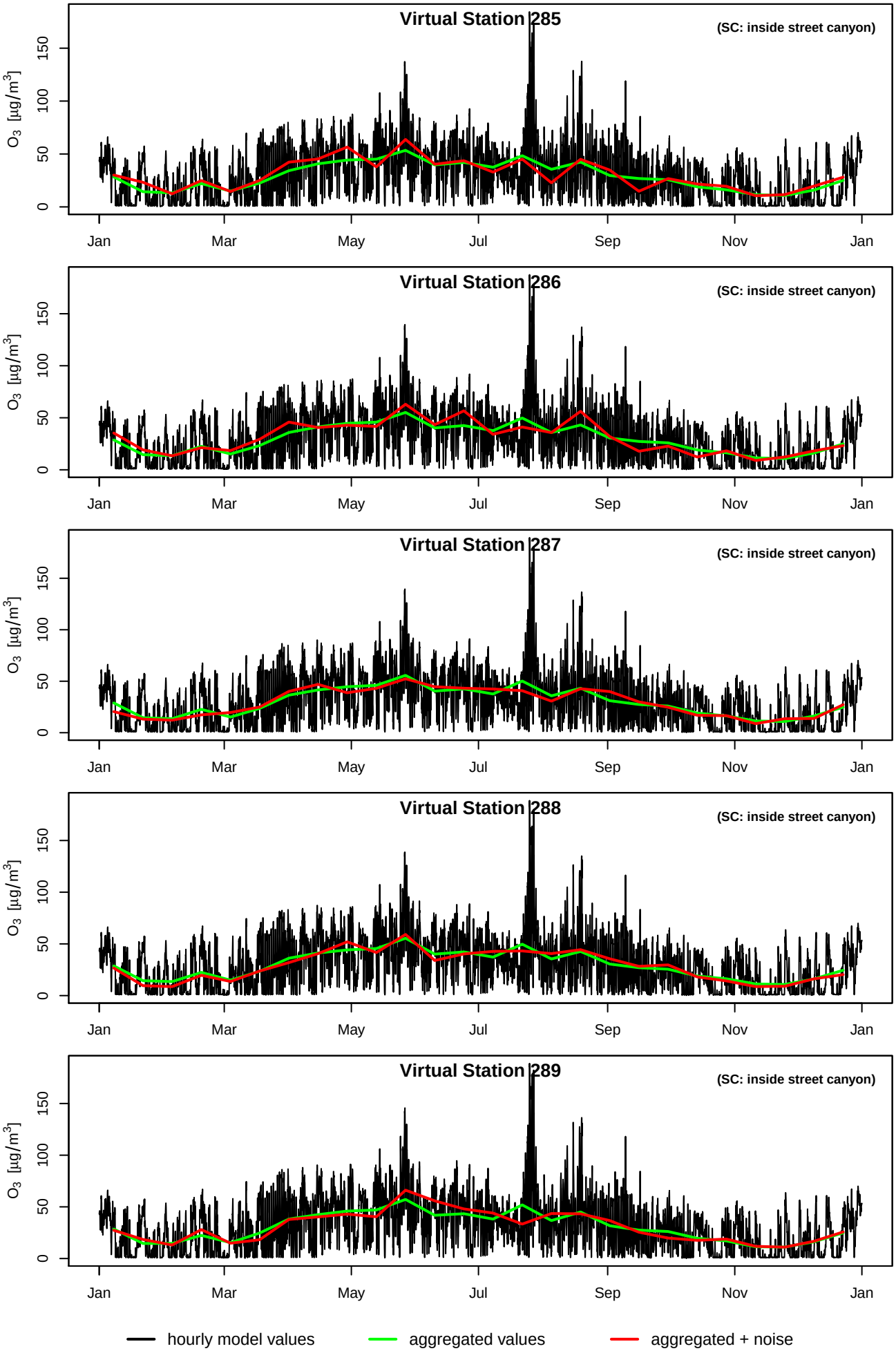

Virtual Station 260
(SC: inside street canyon)
Virtual Station 261
(SC: inside street canyon)
Virtual Station 262
(SC: inside street canyon)
Virtual Station 263
(SC: inside street canyon)
Virtual Station 264
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

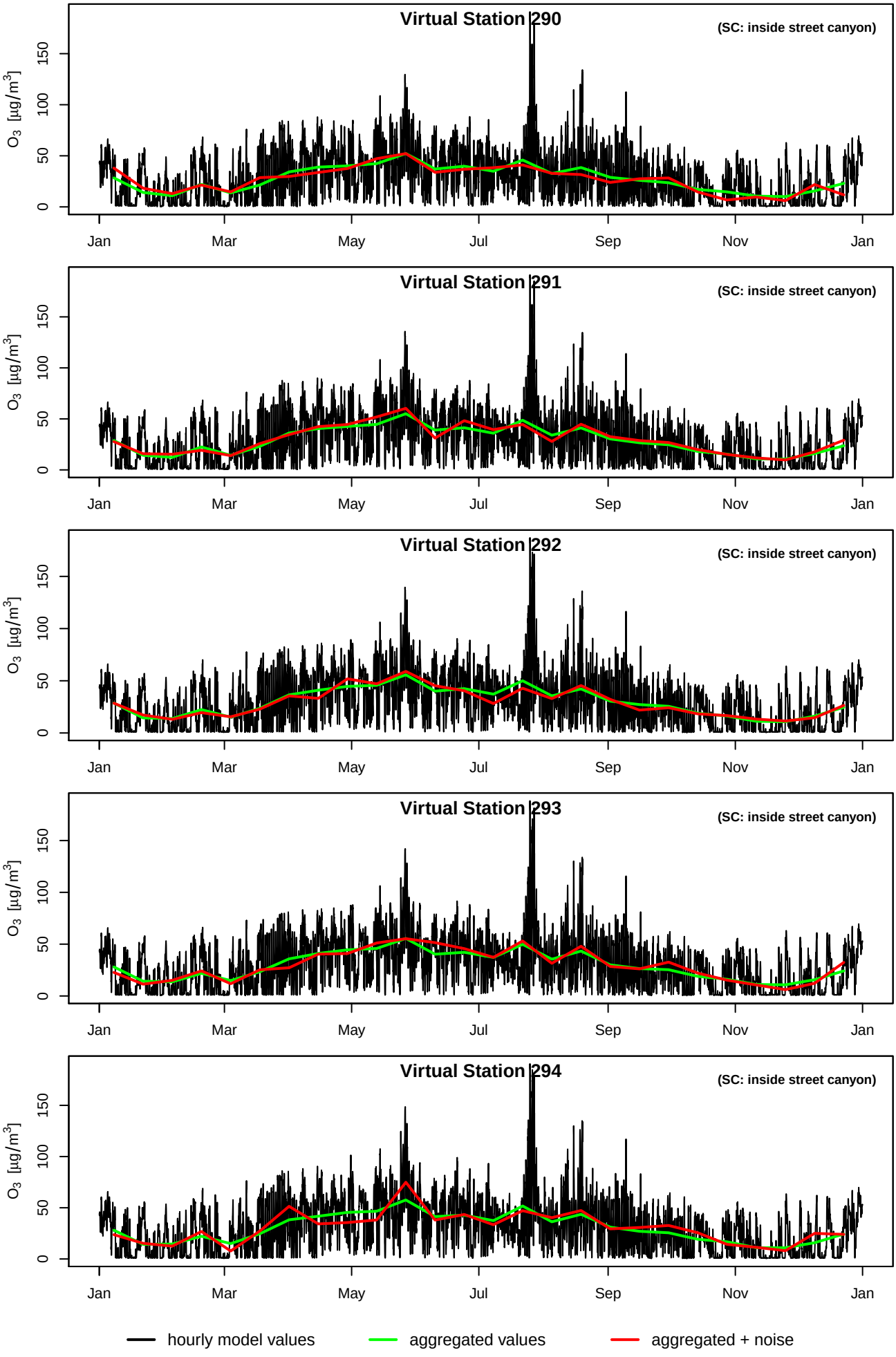

Virtual Station 265
(SC: inside street canyon)
Virtual Station 266
(SC: inside street canyon)
Virtual Station 267
(SC: inside street canyon)
Virtual Station 268
(SC: inside street canyon)
Virtual Station 269
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

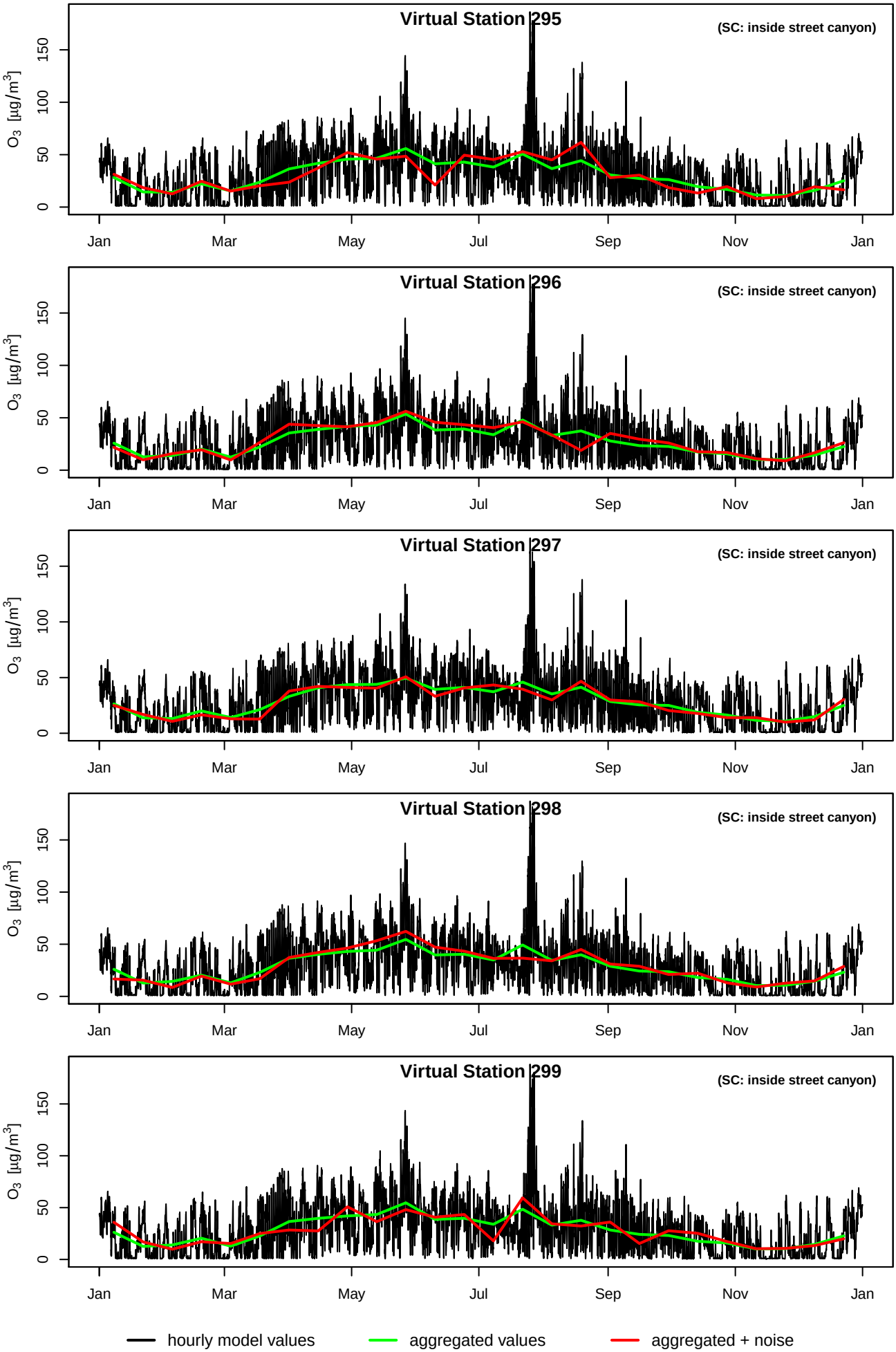

Virtual Station 270
(SC: inside street canyon)
Virtual Station 271
(SC: inside street canyon)
Virtual Station 272
(SC: inside street canyon)
Virtual Station 273
(SC: inside street canyon)
Virtual Station 274
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

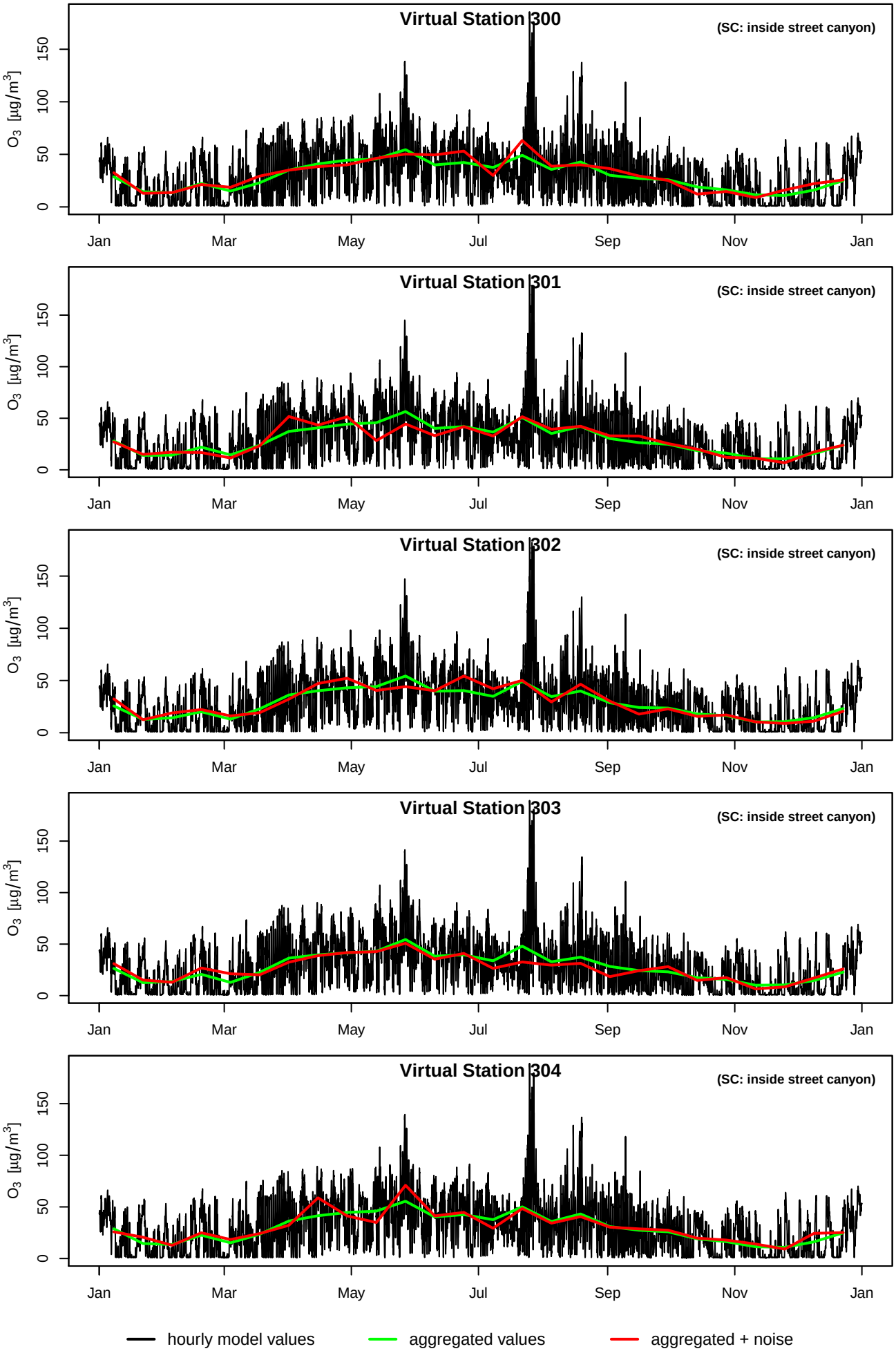

Virtual Station 275
(SC: inside street canyon)
Virtual Station 276
(SC: inside street canyon)
Virtual Station 277
(SC: inside street canyon)
Virtual Station 278
(SC: inside street canyon)
Virtual Station 279
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

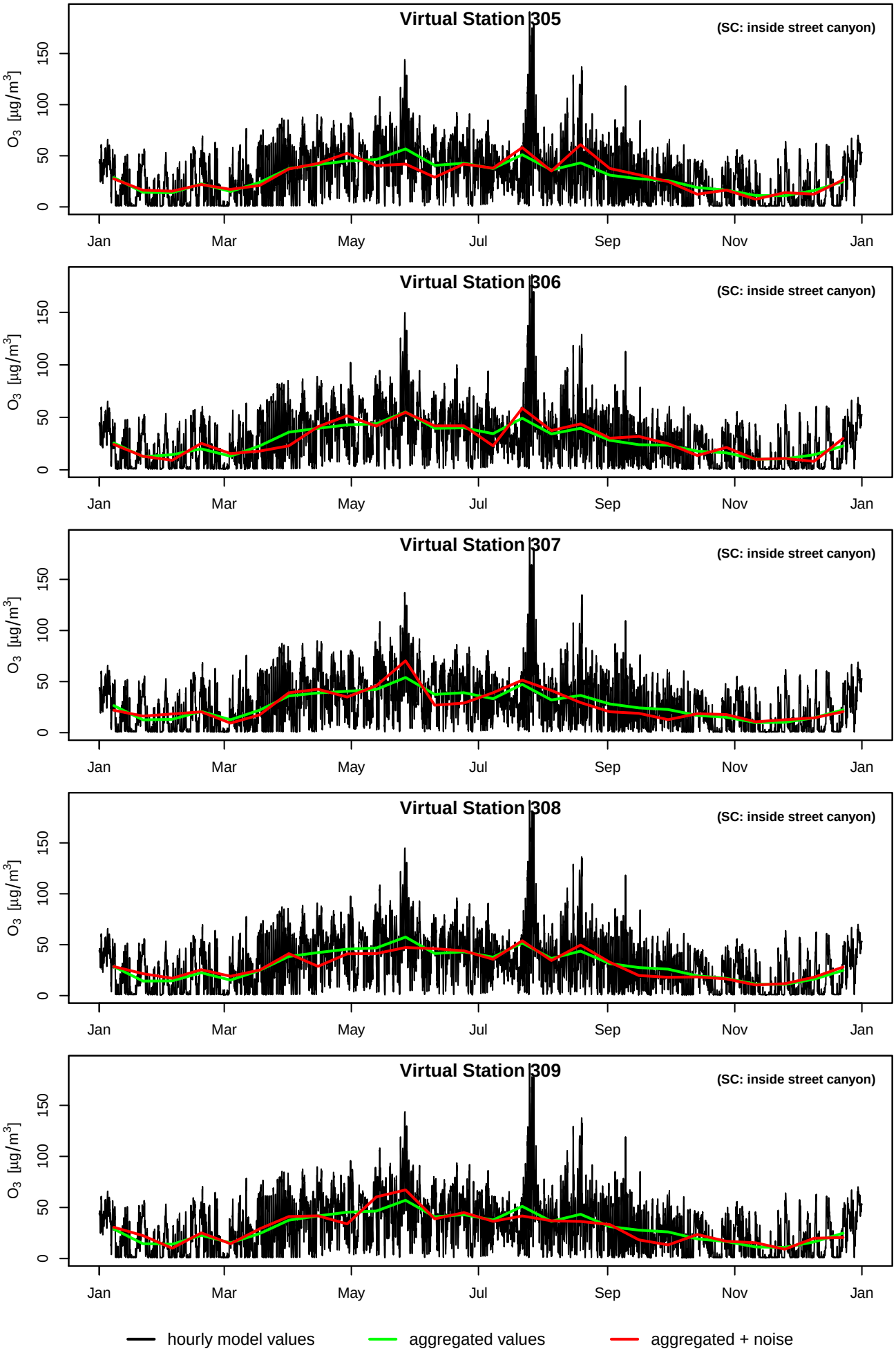

Virtual Station 280
(SC: inside street canyon)
Virtual Station 281
(SC: inside street canyon)
Virtual Station 282
(SC: inside street canyon)
Virtual Station 283
(SC: inside street canyon)
Virtual Station 284
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

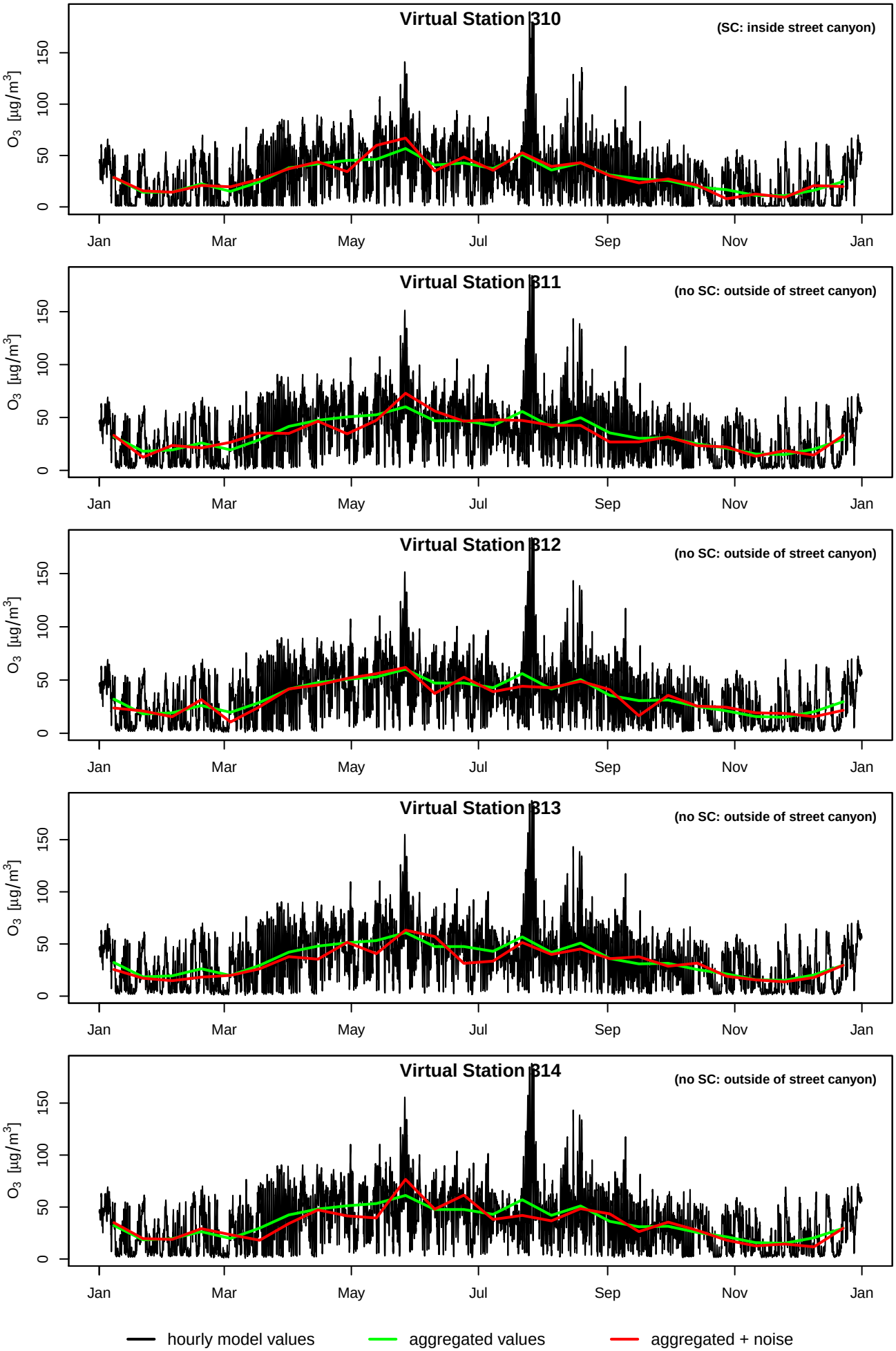

Virtual Station 285
(SC: inside street canyon)
Virtual Station 286
(SC: inside street canyon)
Virtual Station 287
(SC: inside street canyon)
Virtual Station 288
(SC: inside street canyon)
Virtual Station 289
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

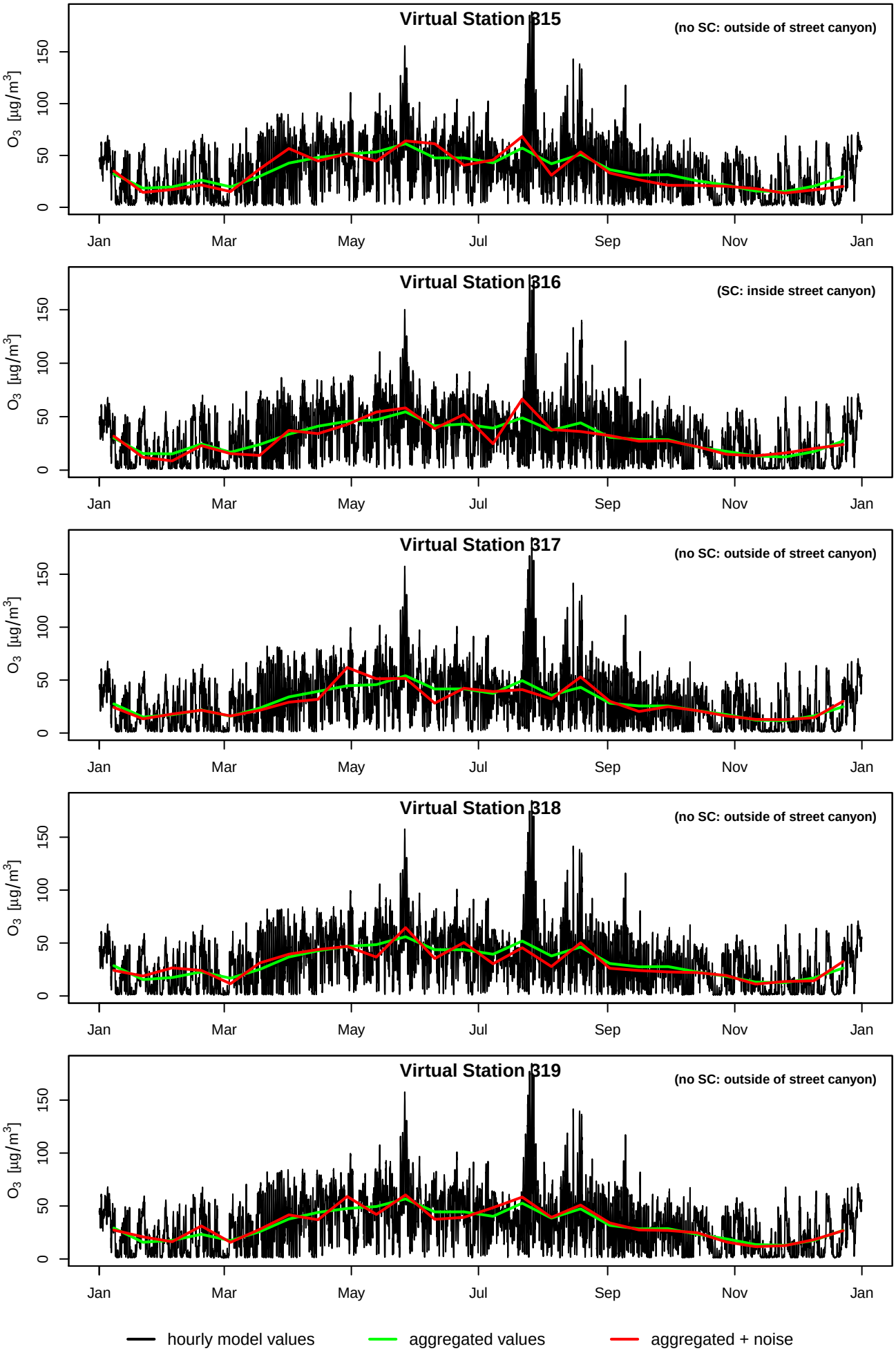

Virtual Station 290
(SC: inside street canyon)
Virtual Station 291
(SC: inside street canyon)
Virtual Station 292
(SC: inside street canyon)
Virtual Station 293
(SC: inside street canyon)
Virtual Station 294
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

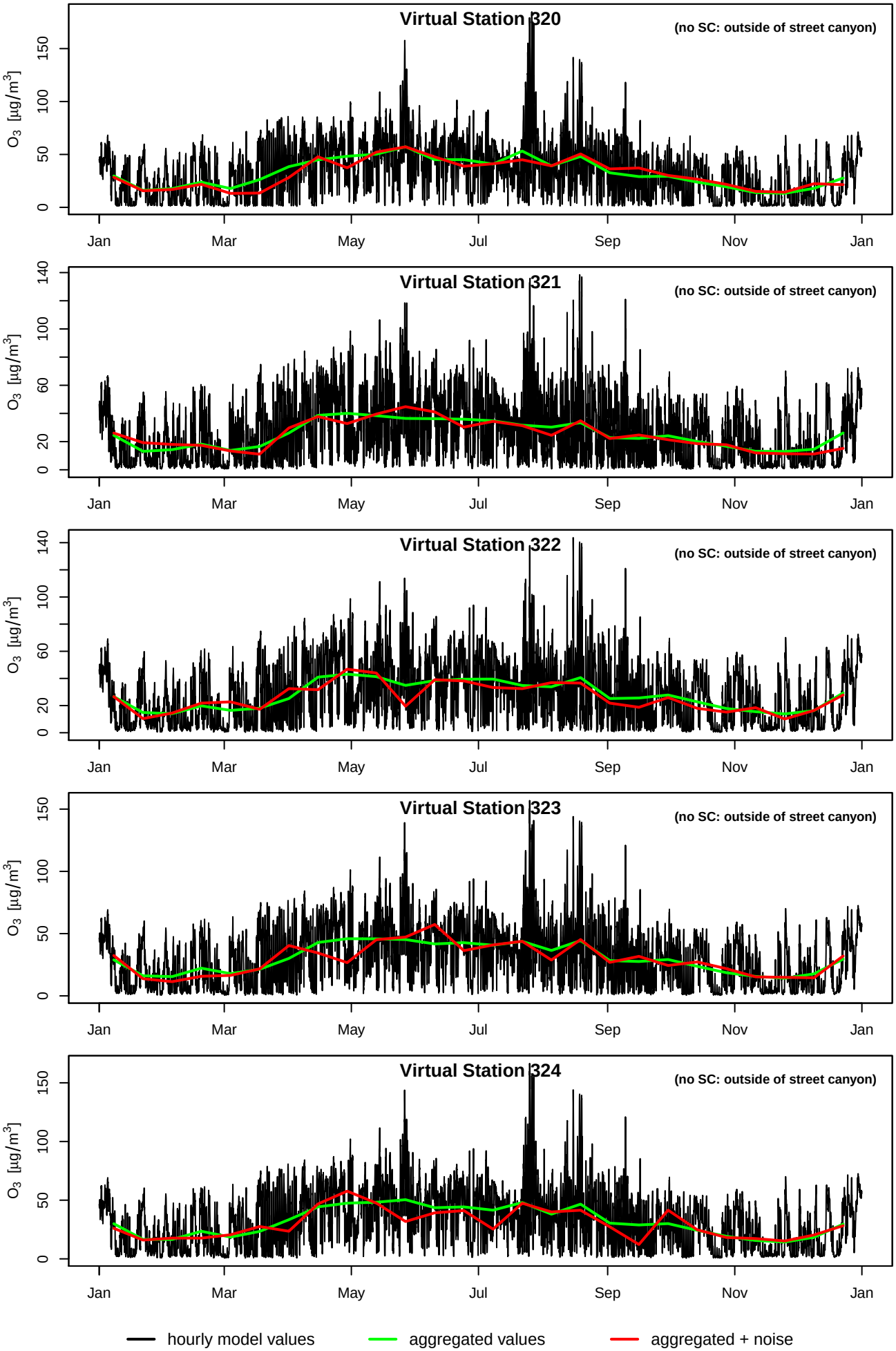

Virtual Station 295
(SC: inside street canyon)
Virtual Station 296
(SC: inside street canyon)
Virtual Station 297
(SC: inside street canyon)
Virtual Station 298
(SC: inside street canyon)
Virtual Station 299
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

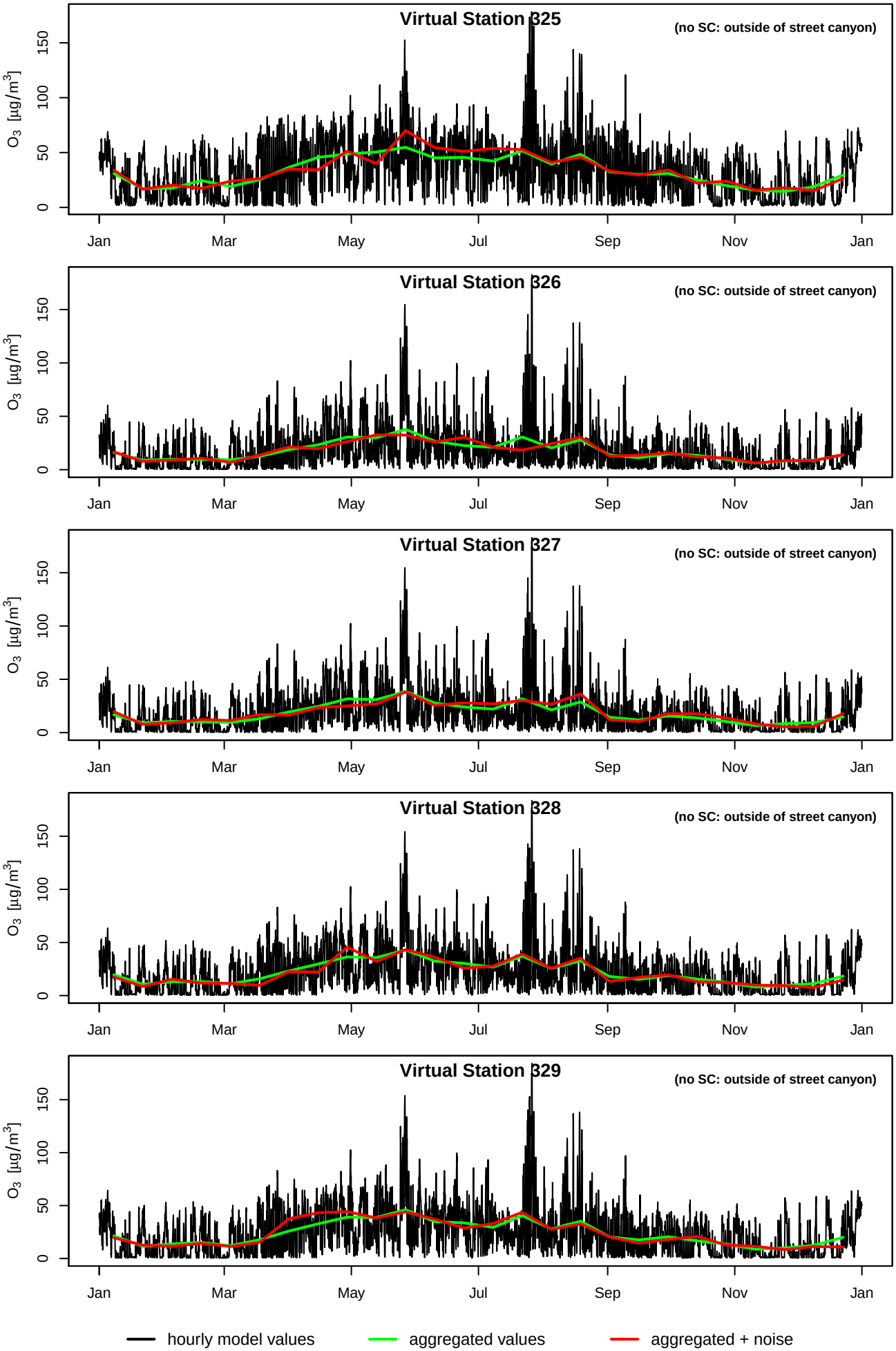

Virtual Station 300
(SC: inside street canyon)
Virtual Station 301
(SC: inside street canyon)
Virtual Station 302
(SC: inside street canyon)
Virtual Station 303
(SC: inside street canyon)
Virtual Station 304
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

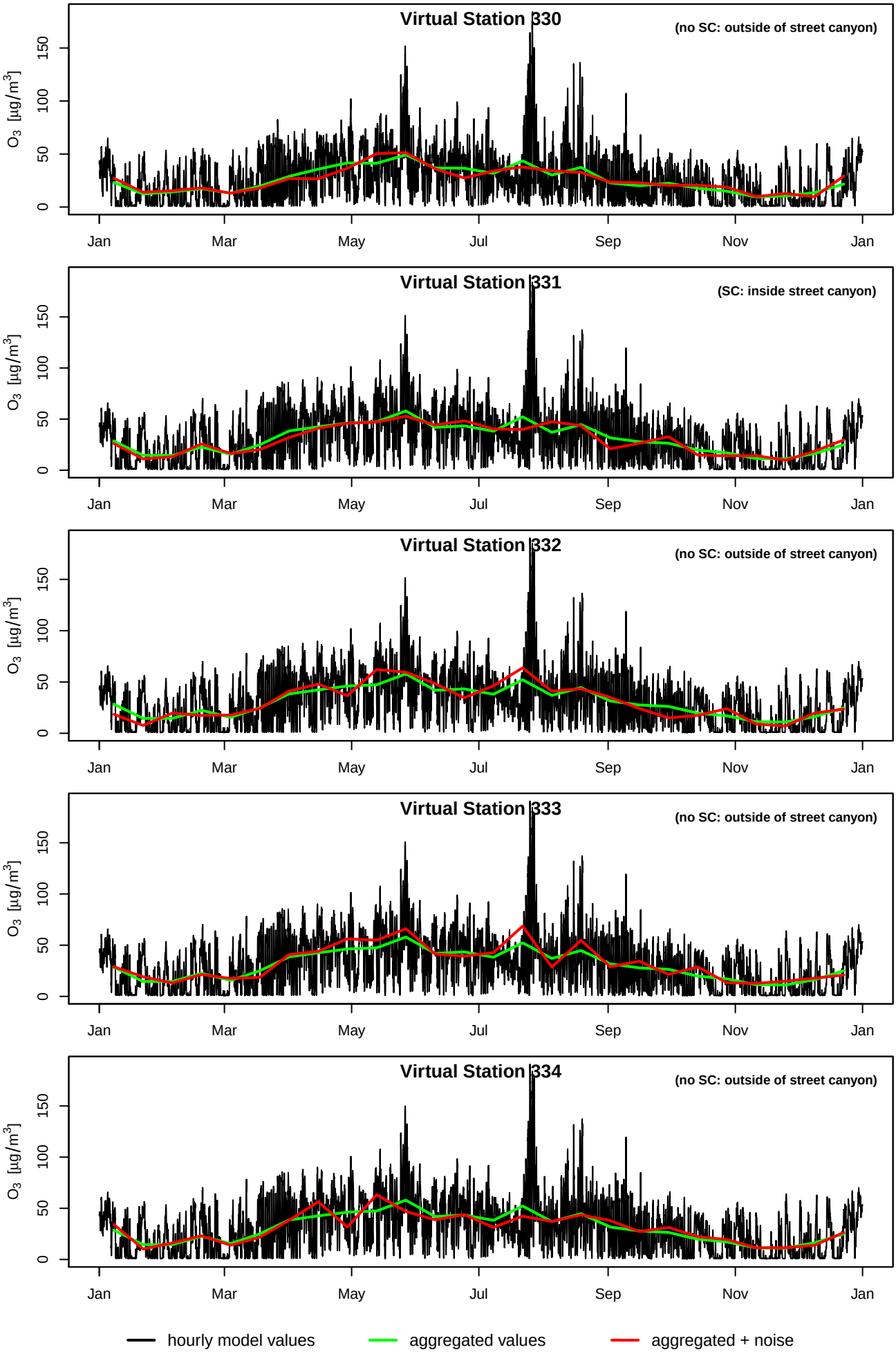

Virtual Station 305
(SC: inside street canyon)
Virtual Station 306
(SC: inside street canyon)
Virtual Station 307
(SC: inside street canyon)
Virtual Station 308
(SC: inside street canyon)
Virtual Station 309
(SC: inside street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

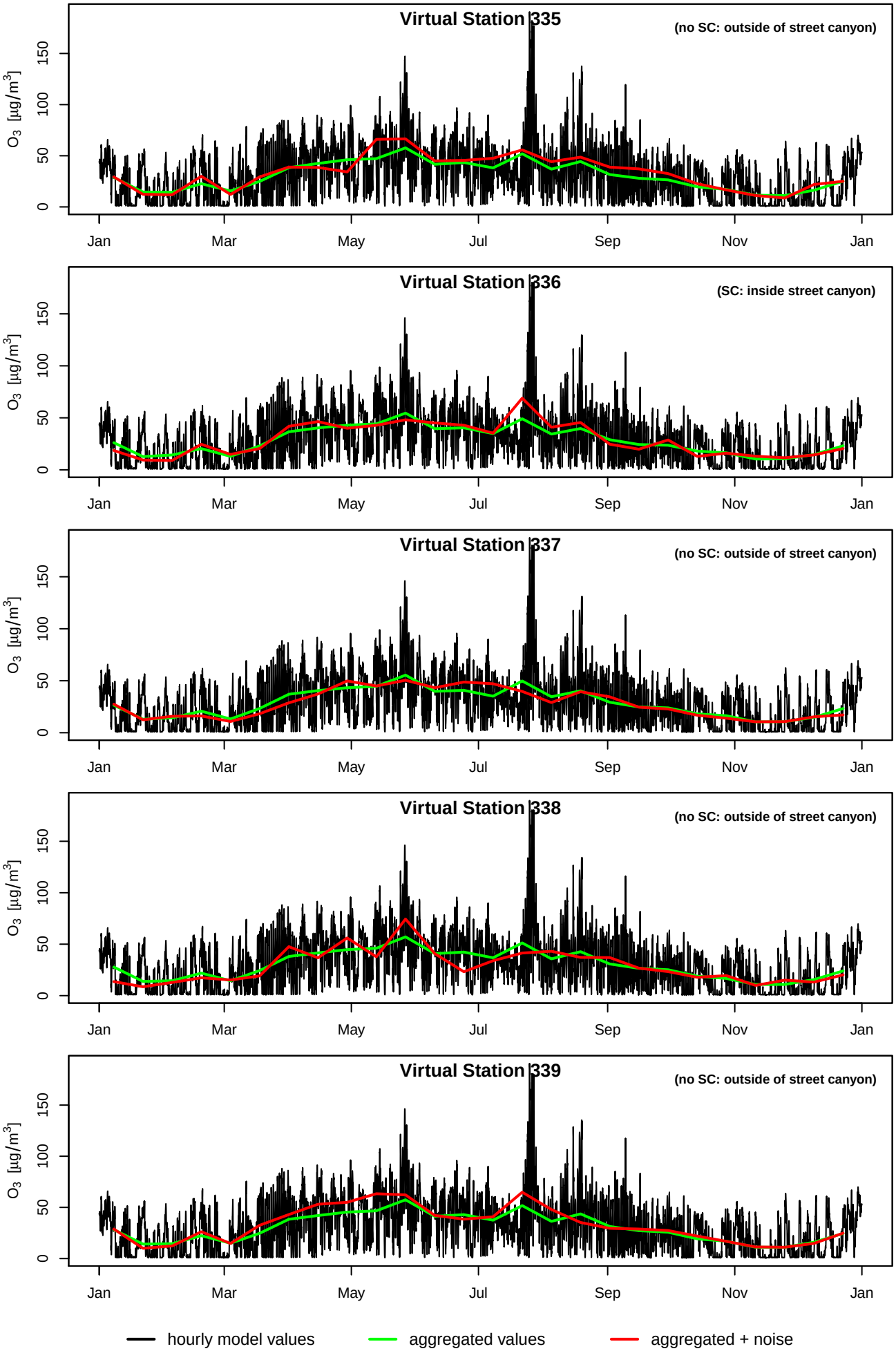

Virtual Station 310
(SC: inside street canyon)
Virtual Station 311
(no SC: outside of street canyon)
Virtual Station 312
(no SC: outside of street canyon)
Virtual Station 313
(no SC: outside of street canyon)
Virtual Station 314
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

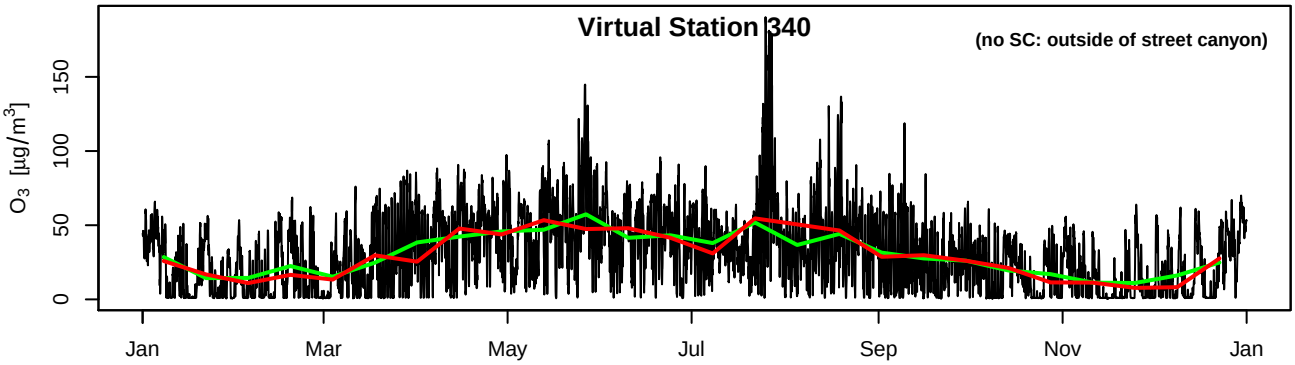

Virtual Station 315
(no SC: outside of street canyon)
Virtual Station 316
(SC: inside street canyon)
Virtual Station 317
(no SC: outside of street canyon)
Virtual Station 318
(no SC: outside of street canyon)
Virtual Station 319
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

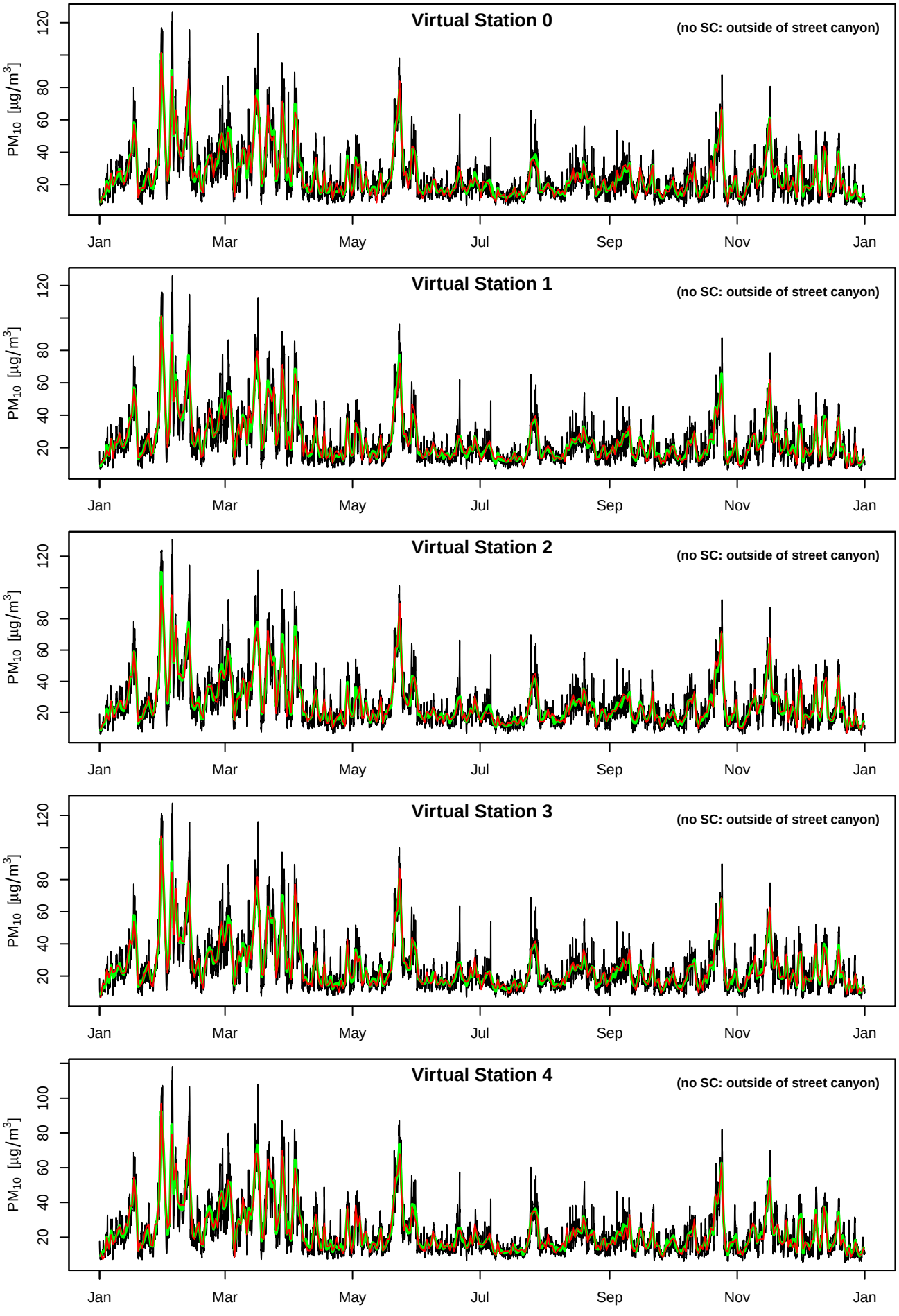

Virtual Station 320
(no SC: outside of street canyon)
Virtual Station 321
(no SC: outside of street canyon)
Virtual Station 322
(no SC: outside of street canyon)
Virtual Station 323
(no SC: outside of street canyon)
Virtual Station 324
(no SC: outside of street canyon)
O3 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

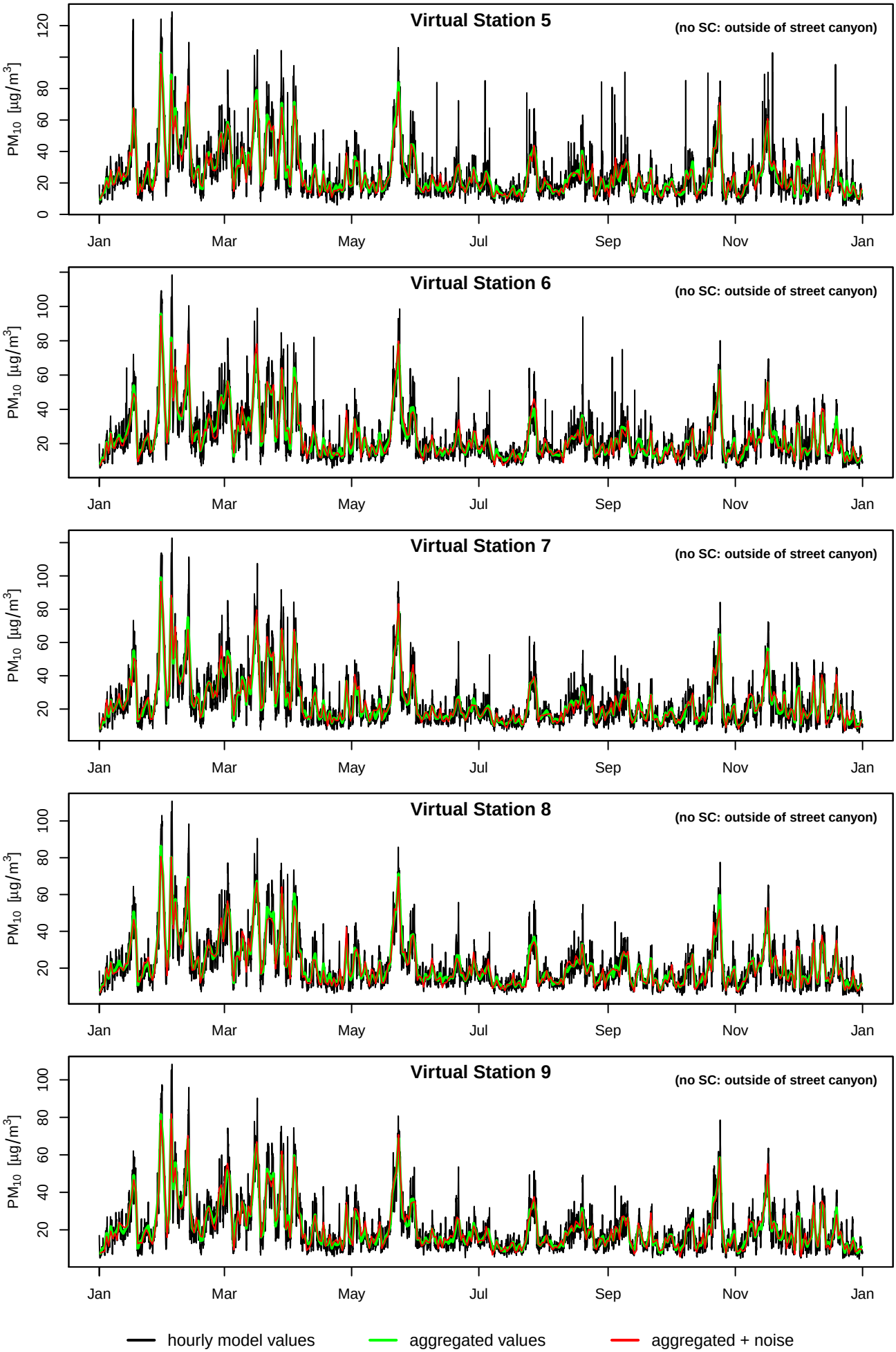

Virtual Station 325
(no SC: outside of street canyon)
Virtual Station 326
(no SC: outside of street canyon)
Virtual Station 327
(no SC: outside of street canyon)
Virtual Station 328
(no SC: outside of street canyon)
Virtual Station 329
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

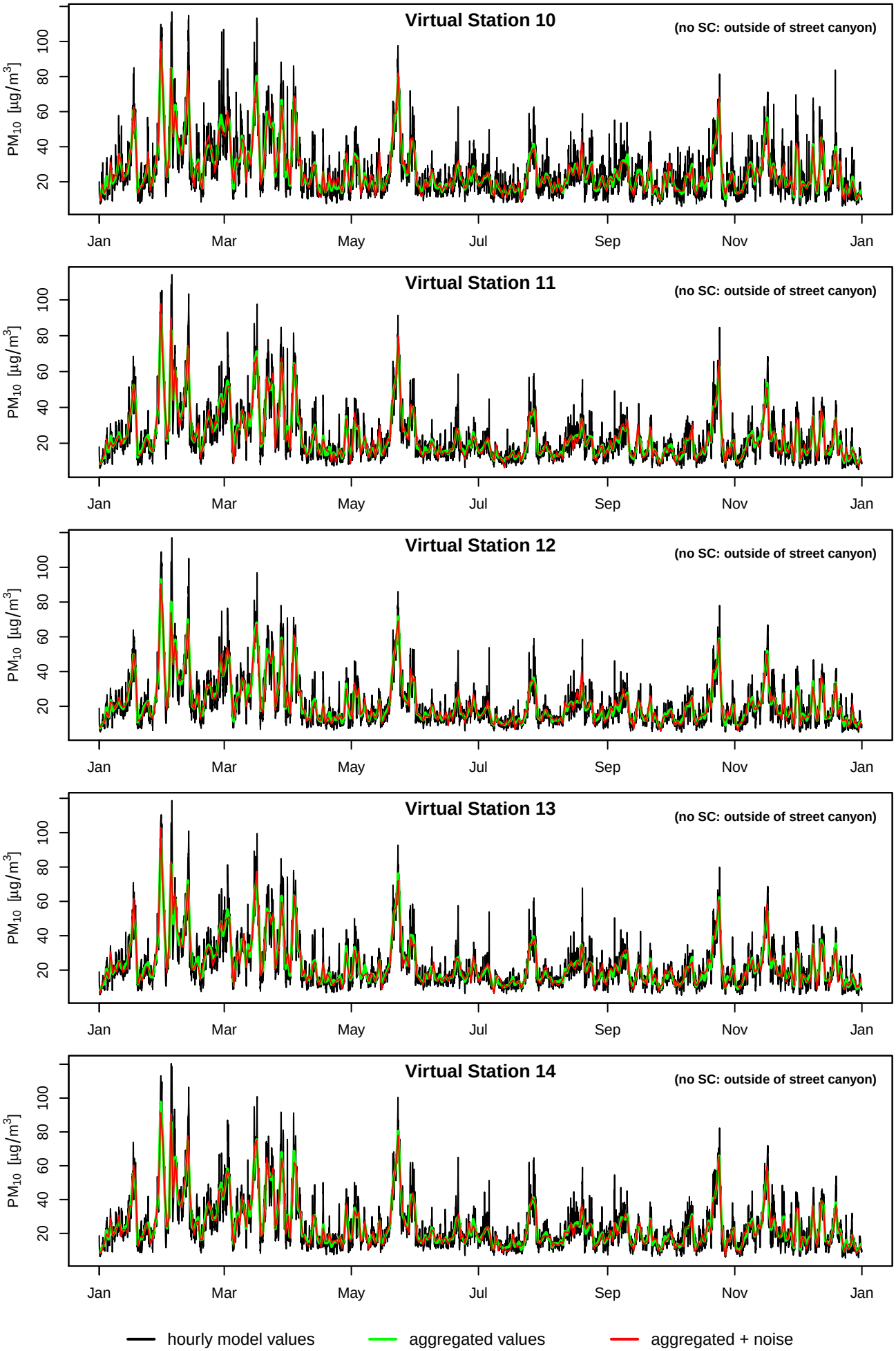

Virtual Station 330
(no SC: outside of street canyon)
Virtual Station 331
(SC: inside street canyon)
Virtual Station 332
(no SC: outside of street canyon)
Virtual Station 333
(no SC: outside of street canyon)
Virtual Station 334
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

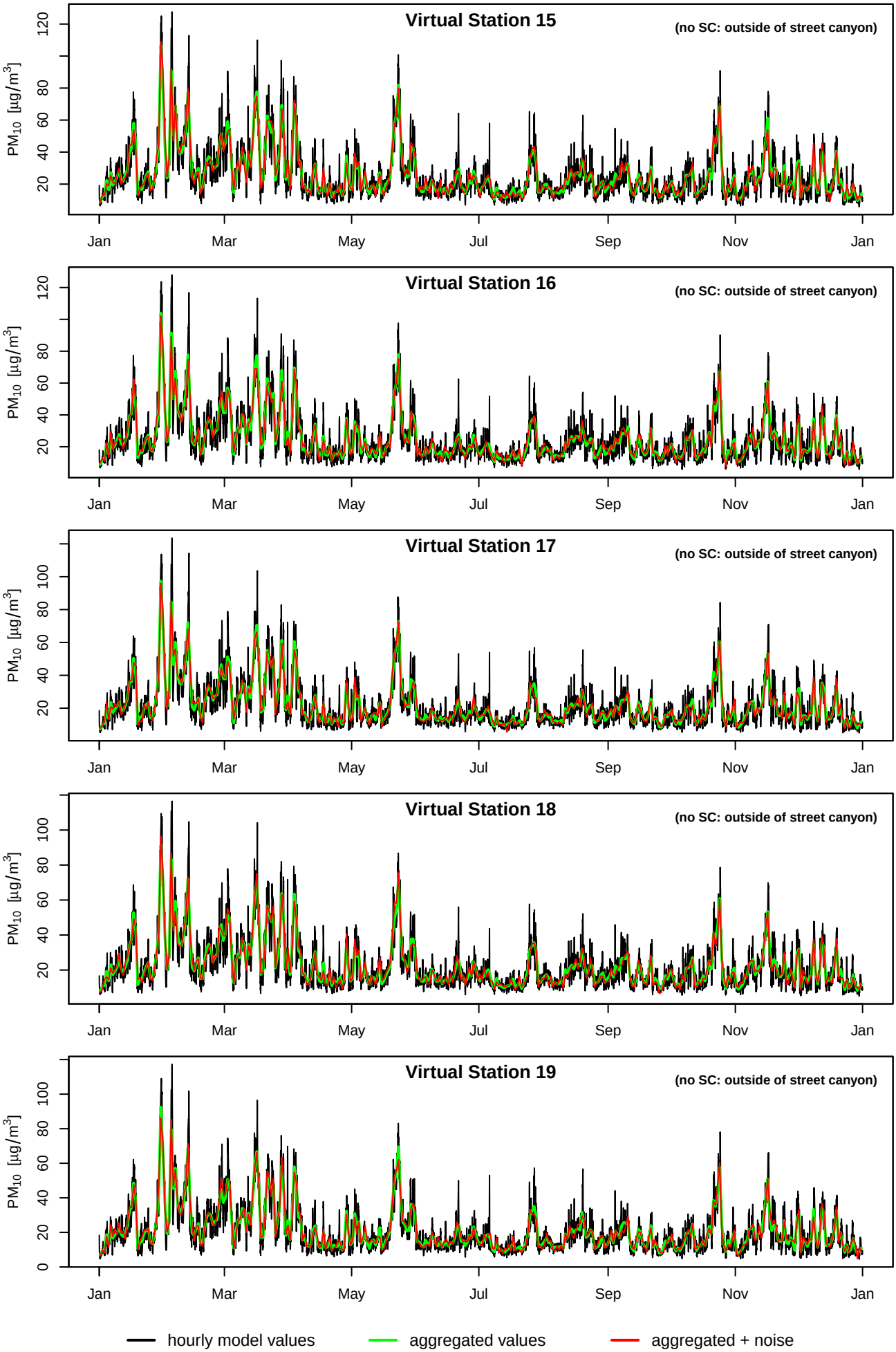

Virtual Station 335
(no SC: outside of street canyon)
Virtual Station 336
(SC: inside street canyon)
Virtual Station 337
(no SC: outside of street canyon)
Virtual Station 338
(no SC: outside of street canyon)
Virtual Station 339
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

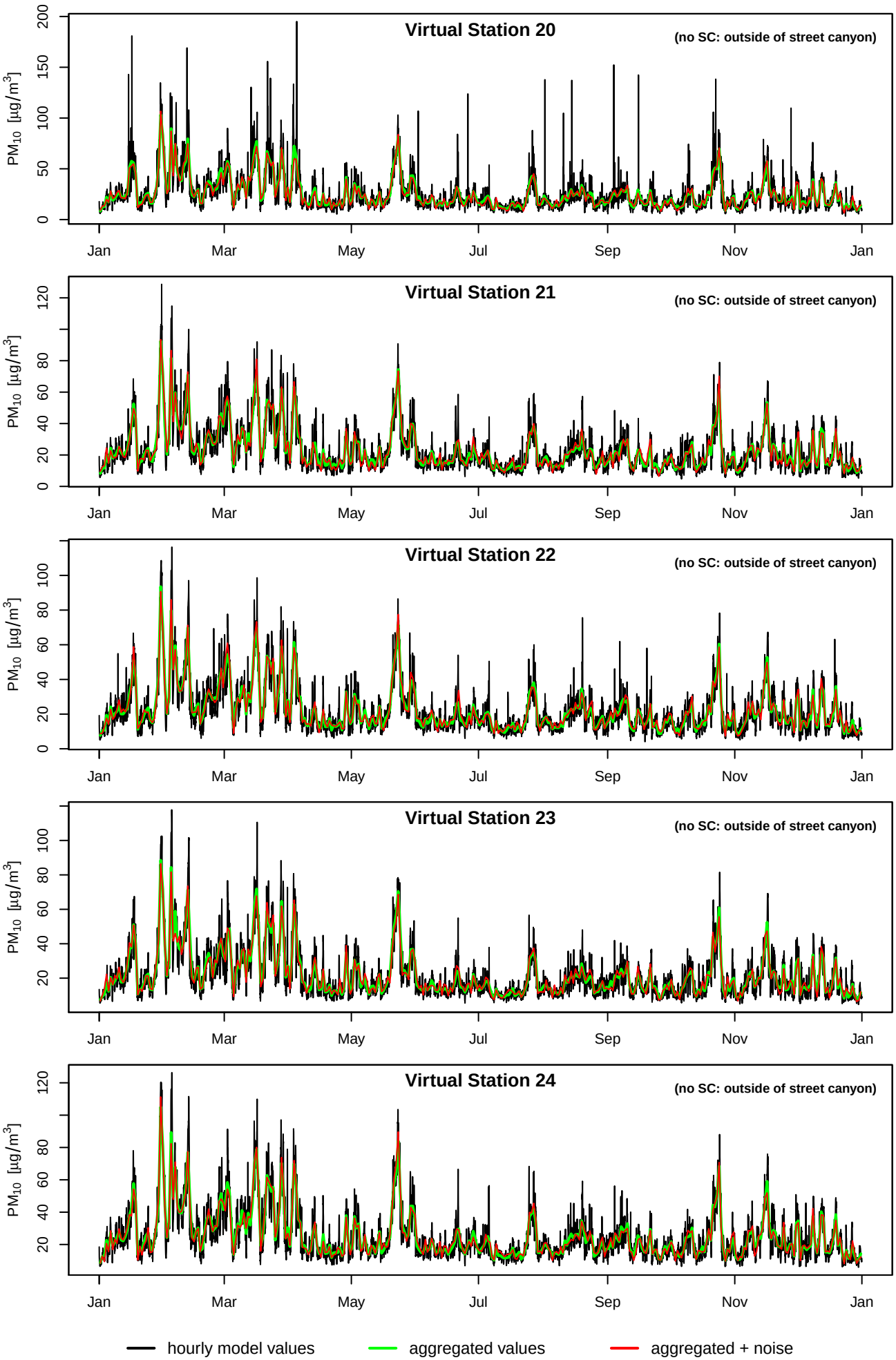

Virtual Station 340
(no SC: outside of street canyon)
O3 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan

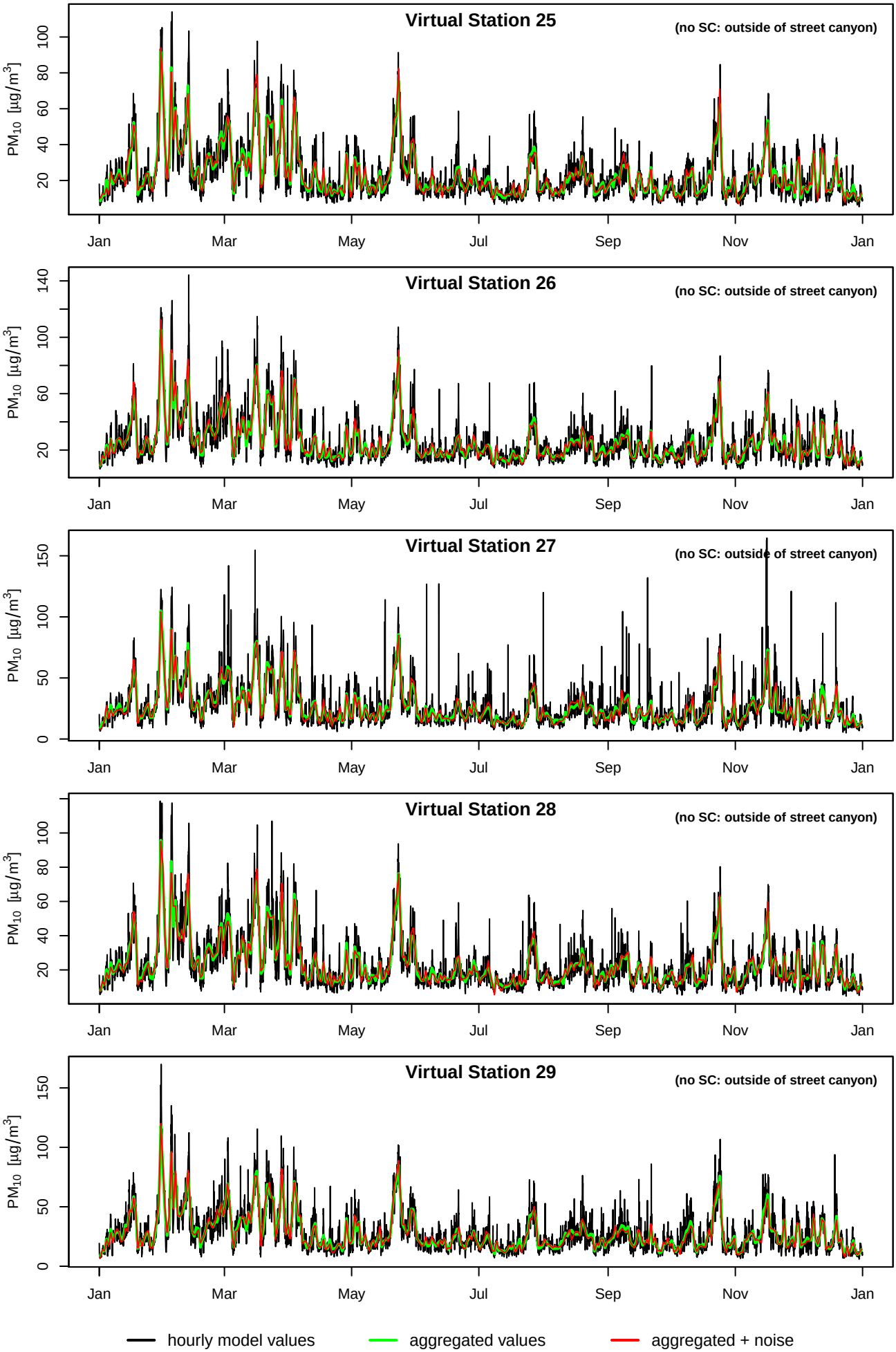

Virtual Station 0
(no SC: outside of street canyon)
Virtual Station 1
(no SC: outside of street canyon)
Virtual Station 2
(no SC: outside of street canyon)
Virtual Station 3
(no SC: outside of street canyon)
Virtual Station 4
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

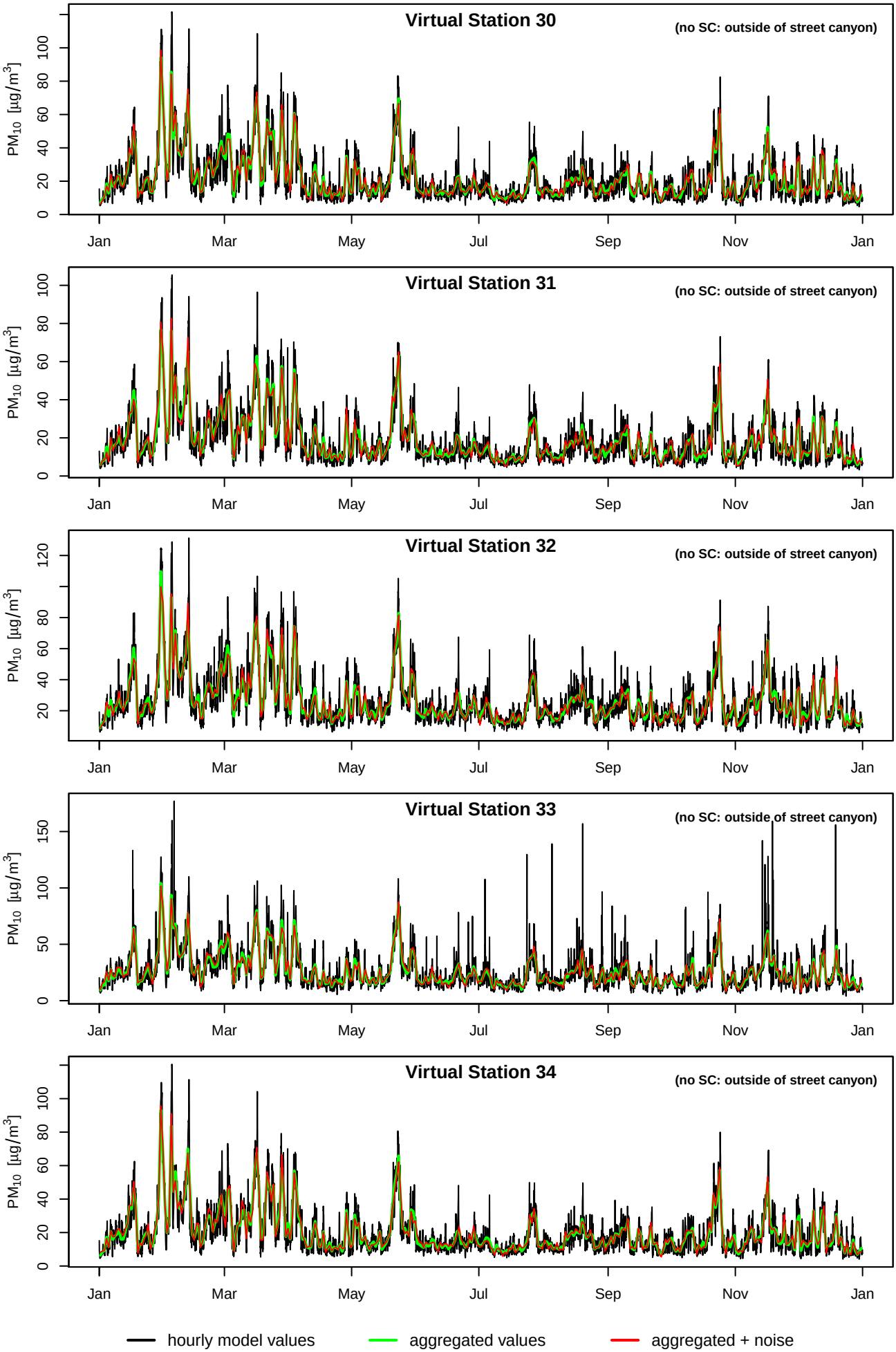

Virtual Station 5
(no SC: outside of street canyon)
Virtual Station 6
(no SC: outside of street canyon)
Virtual Station 7
(no SC: outside of street canyon)
Virtual Station 8
(no SC: outside of street canyon)
Virtual Station 9
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

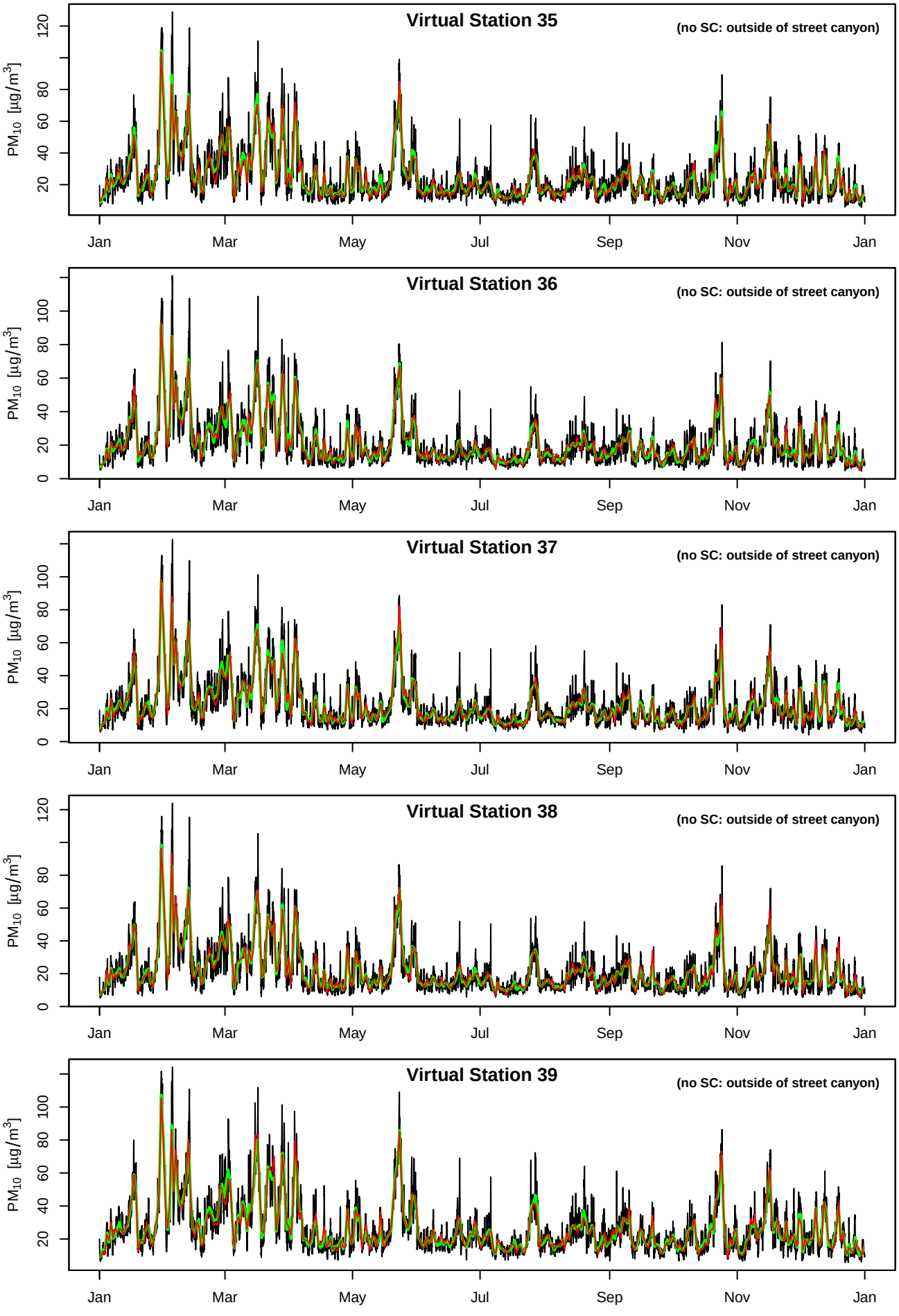

Virtual Station 10
(no SC: outside of street canyon)
Virtual Station 11
(no SC: outside of street canyon)
Virtual Station 12
(no SC: outside of street canyon)
Virtual Station 13
(no SC: outside of street canyon)
Virtual Station 14
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

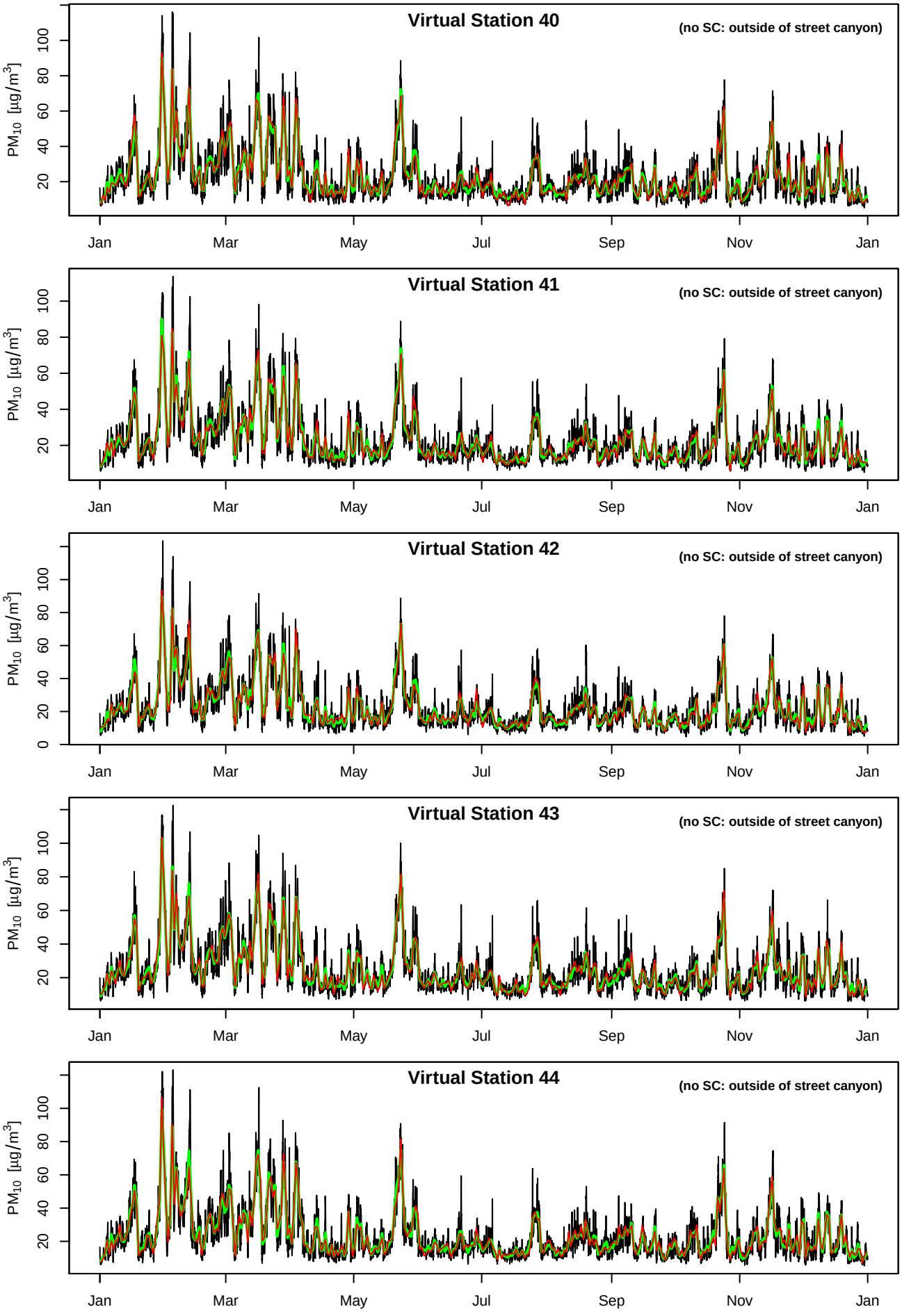

Virtual Station 15
(no SC: outside of street canyon)
Virtual Station 16
(no SC: outside of street canyon)
Virtual Station 17
(no SC: outside of street canyon)
Virtual Station 18
(no SC: outside of street canyon)
Virtual Station 19
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

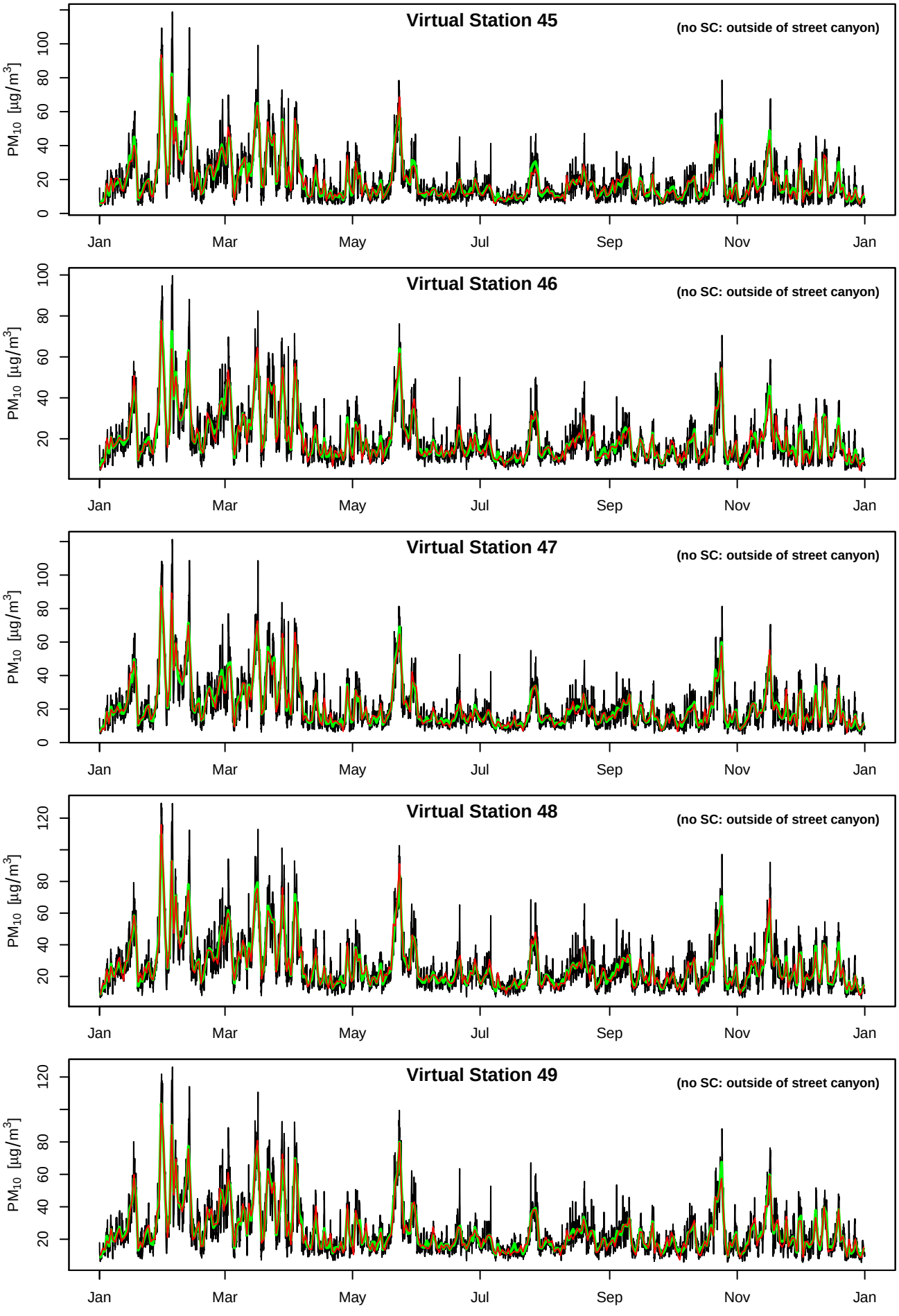

Virtual Station 20
(no SC: outside of street canyon)
Virtual Station 21
(no SC: outside of street canyon)
Virtual Station 22
(no SC: outside of street canyon)
Virtual Station 23
(no SC: outside of street canyon)
Virtual Station 24
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

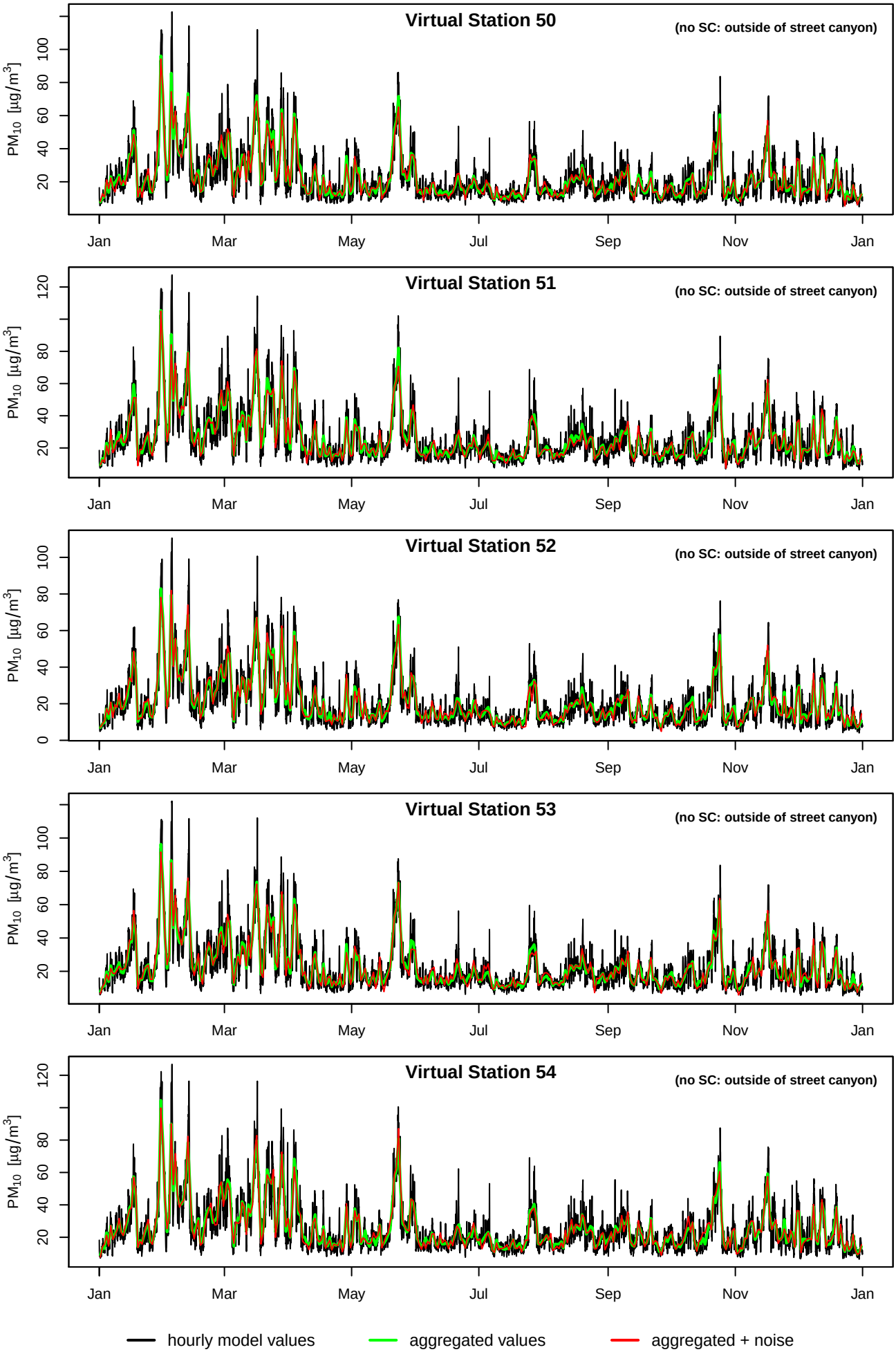

Virtual Station 25
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 26
(no SC: outside of street canyon)
PM10 [µg/m3]
20
60
100
140
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 27
(no SC: outside of street canyon)
PM10 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 28
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
100
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 29
(no SC: outside of street canyon)
PM10 [µg/m3]
0
50
100
150
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

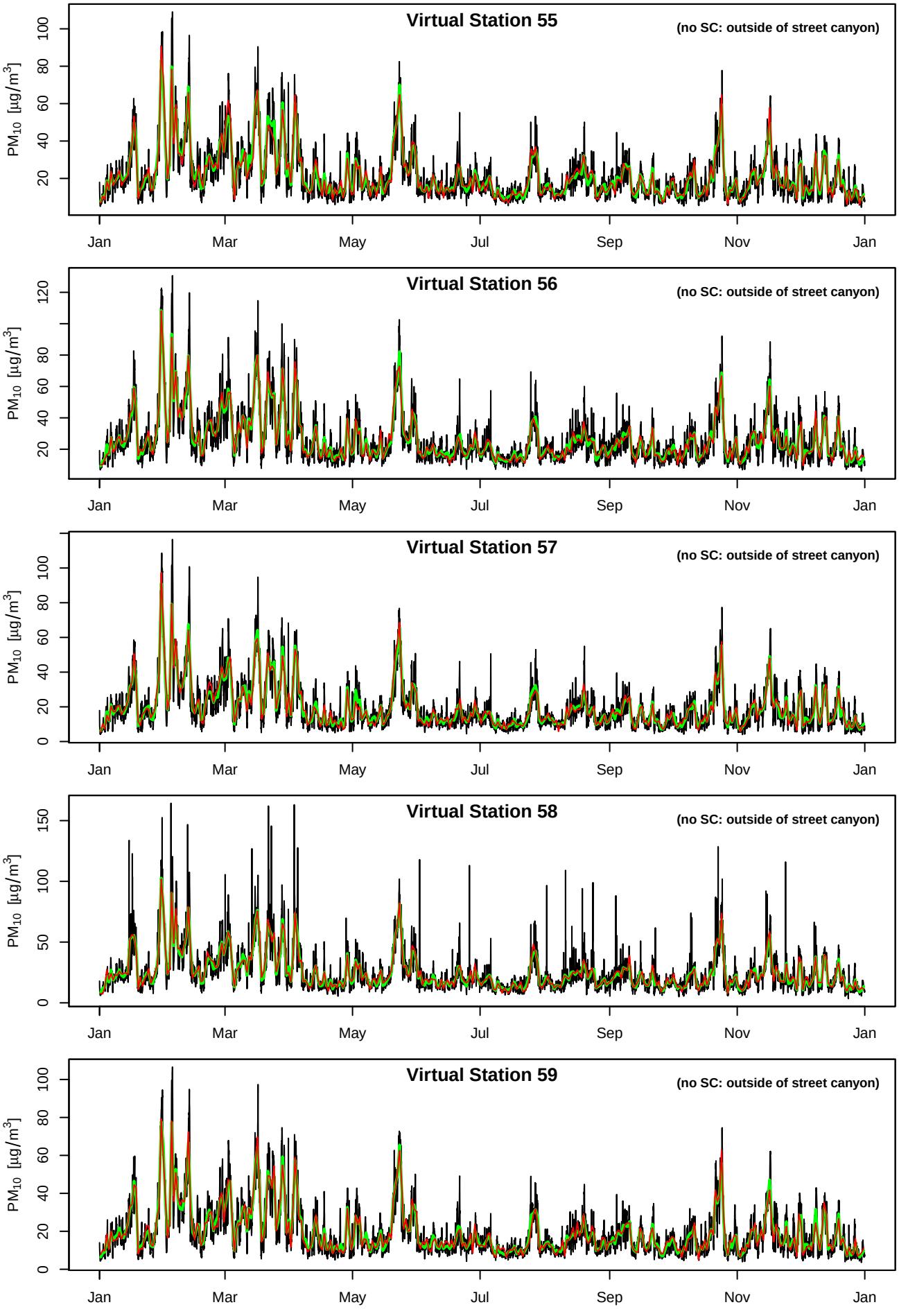

Virtual Station 30
(no SC: outside of street canyon)
PM10 [µg/m3]
0 20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 31
(no SC: outside of street canyon)
PM10 [µg/m3]
0 20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 32
(no SC: outside of street canyon)
PM10 [µg/m3]
20 40 60 80 120
Jan Mar May Jul Sep Nov Jan
Virtual Station 33
(no SC: outside of street canyon)
PM10 [µg/m3]
0 50 100 150
Jan Mar May Jul Sep Nov Jan
Virtual Station 34
(no SC: outside of street canyon)
PM10 [µg/m3]
0 20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
hourly model values
aggregated values
aggregated + noise

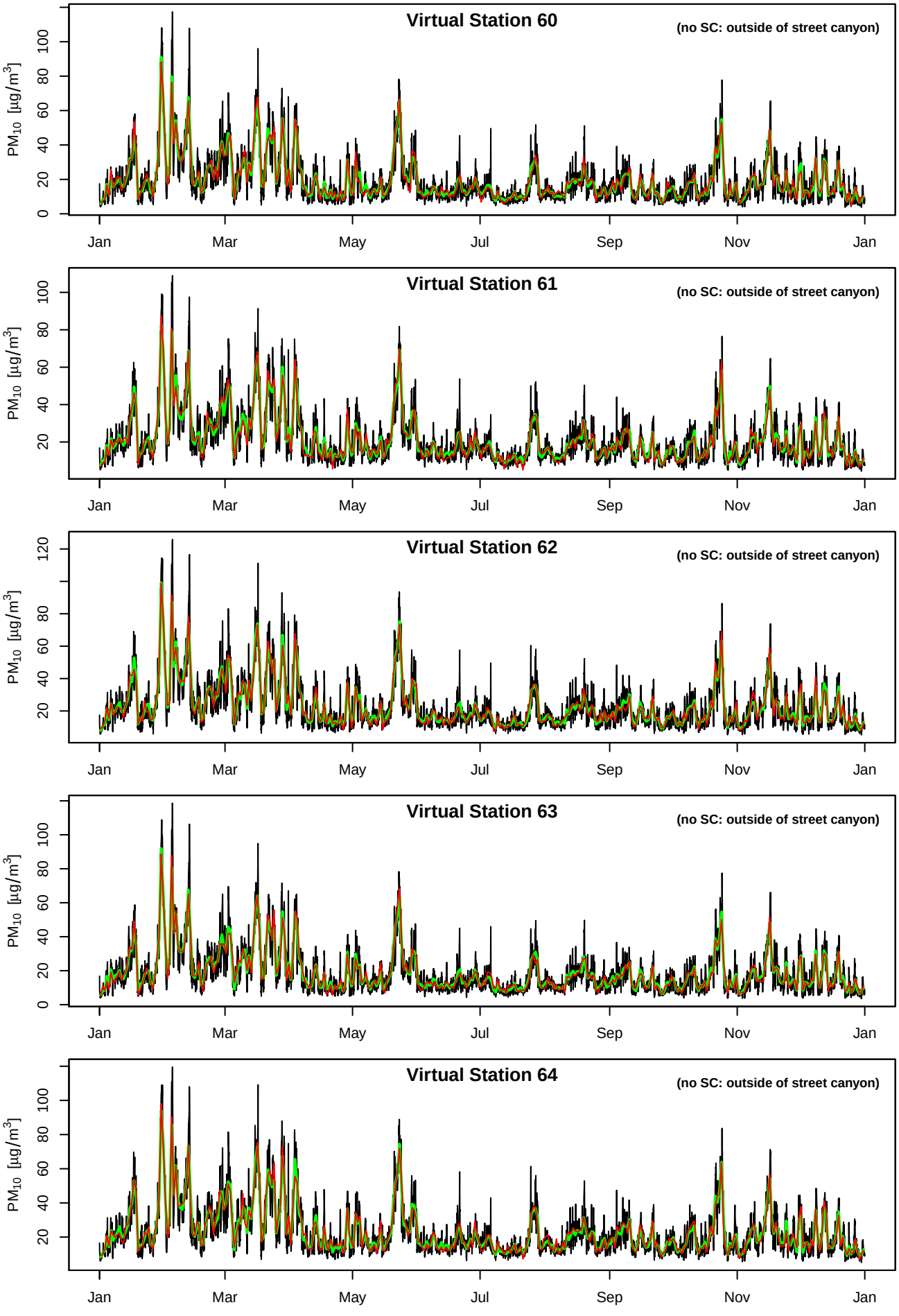

Virtual Station 35
(no SC: outside of street canyon)
Virtual Station 36
(no SC: outside of street canyon)
Virtual Station 37
(no SC: outside of street canyon)
Virtual Station 38
(no SC: outside of street canyon)
Virtual Station 39
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

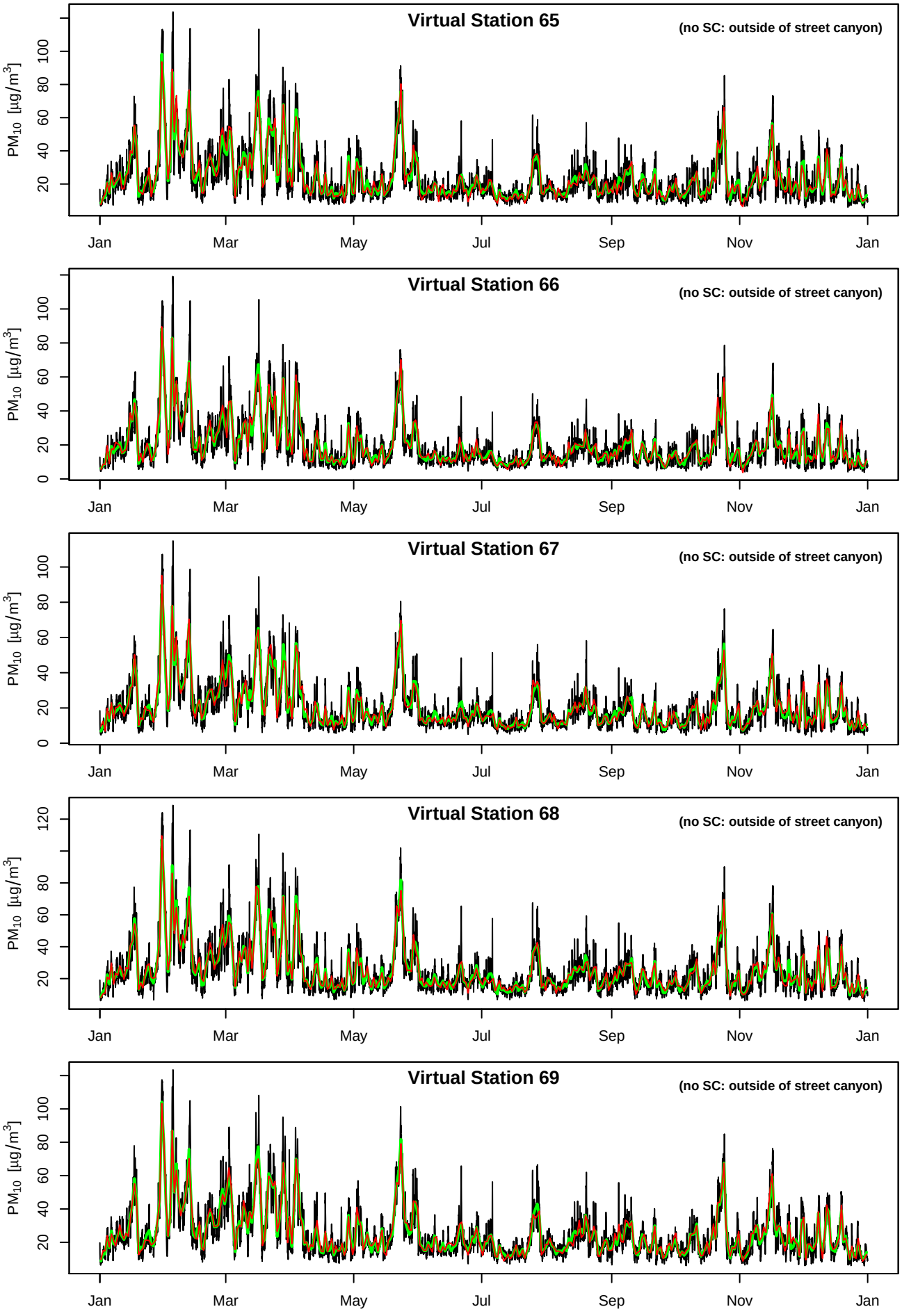

Virtual Station 40
(no SC: outside of street canyon)
Virtual Station 41
(no SC: outside of street canyon)
Virtual Station 42
(no SC: outside of street canyon)
Virtual Station 43
(no SC: outside of street canyon)
Virtual Station 44
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

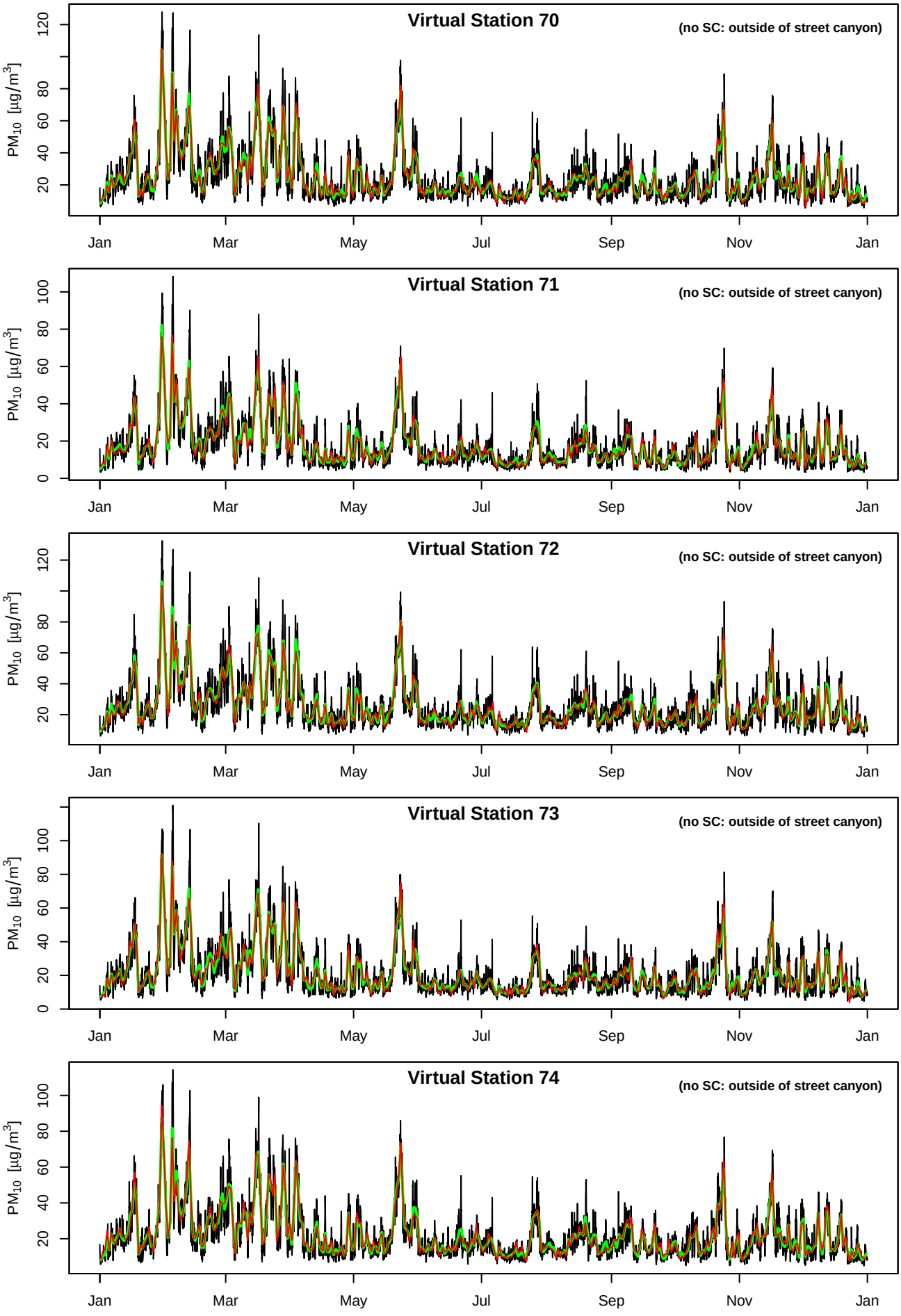

Virtual Station 45
(no SC: outside of street canyon)
Virtual Station 46
(no SC: outside of street canyon)
Virtual Station 47
(no SC: outside of street canyon)
Virtual Station 48
(no SC: outside of street canyon)
Virtual Station 49
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

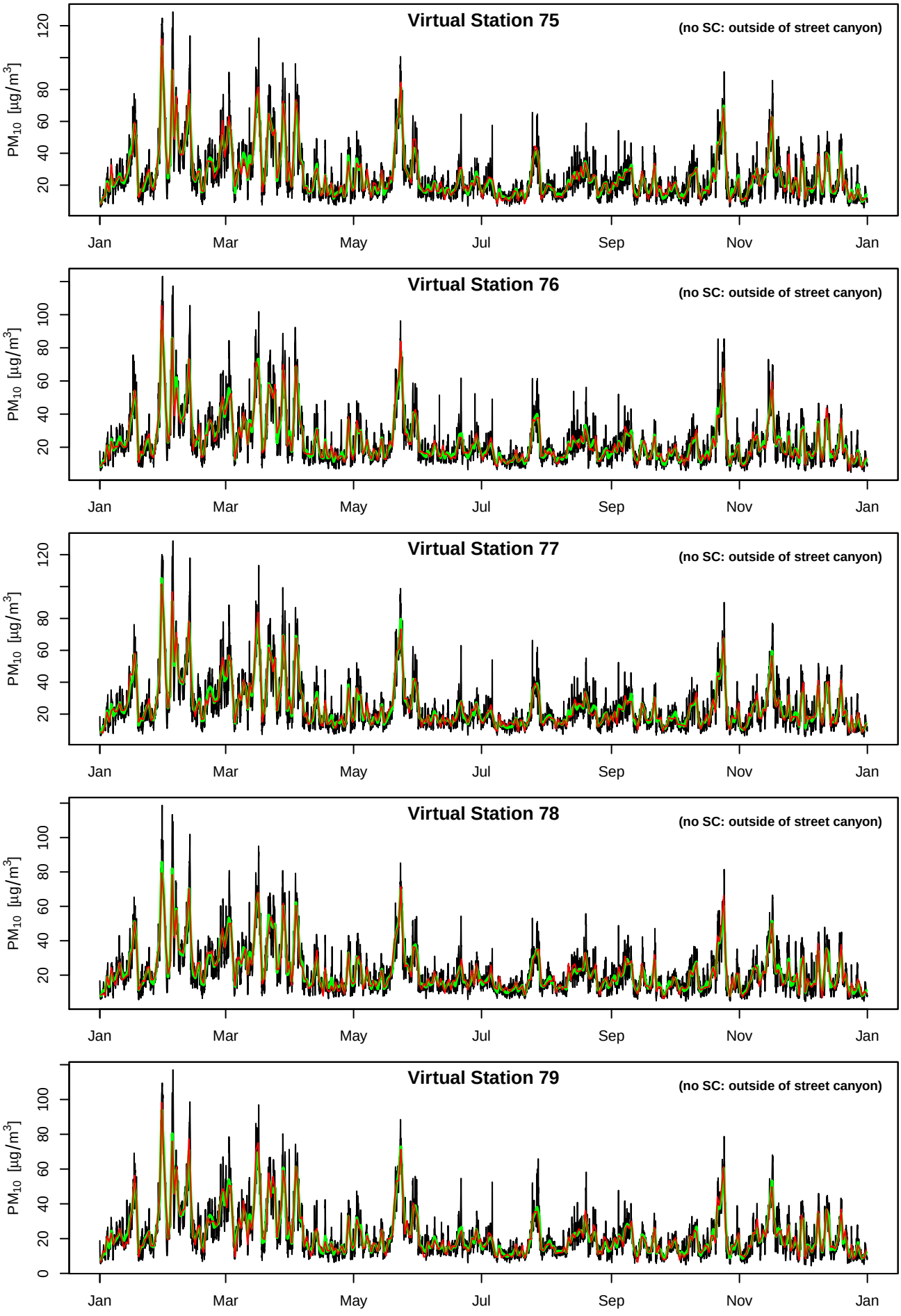

Virtual Station 50
(no SC: outside of street canyon)
Virtual Station 51
(no SC: outside of street canyon)
Virtual Station 52
(no SC: outside of street canyon)
Virtual Station 53
(no SC: outside of street canyon)
Virtual Station 54
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

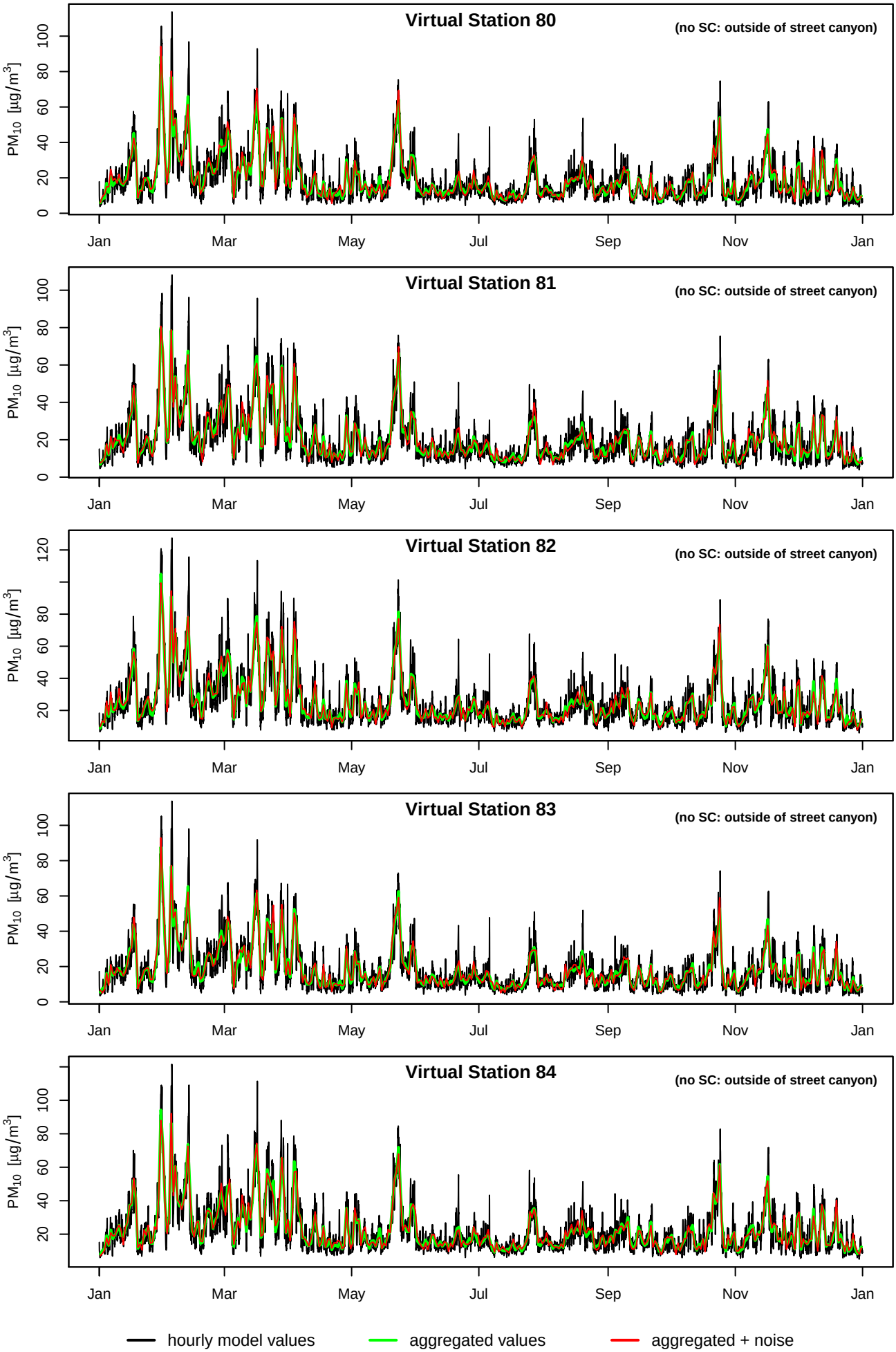

Virtual Station 55
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
Virtual Station 56
(no SC: outside of street canyon)
Virtual Station 57
(no SC: outside of street canyon)
Virtual Station 58
(no SC: outside of street canyon)
Virtual Station 59
(no SC: outside of street canyon)
hourly model values
aggregated values
aggregated + noise

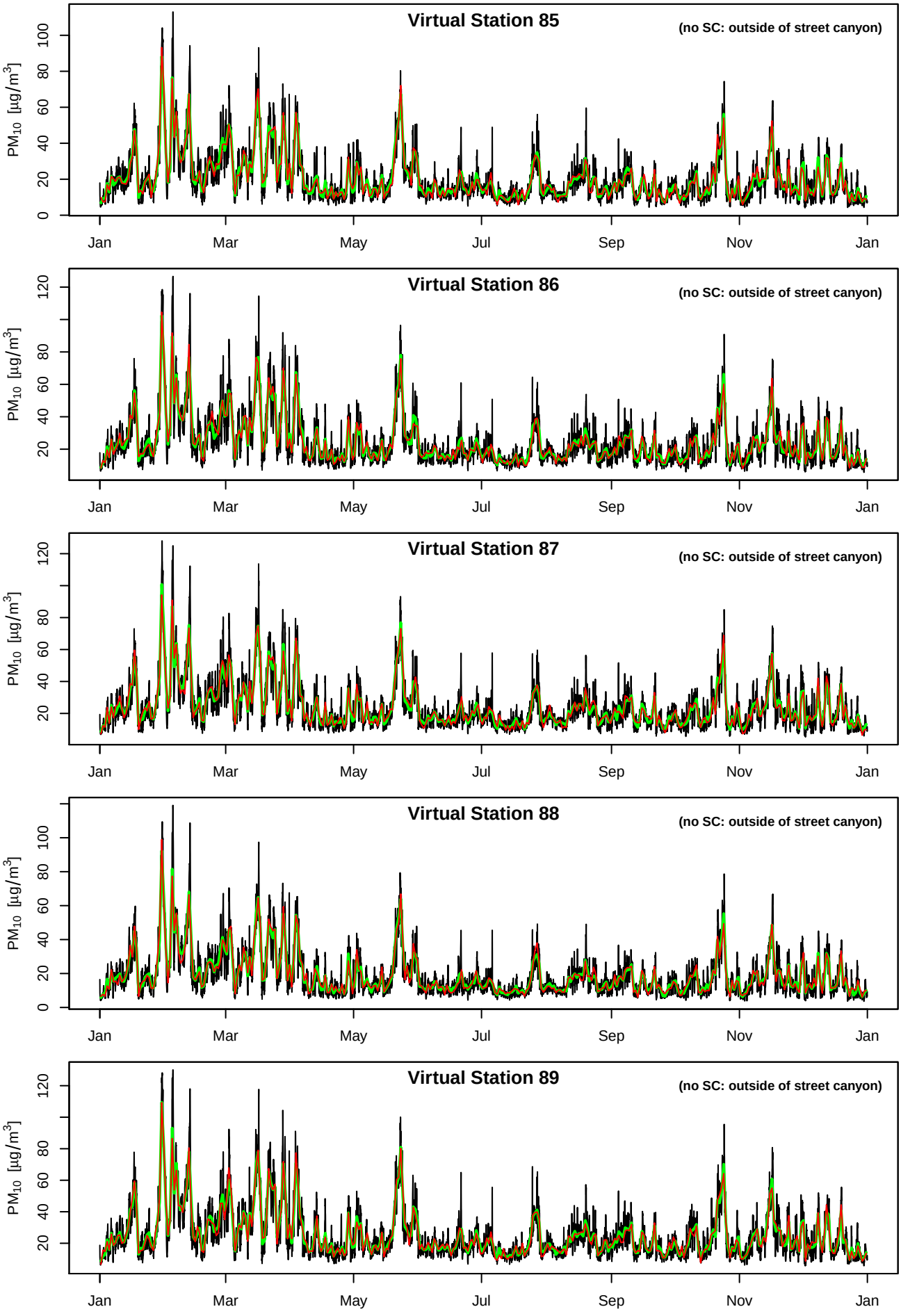

Virtual Station 60
(no SC: outside of street canyon)
Virtual Station 61
(no SC: outside of street canyon)
Virtual Station 62
(no SC: outside of street canyon)
Virtual Station 63
(no SC: outside of street canyon)
Virtual Station 64
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

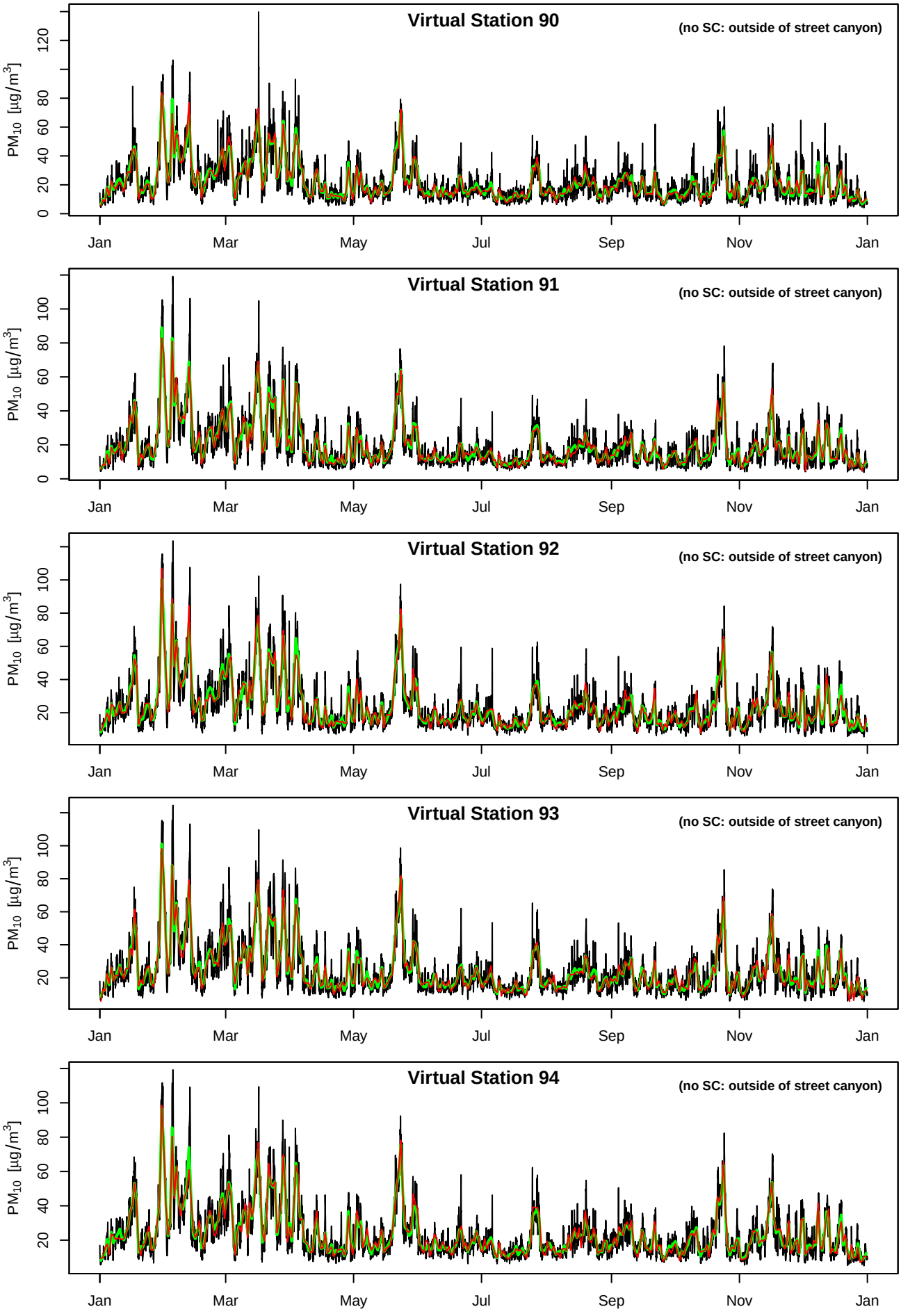

Virtual Station 65
(no SC: outside of street canyon)
Virtual Station 66
(no SC: outside of street canyon)
Virtual Station 67
(no SC: outside of street canyon)
Virtual Station 68
(no SC: outside of street canyon)
Virtual Station 69
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

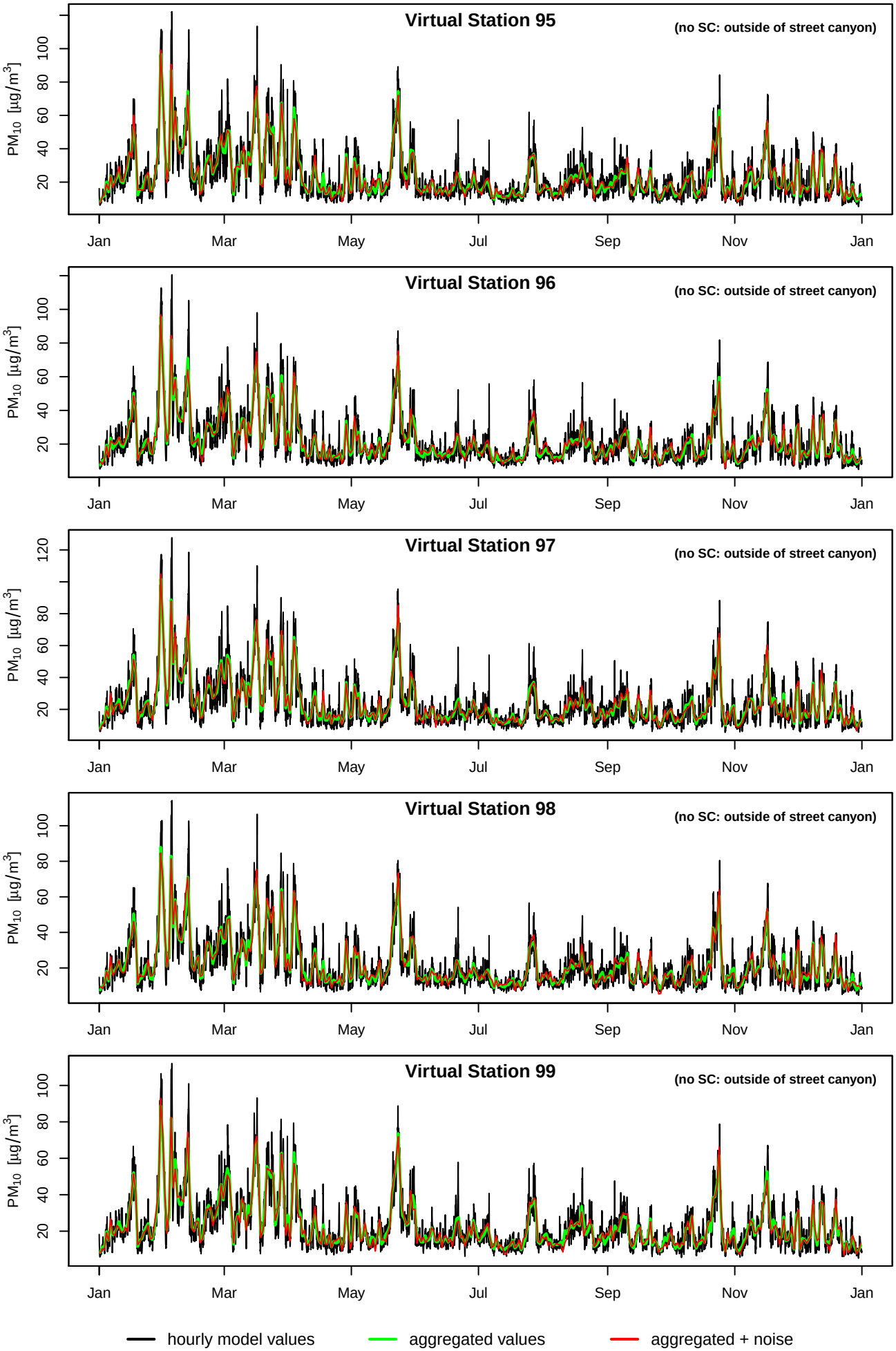

Virtual Station 70
(no SC: outside of street canyon)
Virtual Station 71
(no SC: outside of street canyon)
Virtual Station 72
(no SC: outside of street canyon)
Virtual Station 73
(no SC: outside of street canyon)
Virtual Station 74
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

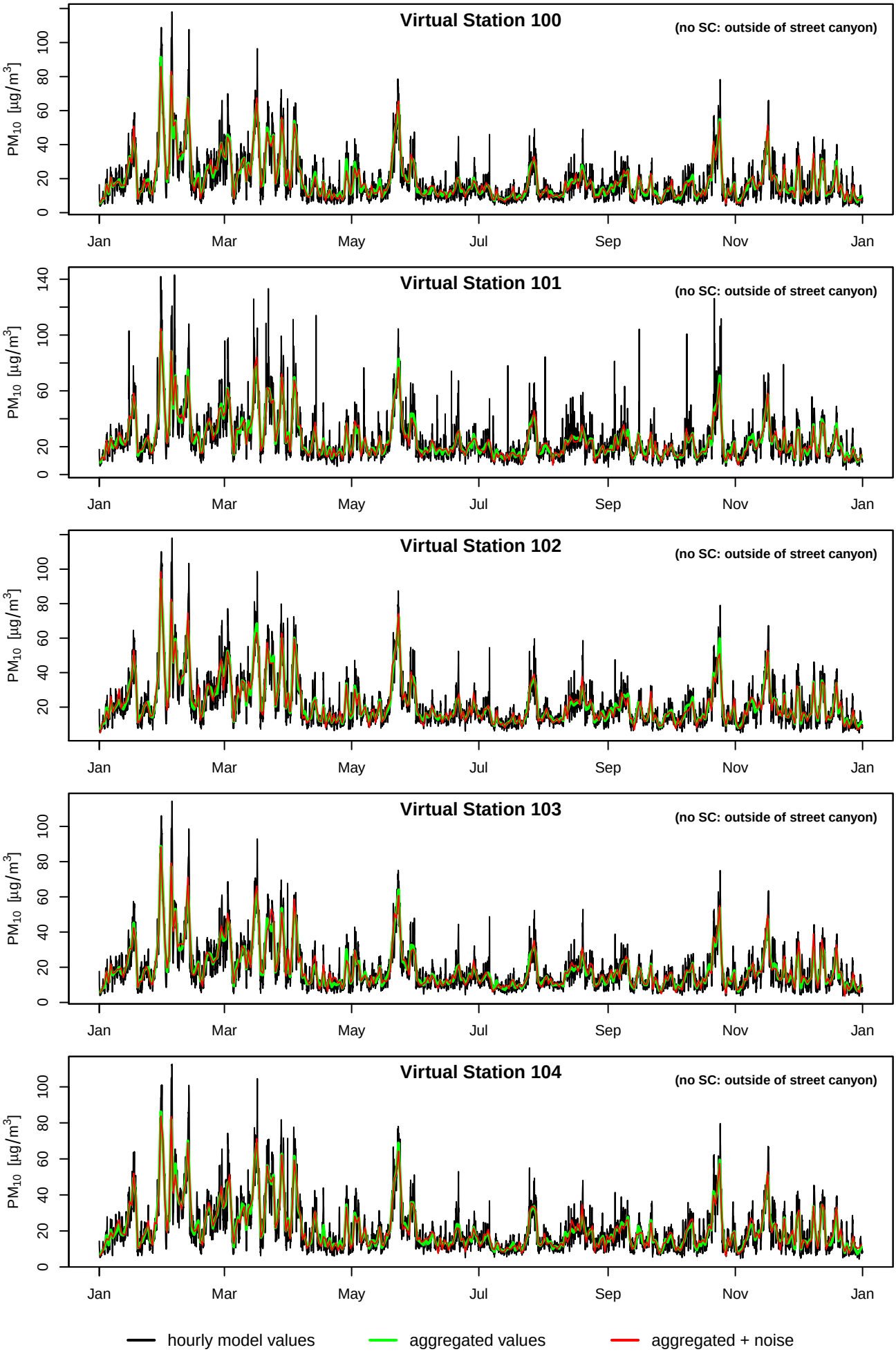

Virtual Station 75
(no SC: outside of street canyon)
Virtual Station 76
(no SC: outside of street canyon)
Virtual Station 77
(no SC: outside of street canyon)
Virtual Station 78
(no SC: outside of street canyon)
Virtual Station 79
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

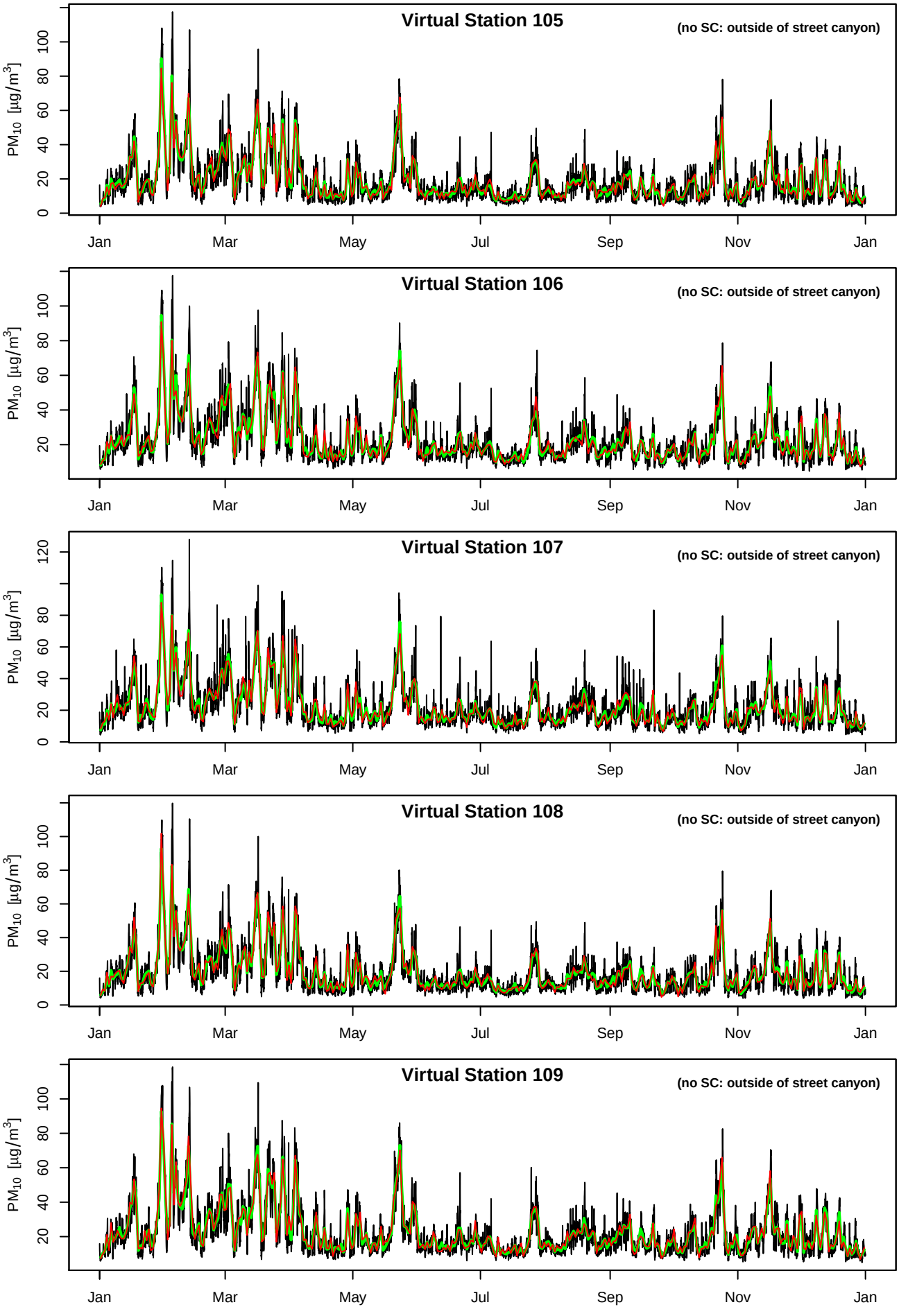

Virtual Station 80
(no SC: outside of street canyon)
Virtual Station 81
(no SC: outside of street canyon)
Virtual Station 82
(no SC: outside of street canyon)
Virtual Station 83
(no SC: outside of street canyon)
Virtual Station 84
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

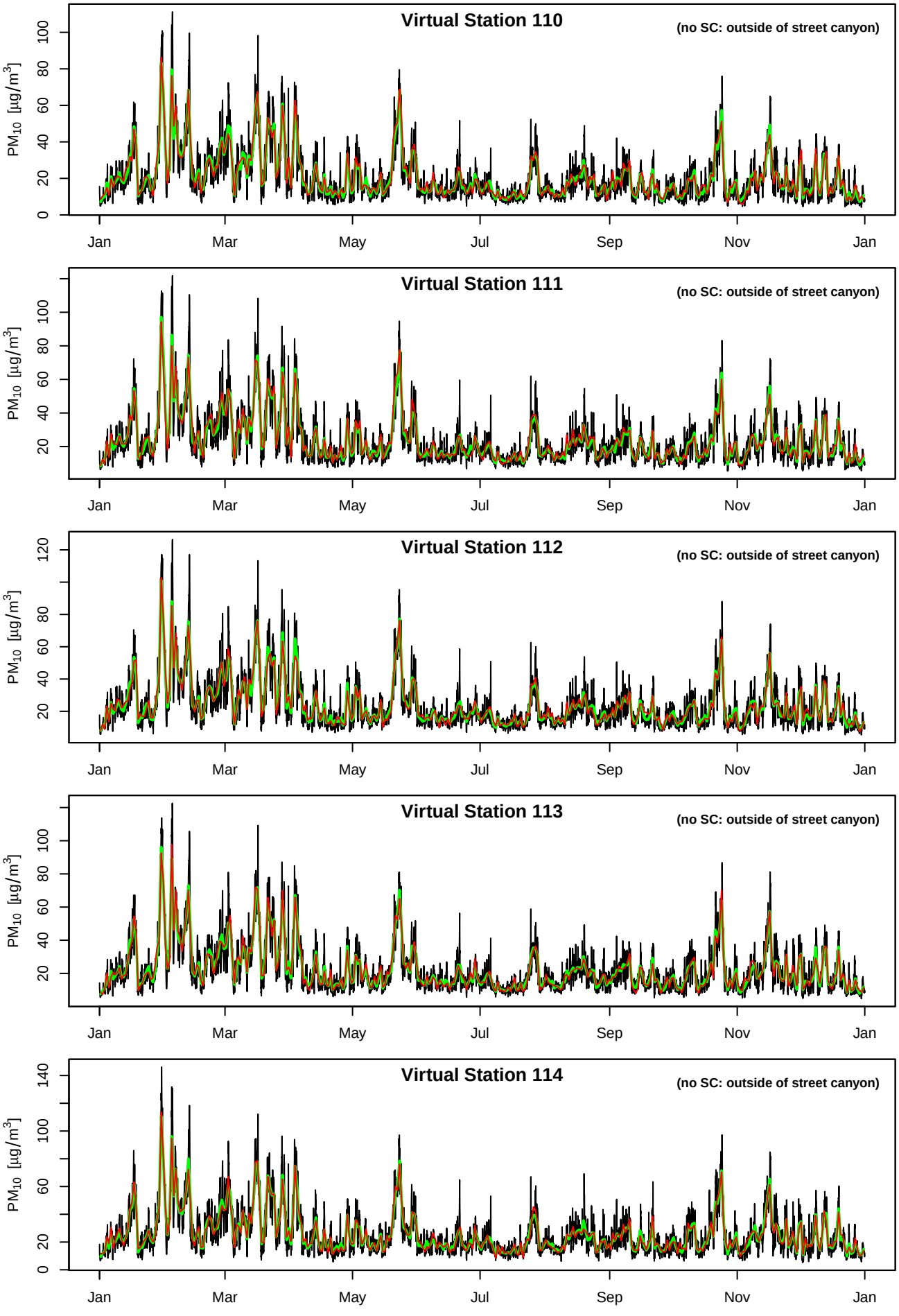

Virtual Station 85
(no SC: outside of street canyon)
Virtual Station 86
(no SC: outside of street canyon)
Virtual Station 87
(no SC: outside of street canyon)
Virtual Station 88
(no SC: outside of street canyon)
Virtual Station 89
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

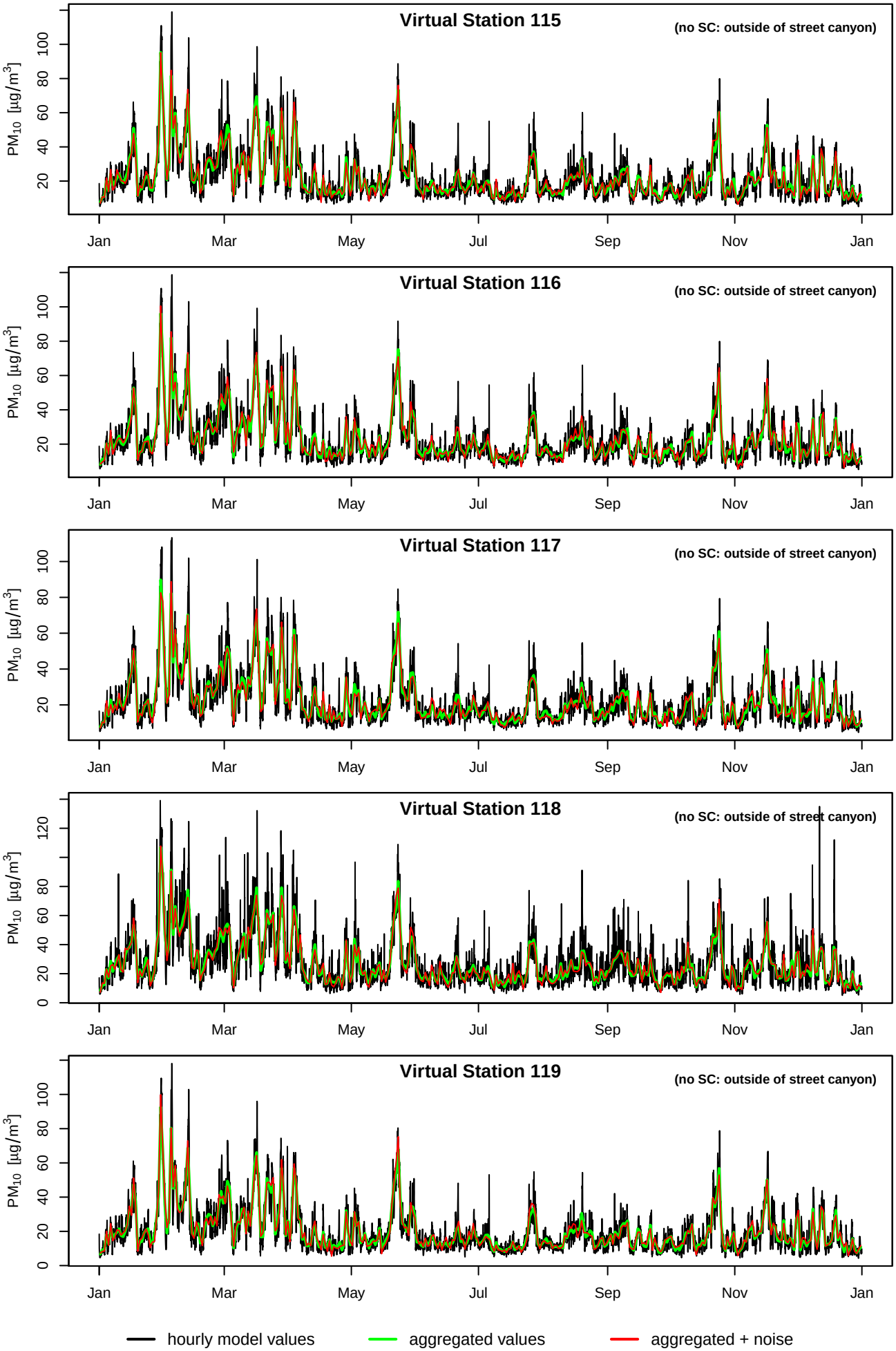

Virtual Station 90
(no SC: outside of street canyon)
Virtual Station 91
(no SC: outside of street canyon)
Virtual Station 92
(no SC: outside of street canyon)
Virtual Station 93
(no SC: outside of street canyon)
Virtual Station 94
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

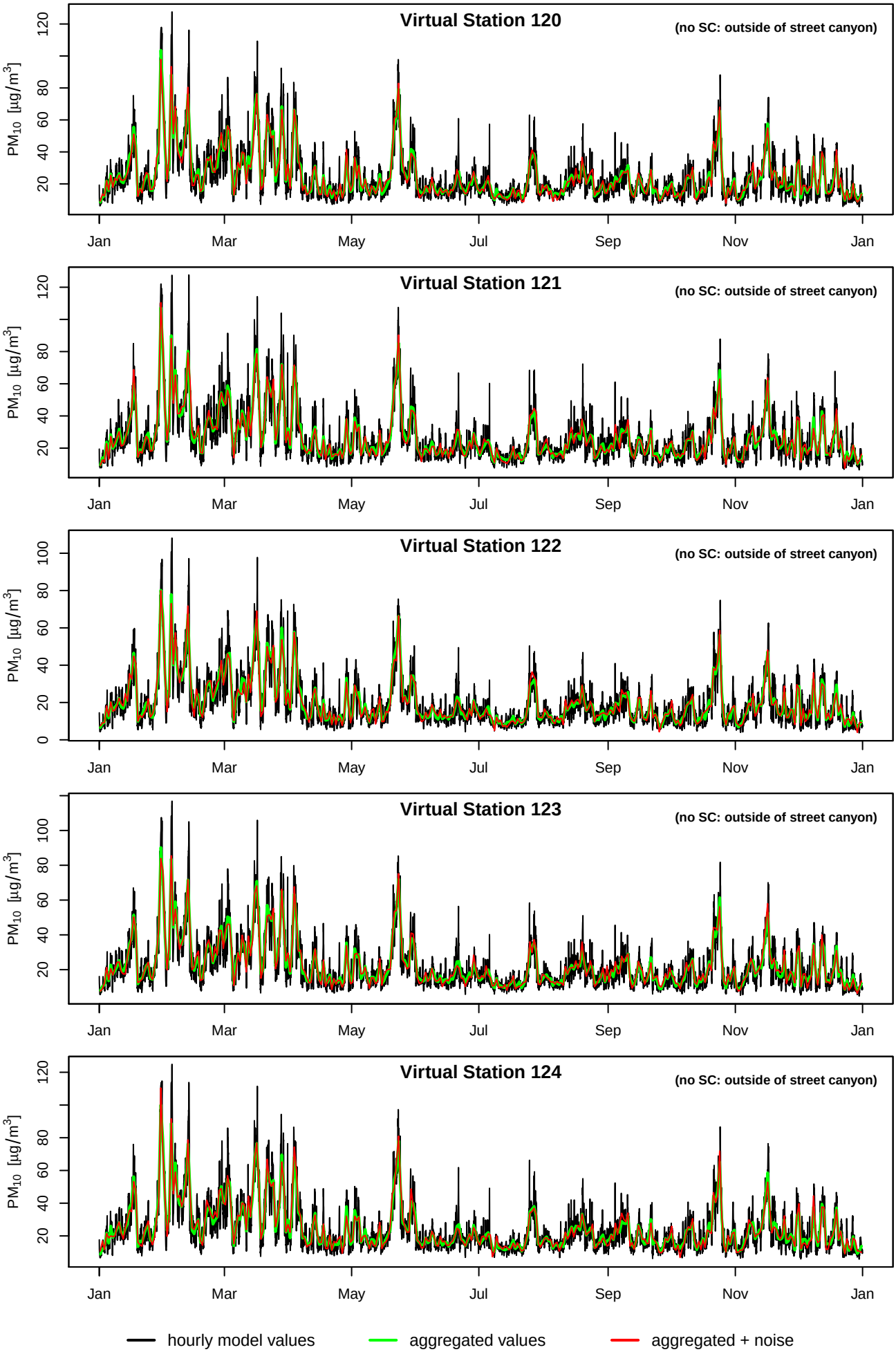

Virtual Station 95
(no SC: outside of street canyon)
Virtual Station 96
(no SC: outside of street canyon)
Virtual Station 97
(no SC: outside of street canyon)
Virtual Station 98
(no SC: outside of street canyon)
Virtual Station 99
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

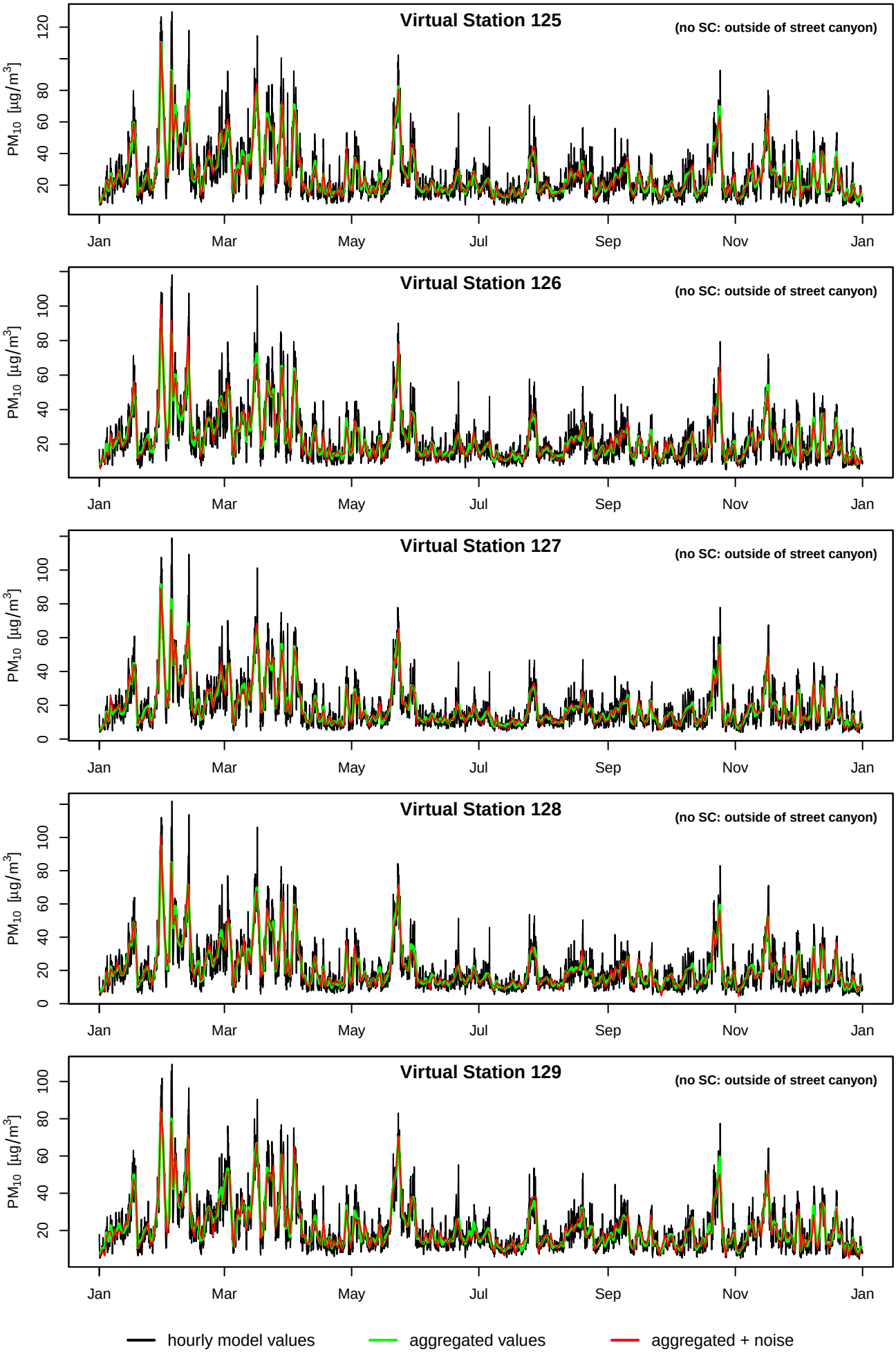

Virtual Station 100
(no SC: outside of street canyon)
Virtual Station 101
(no SC: outside of street canyon)
Virtual Station 102
(no SC: outside of street canyon)
Virtual Station 103
(no SC: outside of street canyon)
Virtual Station 104
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

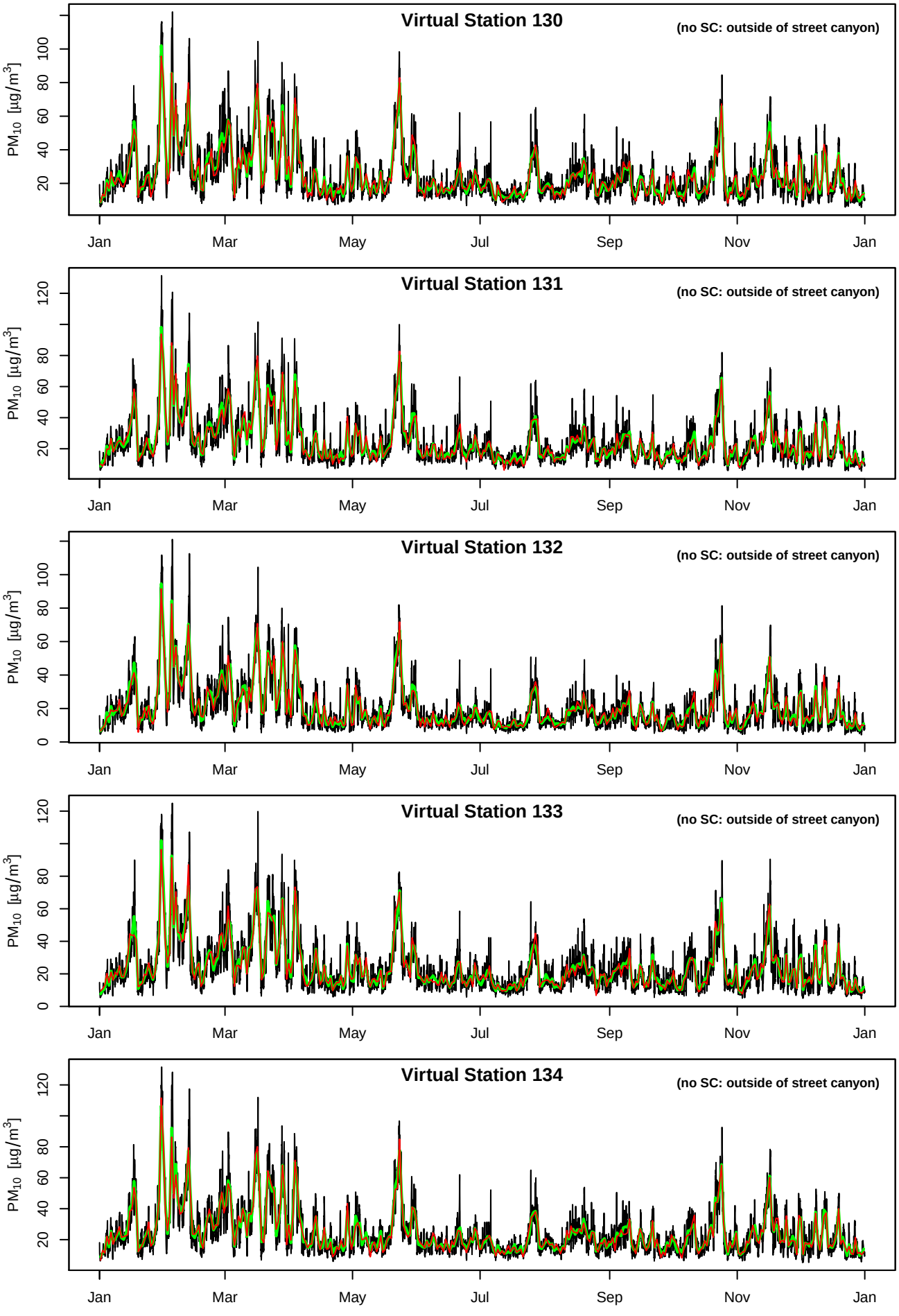

Virtual Station 105
(no SC: outside of street canyon)
Virtual Station 106
(no SC: outside of street canyon)
Virtual Station 107
(no SC: outside of street canyon)
Virtual Station 108
(no SC: outside of street canyon)
Virtual Station 109
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

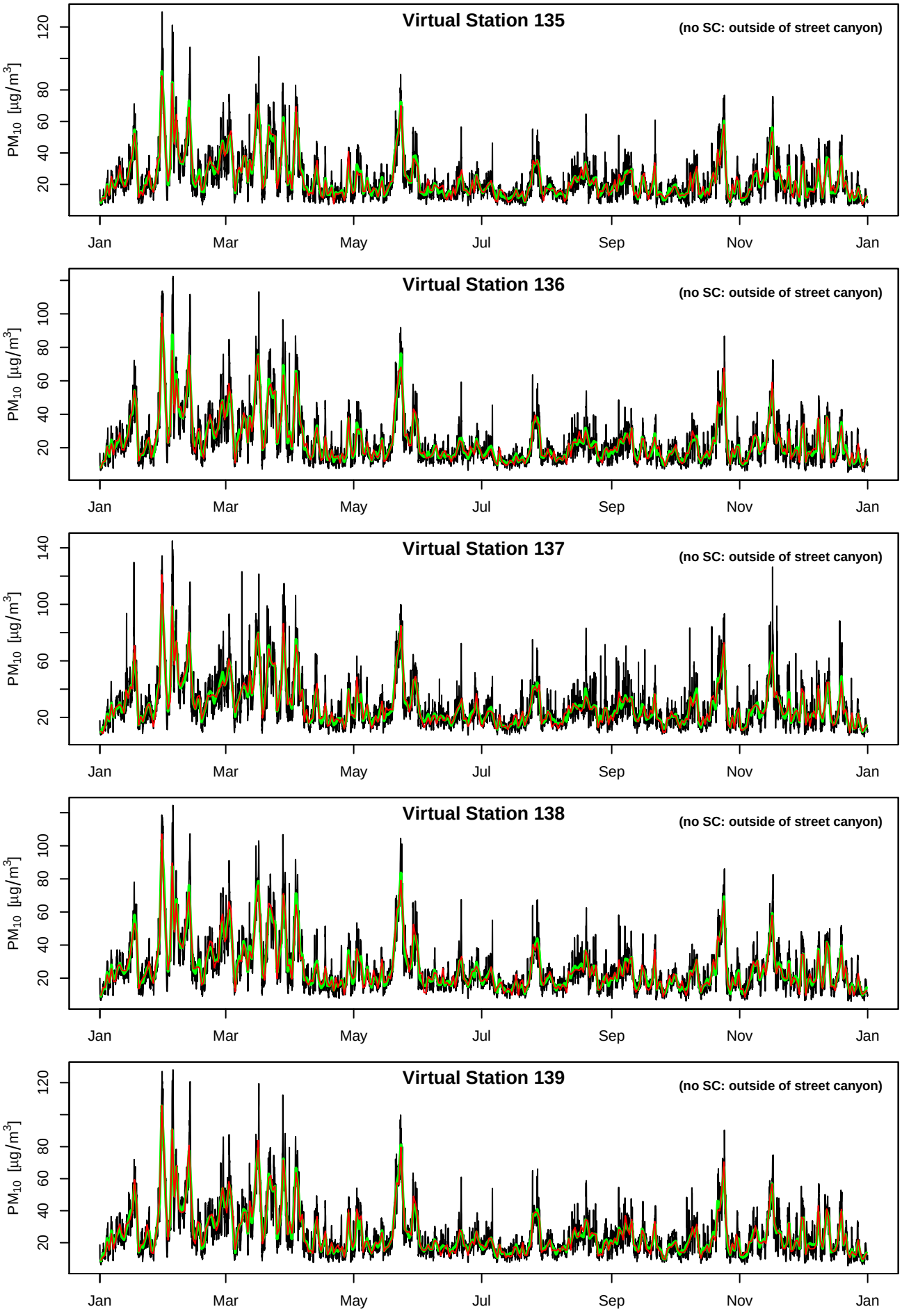

Virtual Station 110
(no SC: outside of street canyon)
Virtual Station 111
(no SC: outside of street canyon)
Virtual Station 112
(no SC: outside of street canyon)
Virtual Station 113
(no SC: outside of street canyon)
Virtual Station 114
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

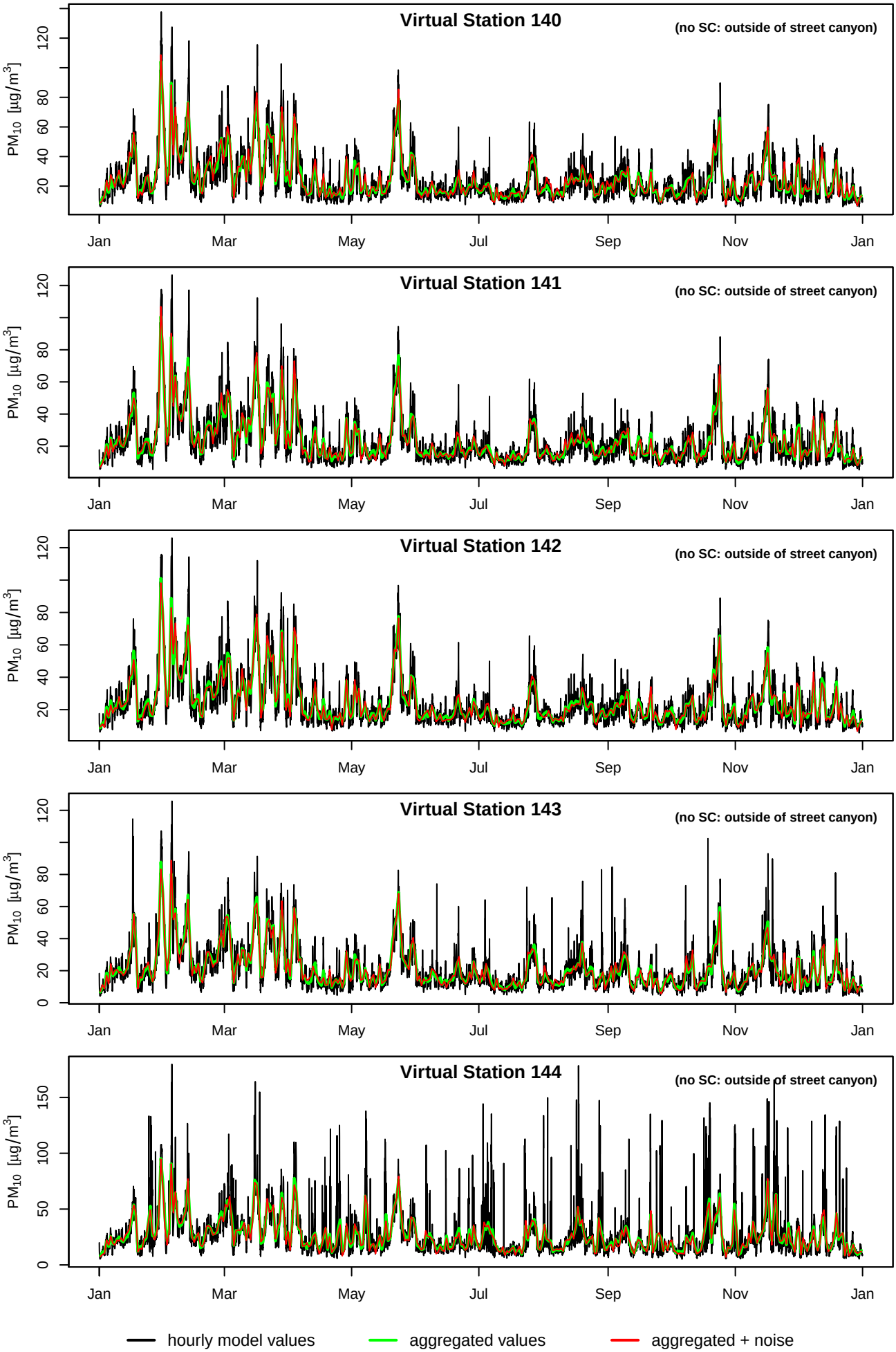

Virtual Station 115
(no SC: outside of street canyon)
Virtual Station 116
(no SC: outside of street canyon)
Virtual Station 117
(no SC: outside of street canyon)
Virtual Station 118
(no SC: outside of street canyon)
Virtual Station 119
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

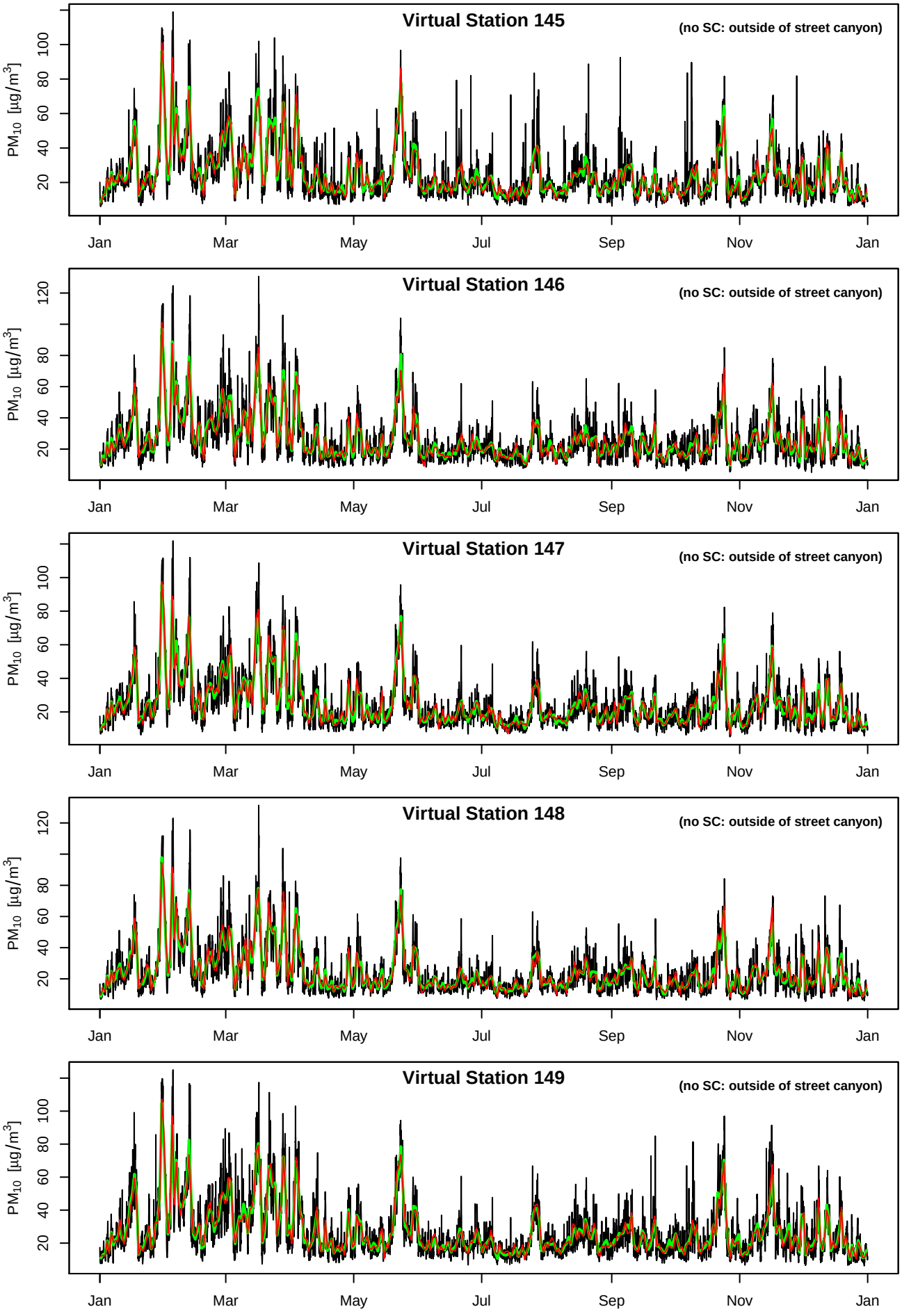

Virtual Station 120
(no SC: outside of street canyon)
Virtual Station 121
(no SC: outside of street canyon)
Virtual Station 122
(no SC: outside of street canyon)
Virtual Station 123
(no SC: outside of street canyon)
Virtual Station 124
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

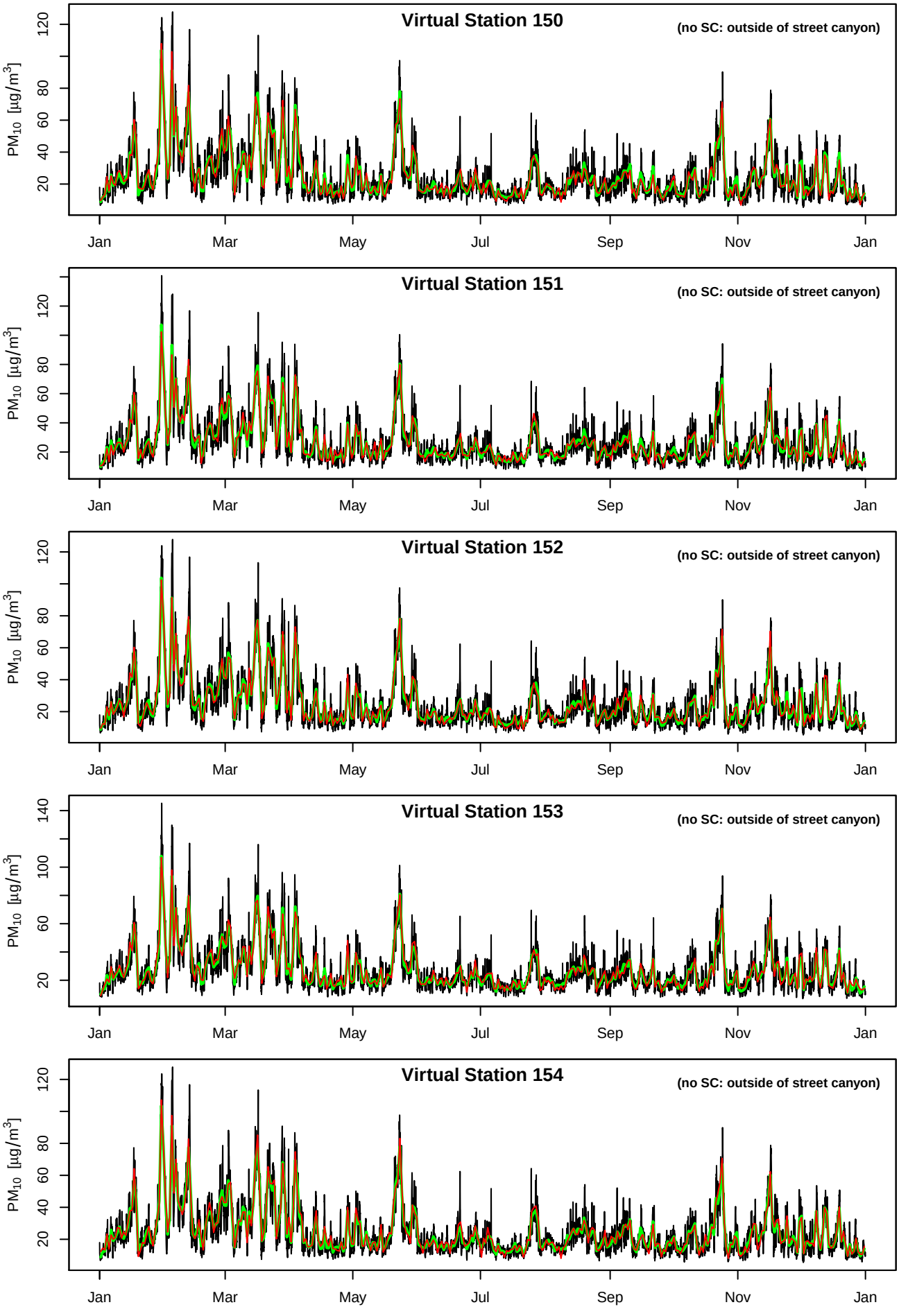

Virtual Station 125
(no SC: outside of street canyon)
Virtual Station 126
(no SC: outside of street canyon)
Virtual Station 127
(no SC: outside of street canyon)
Virtual Station 128
(no SC: outside of street canyon)
Virtual Station 129
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

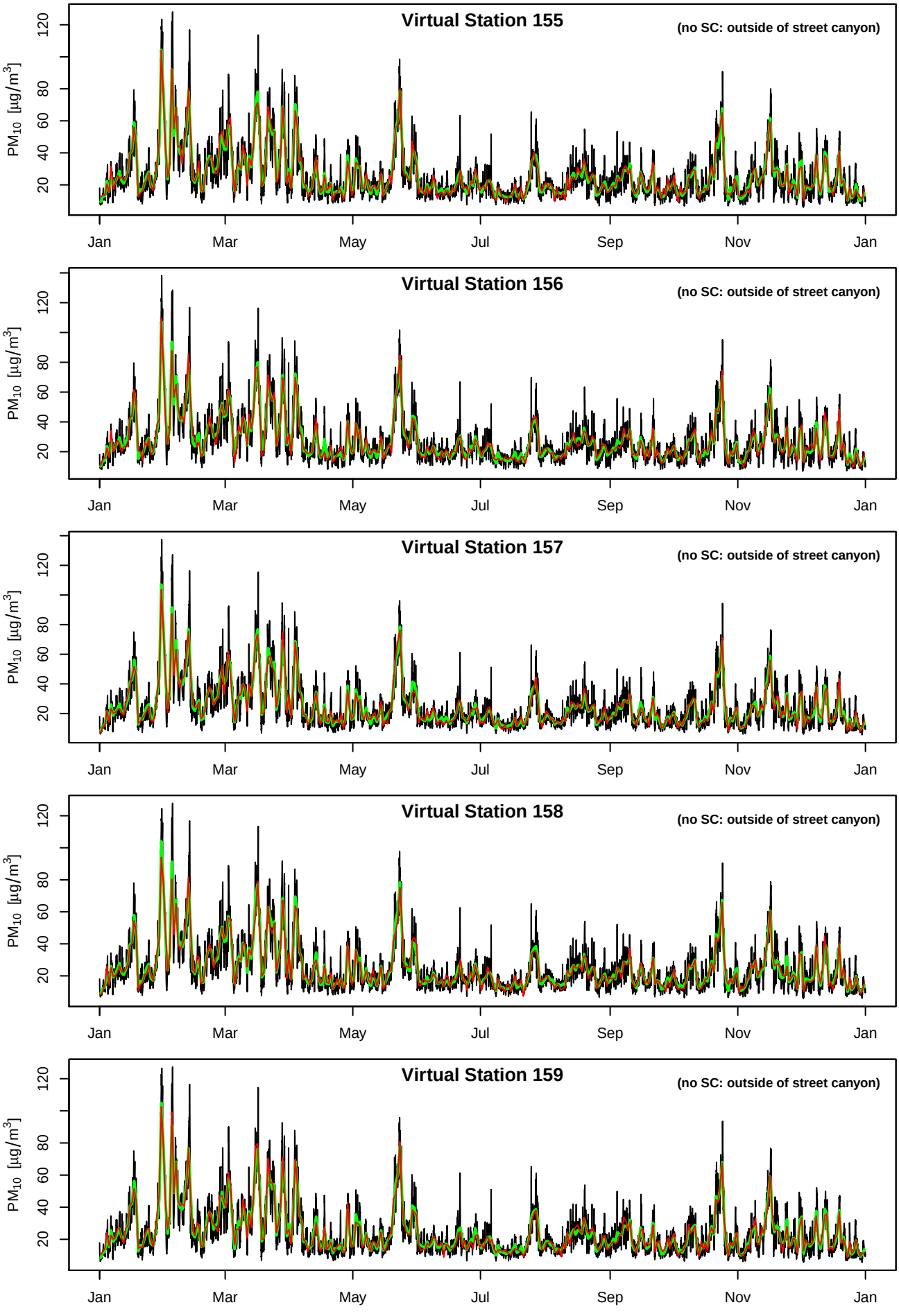

Virtual Station 130
(no SC: outside of street canyon)
Virtual Station 131
(no SC: outside of street canyon)
Virtual Station 132
(no SC: outside of street canyon)
Virtual Station 133
(no SC: outside of street canyon)
Virtual Station 134
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

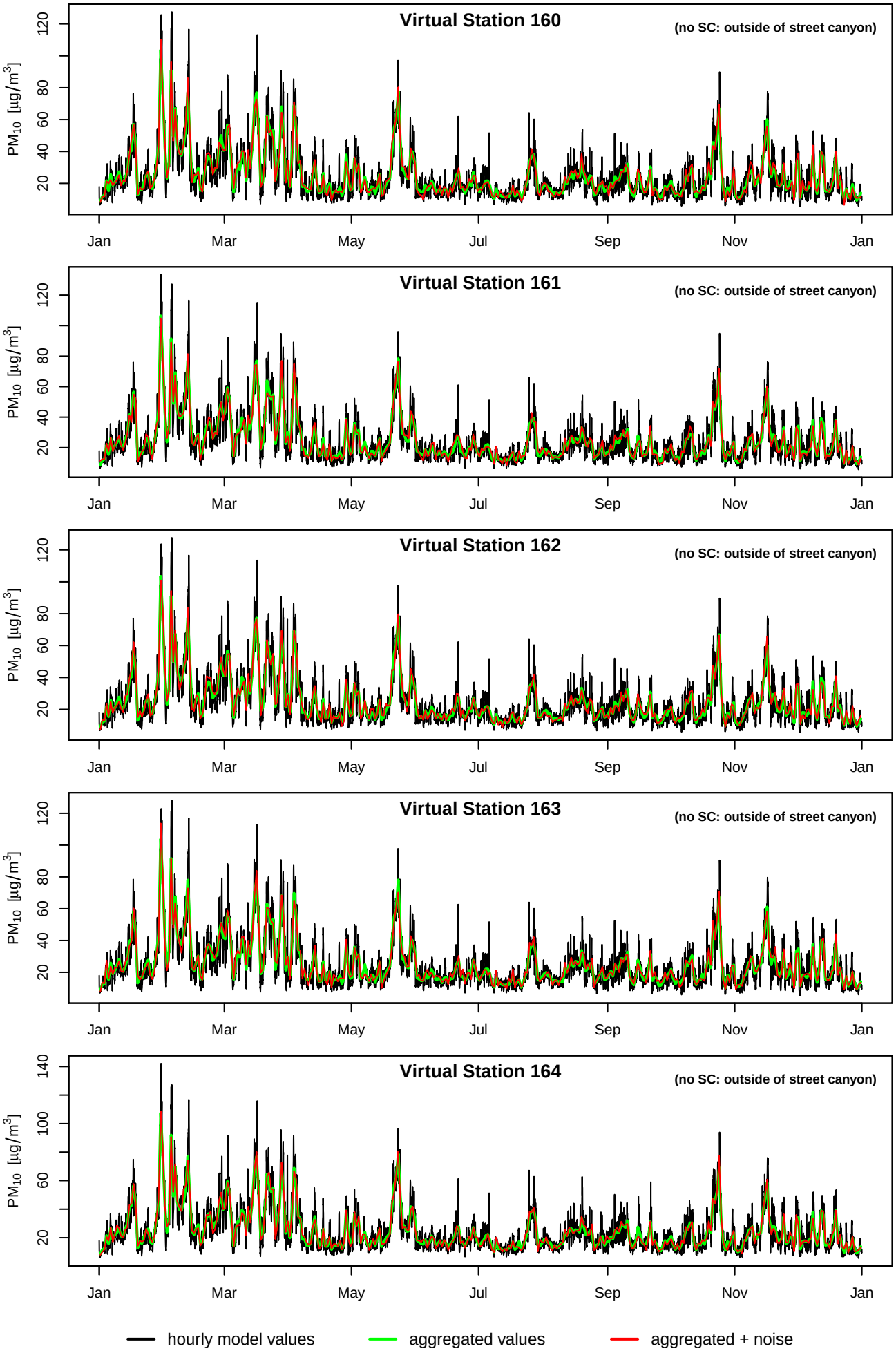

Virtual Station 135
(no SC: outside of street canyon)
PM10 [µg/m3]
20 40 60 80 120
Jan Mar May Jul Sep Nov Jan
Virtual Station 136
(no SC: outside of street canyon)
PM10 [µg/m3]
20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 137
(no SC: outside of street canyon)
PM10 [µg/m3]
20 60 100 140
Jan Mar May Jul Sep Nov Jan
Virtual Station 138
(no SC: outside of street canyon)
PM10 [µg/m3]
20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 139
(no SC: outside of street canyon)
PM10 [µg/m3]
20 40 60 80 120
Jan Mar May Jul Sep Nov Jan
hourly model values
aggregated values
aggregated + noise

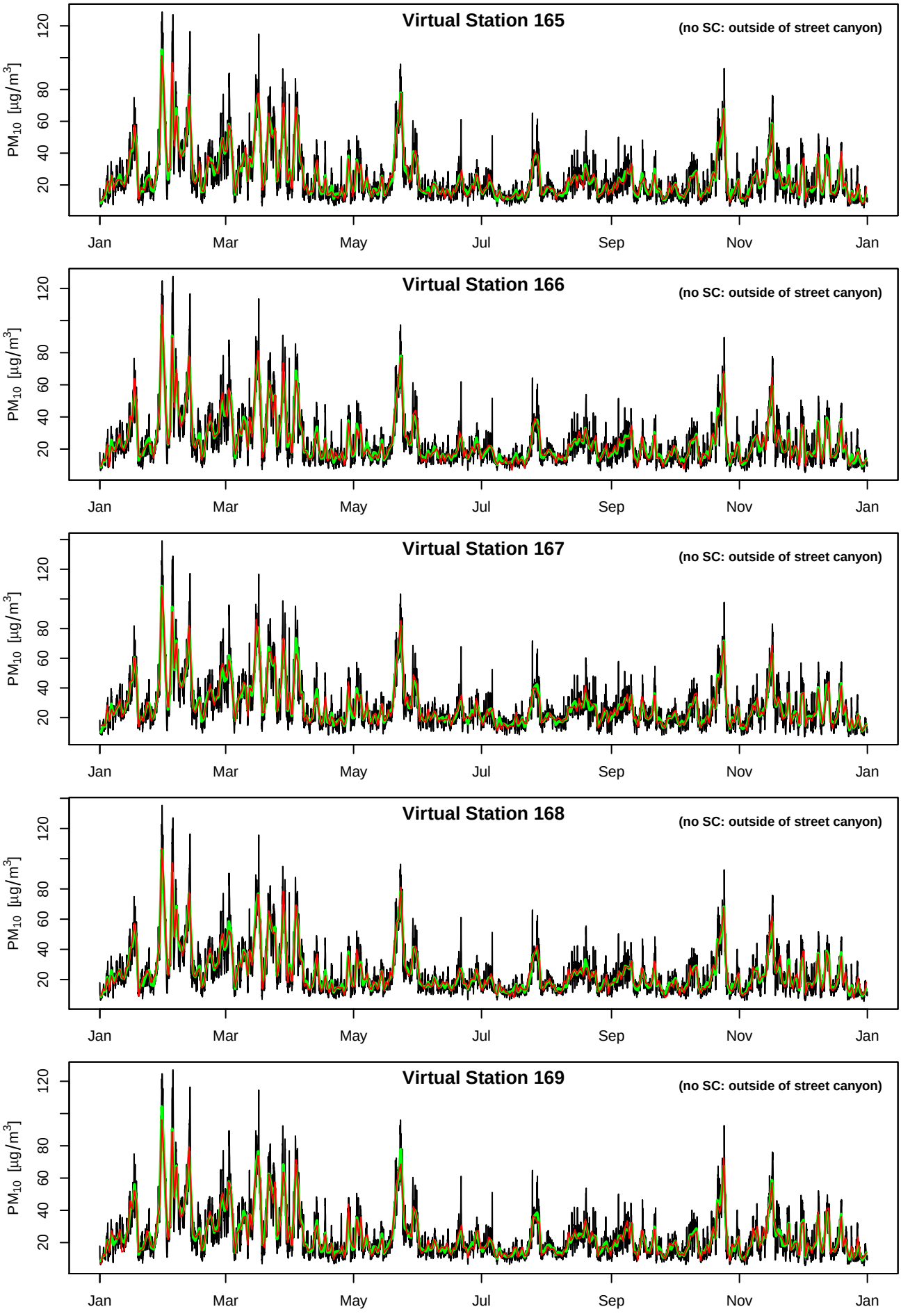

Virtual Station 140
(no SC: outside of street canyon)
Virtual Station 141
(no SC: outside of street canyon)
Virtual Station 142
(no SC: outside of street canyon)
Virtual Station 143
(no SC: outside of street canyon)
Virtual Station 144
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

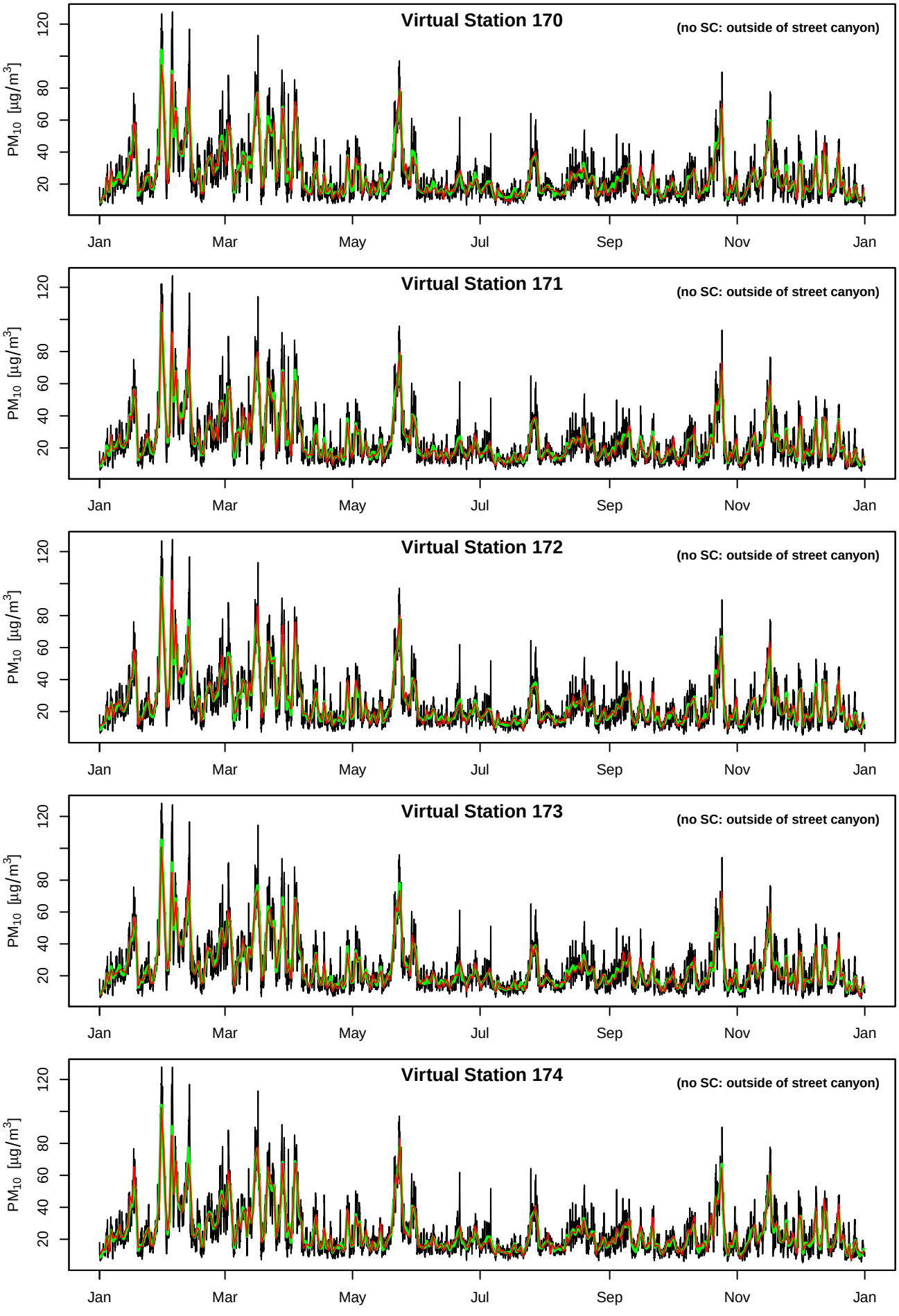

Virtual Station 145
(no SC: outside of street canyon)
Virtual Station 146
(no SC: outside of street canyon)
Virtual Station 147
(no SC: outside of street canyon)
Virtual Station 148
(no SC: outside of street canyon)
Virtual Station 149
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

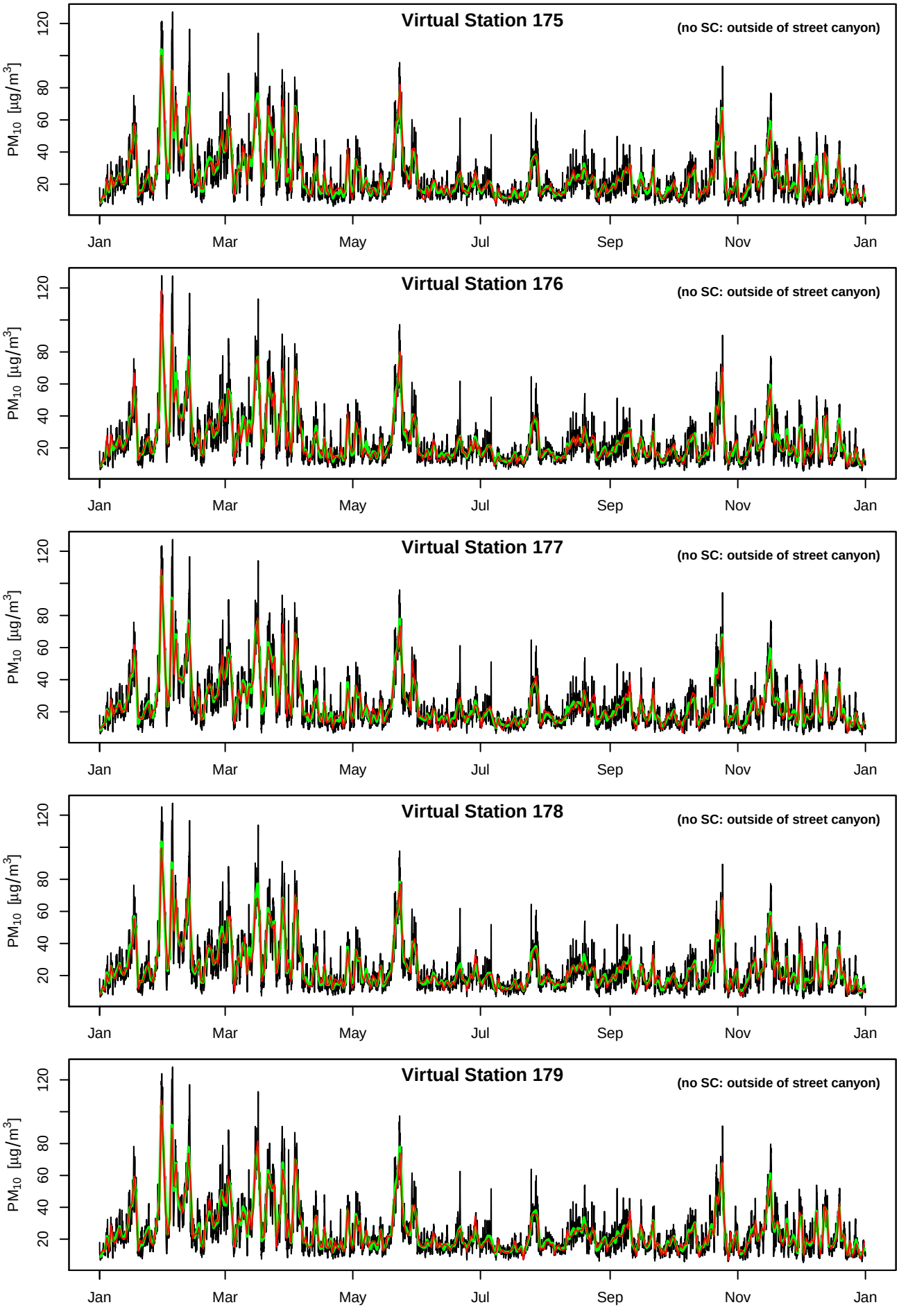

Virtual Station 150
(no SC: outside of street canyon)
Virtual Station 151
(no SC: outside of street canyon)
Virtual Station 152
(no SC: outside of street canyon)
Virtual Station 153
(no SC: outside of street canyon)
Virtual Station 154
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

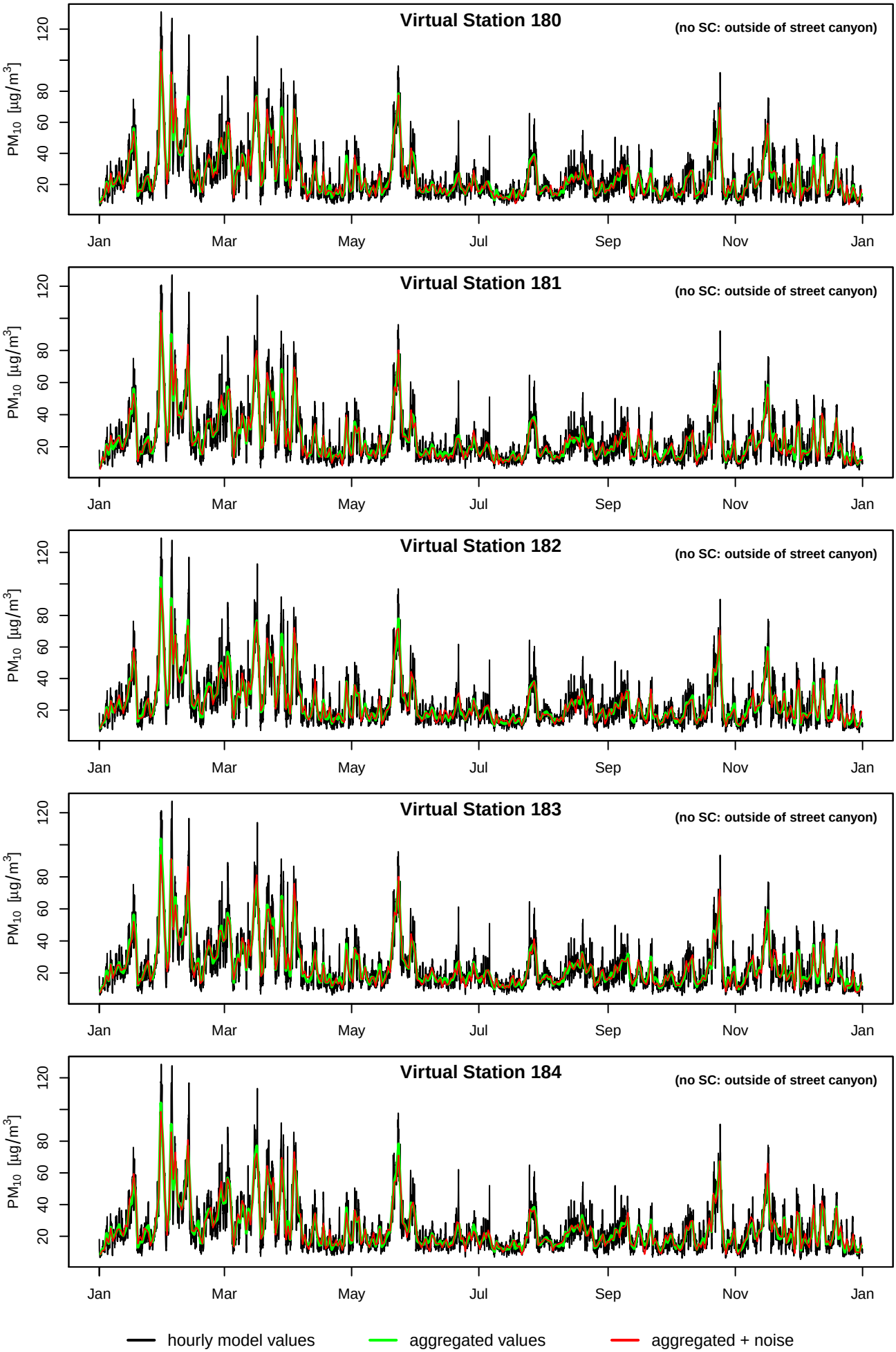

Virtual Station 155
(no SC: outside of street canyon)
Virtual Station 156
(no SC: outside of street canyon)
Virtual Station 157
(no SC: outside of street canyon)
Virtual Station 158
(no SC: outside of street canyon)
Virtual Station 159
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

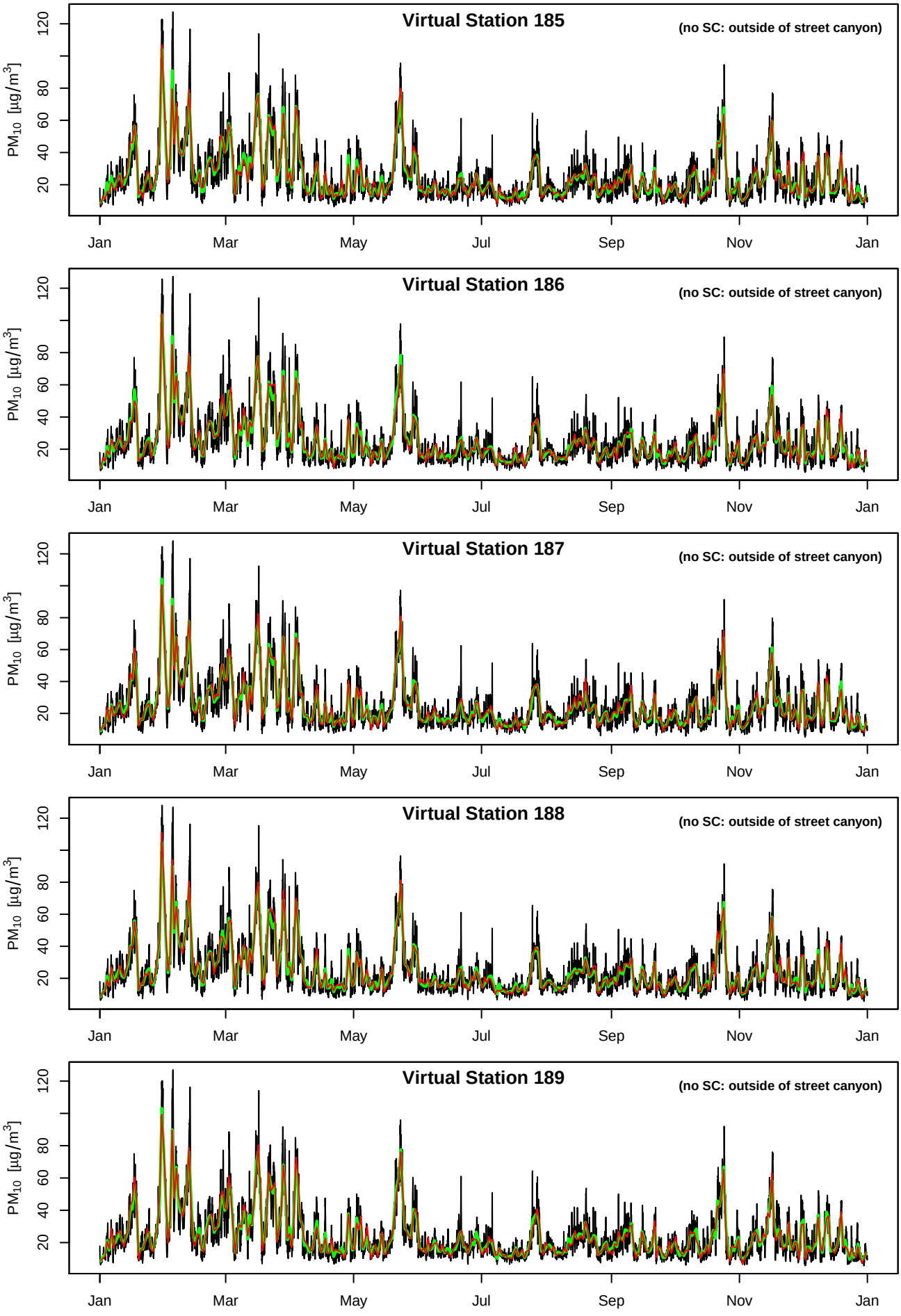

Virtual Station 160
(no SC: outside of street canyon)
Virtual Station 161
(no SC: outside of street canyon)
Virtual Station 162
(no SC: outside of street canyon)
Virtual Station 163
(no SC: outside of street canyon)
Virtual Station 164
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

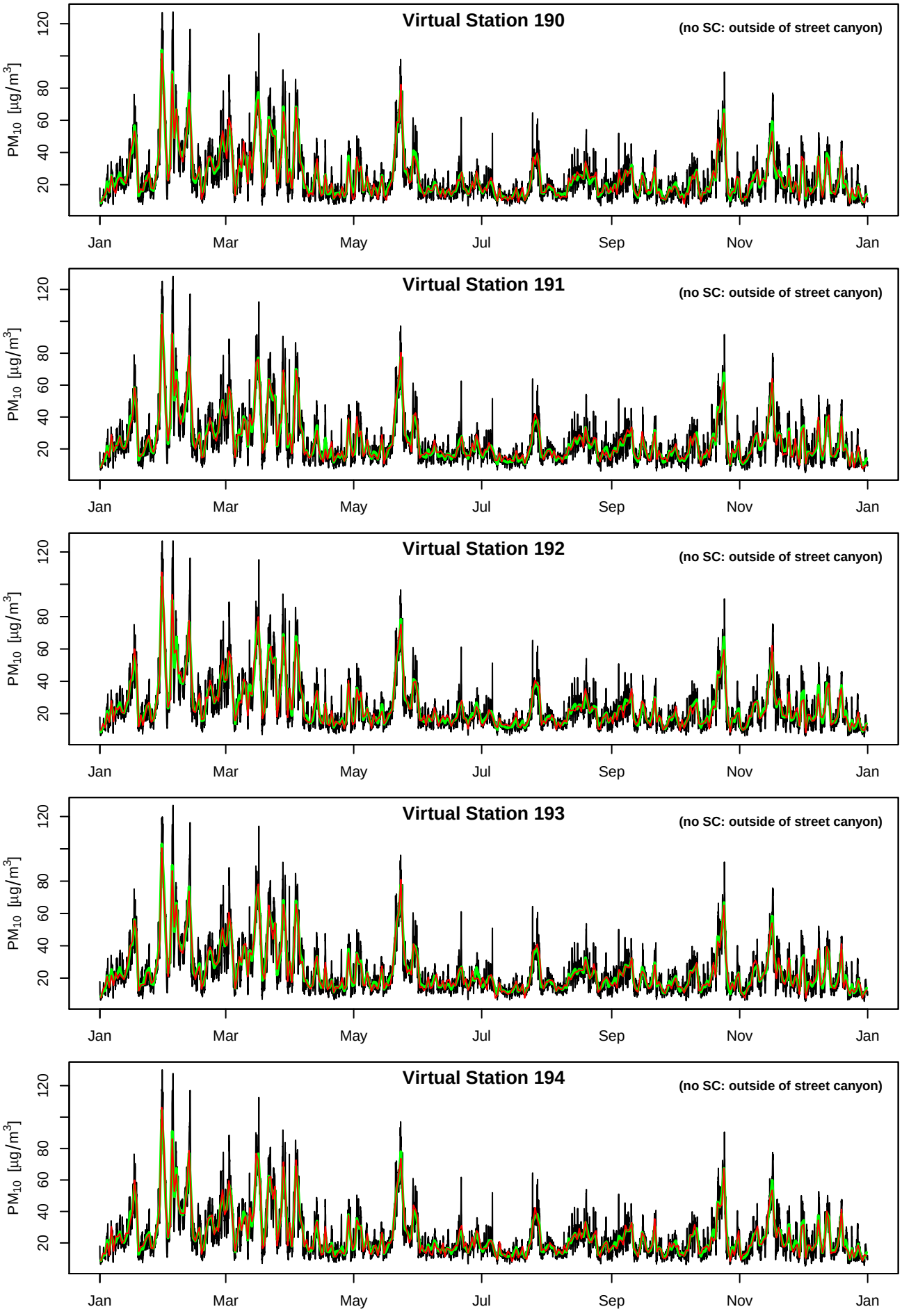

Virtual Station 165
(no SC: outside of street canyon)
Virtual Station 166
(no SC: outside of street canyon)
Virtual Station 167
(no SC: outside of street canyon)
Virtual Station 168
(no SC: outside of street canyon)
Virtual Station 169
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

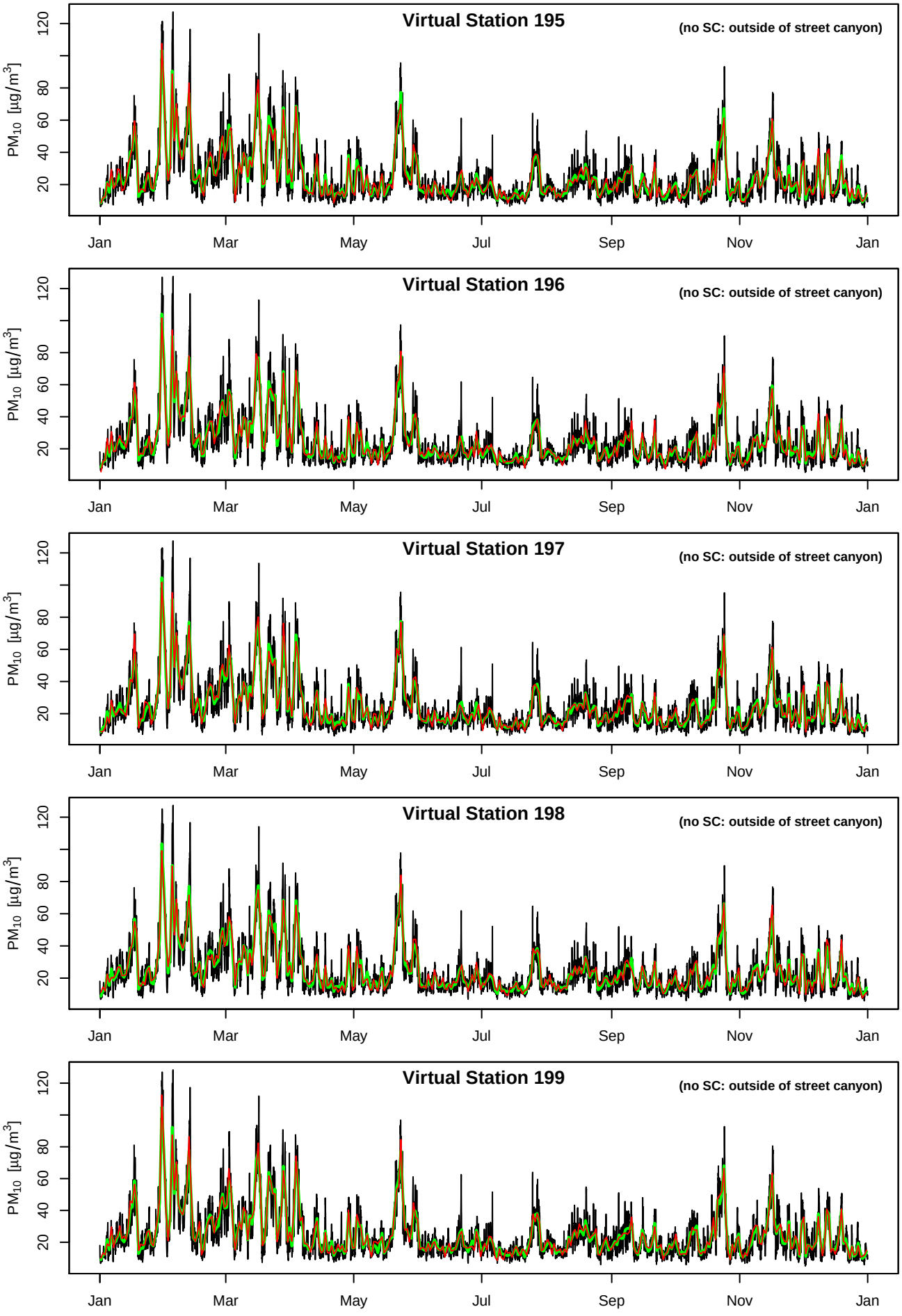

Virtual Station 170
(no SC: outside of street canyon)
Virtual Station 171
(no SC: outside of street canyon)
Virtual Station 172
(no SC: outside of street canyon)
Virtual Station 173
(no SC: outside of street canyon)
Virtual Station 174
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

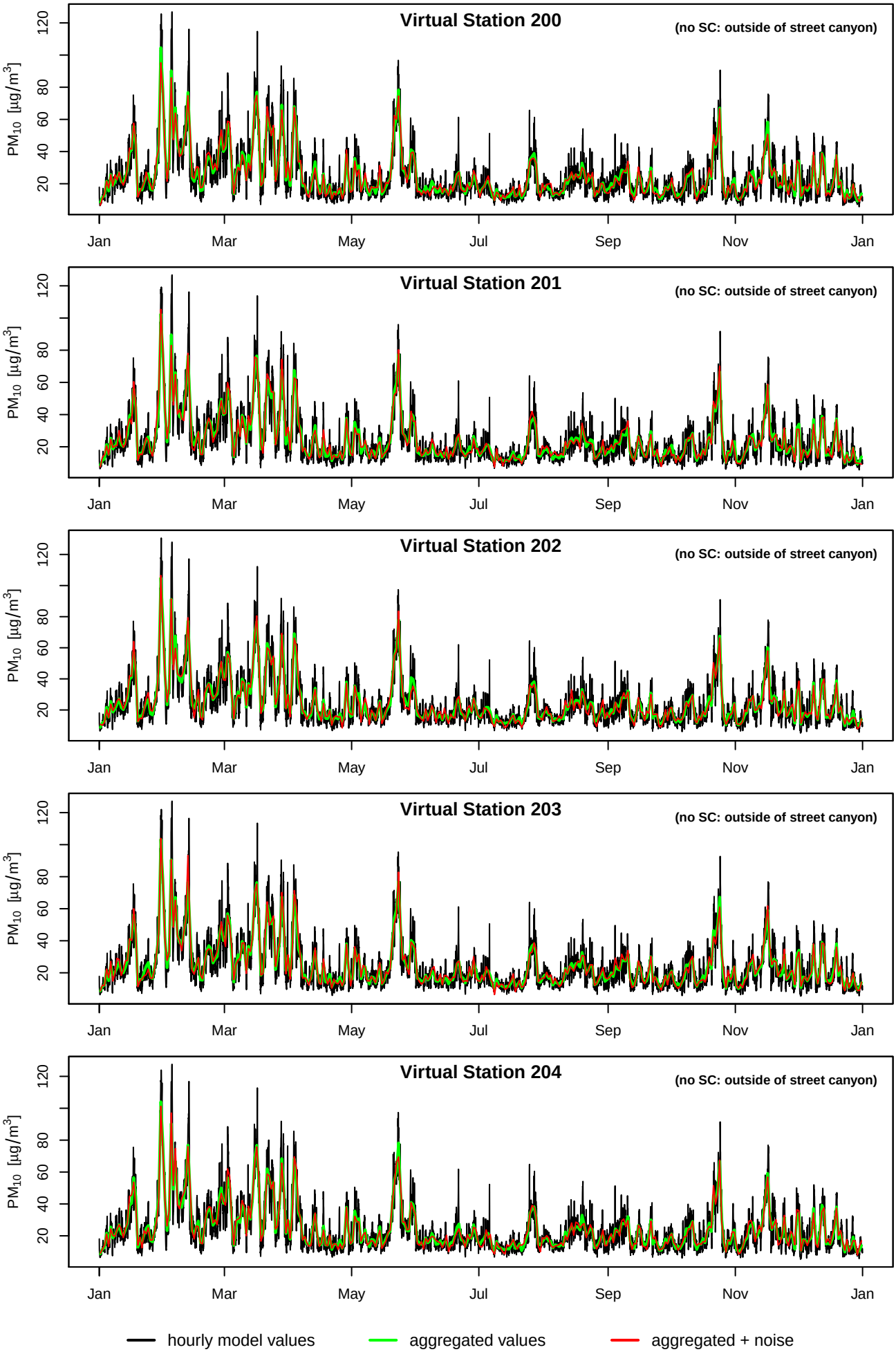

Virtual Station 175
(no SC: outside of street canyon)
Virtual Station 176
(no SC: outside of street canyon)
Virtual Station 177
(no SC: outside of street canyon)
Virtual Station 178
(no SC: outside of street canyon)
Virtual Station 179
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

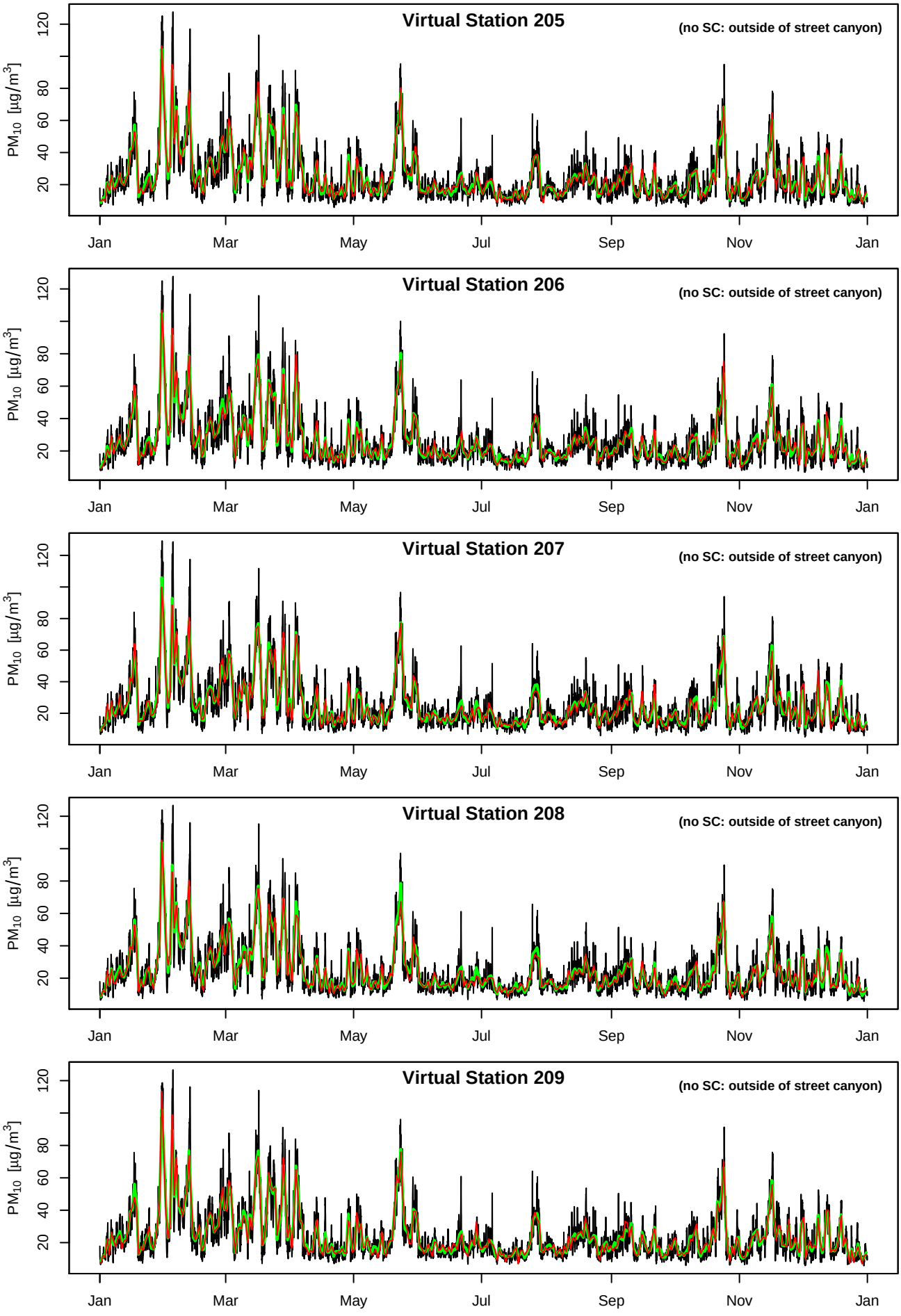

Virtual Station 180
(no SC: outside of street canyon)
Virtual Station 181
(no SC: outside of street canyon)
Virtual Station 182
(no SC: outside of street canyon)
Virtual Station 183
(no SC: outside of street canyon)
Virtual Station 184
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

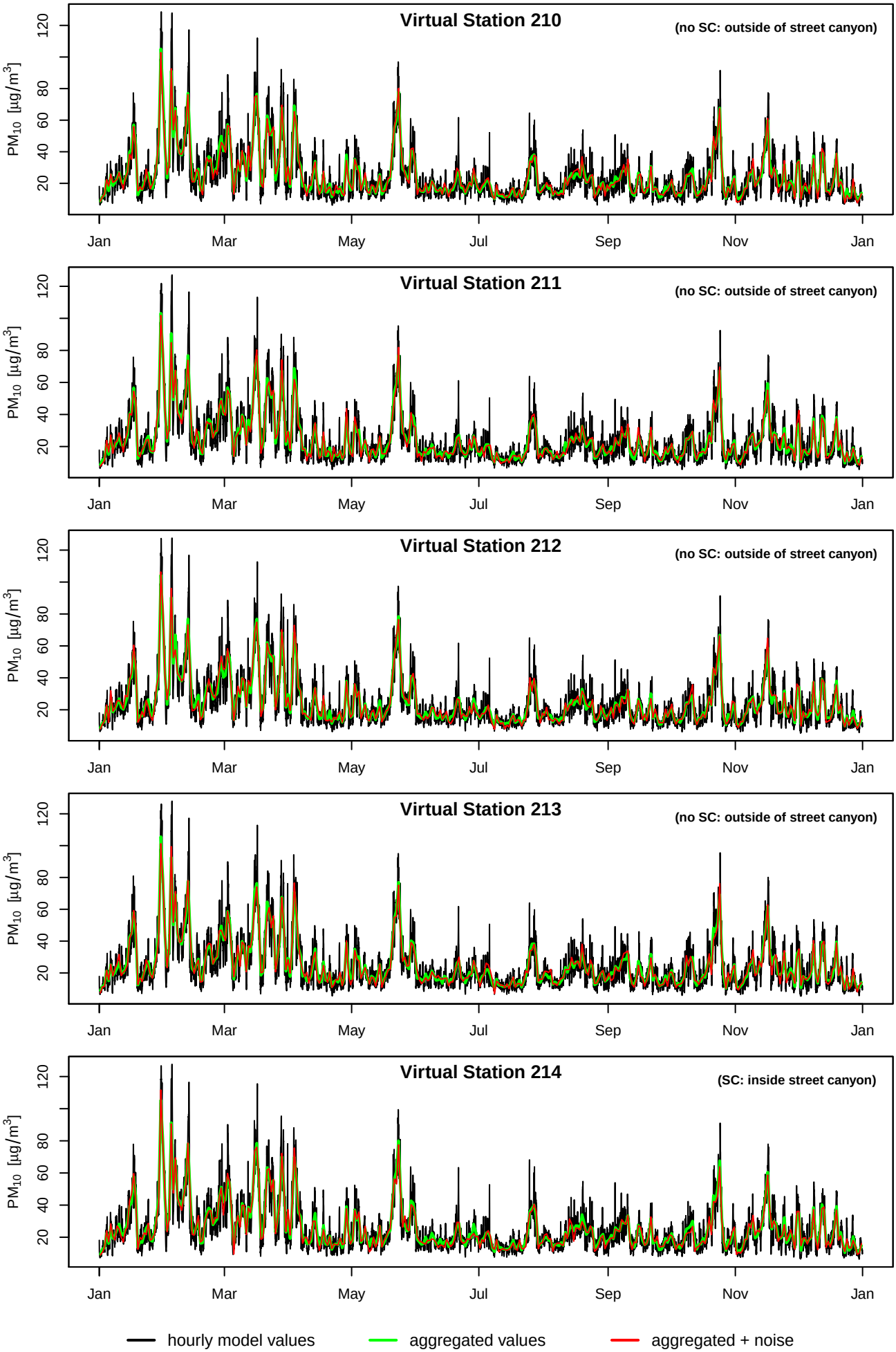

Virtual Station 185
(no SC: outside of street canyon)
Virtual Station 186
(no SC: outside of street canyon)
Virtual Station 187
(no SC: outside of street canyon)
Virtual Station 188
(no SC: outside of street canyon)
Virtual Station 189
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

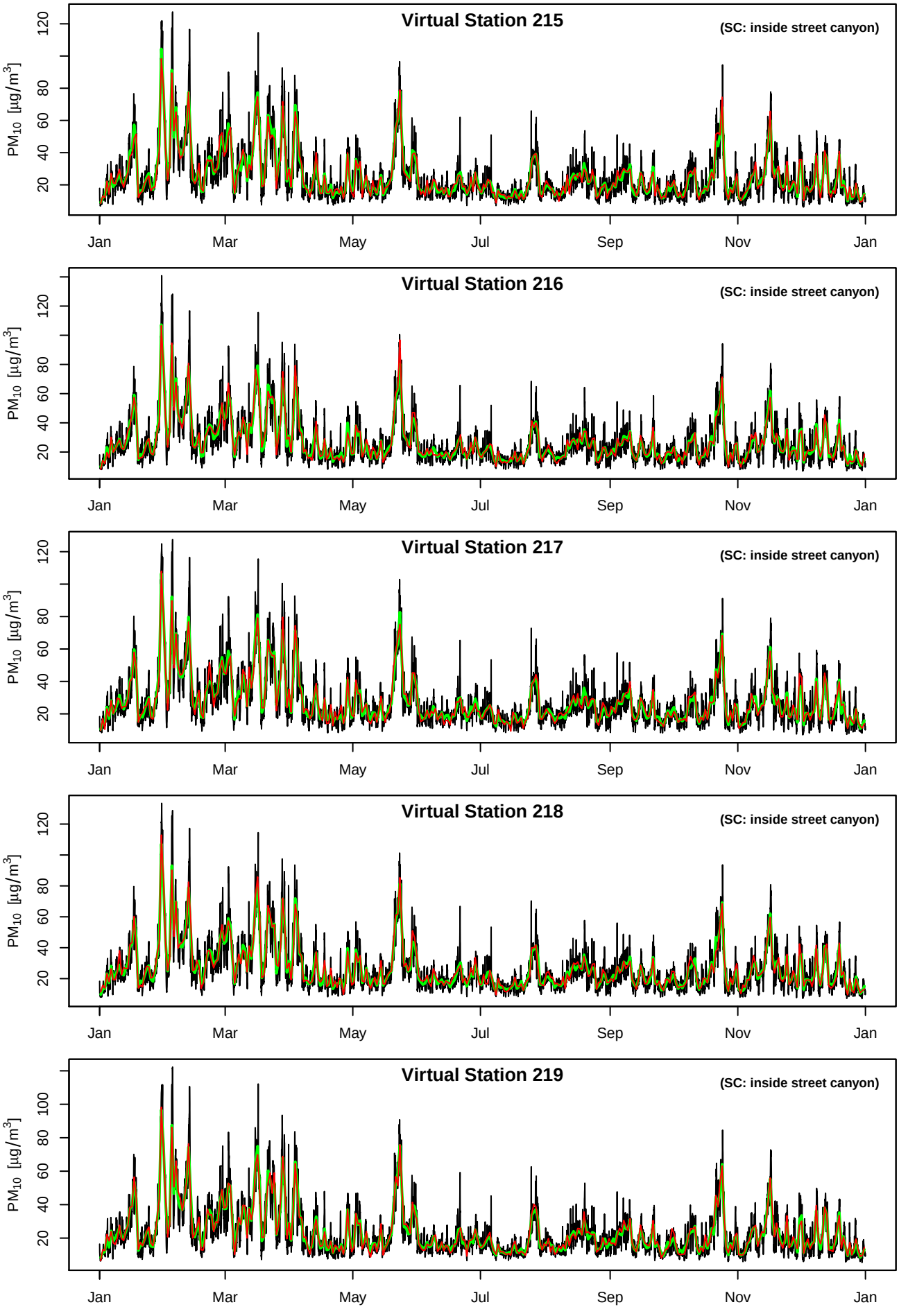

Virtual Station 190
(no SC: outside of street canyon)
Virtual Station 191
(no SC: outside of street canyon)
Virtual Station 192
(no SC: outside of street canyon)
Virtual Station 193
(no SC: outside of street canyon)
Virtual Station 194
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

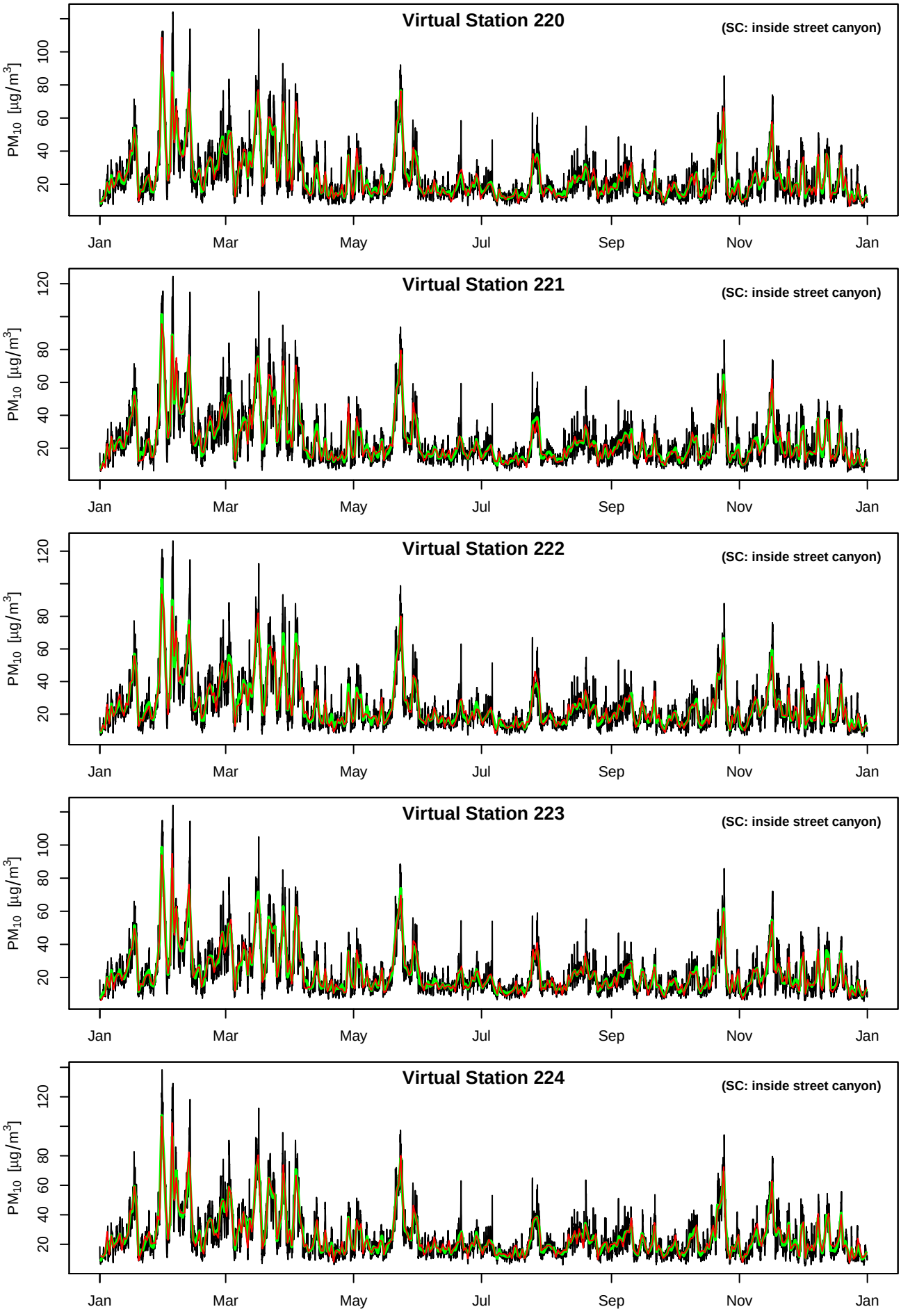

Virtual Station 195
(no SC: outside of street canyon)
Virtual Station 196
(no SC: outside of street canyon)
Virtual Station 197
(no SC: outside of street canyon)
Virtual Station 198
(no SC: outside of street canyon)
Virtual Station 199
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

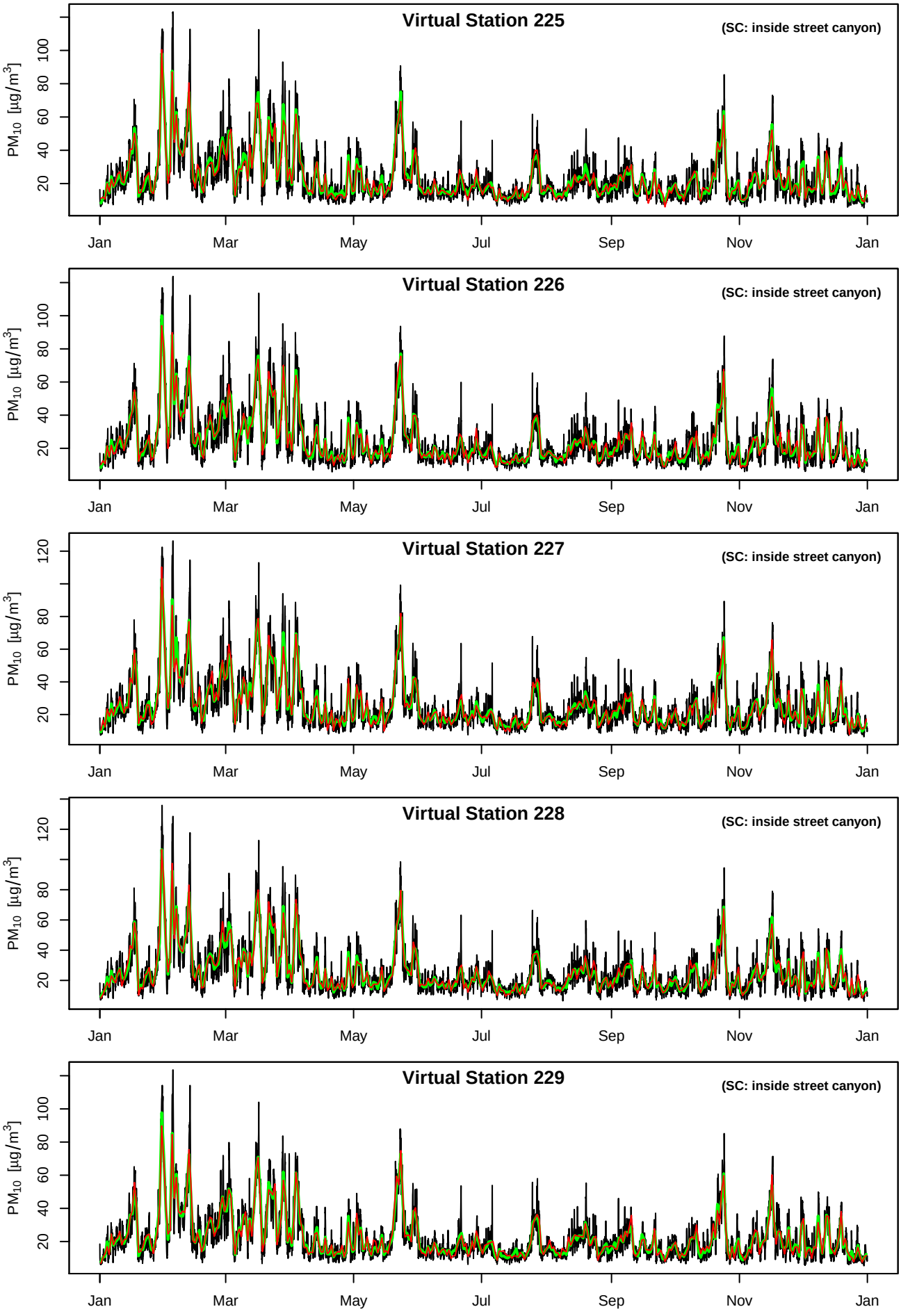

Virtual Station 200
(no SC: outside of street canyon)
Virtual Station 201
(no SC: outside of street canyon)
Virtual Station 202
(no SC: outside of street canyon)
Virtual Station 203
(no SC: outside of street canyon)
Virtual Station 204
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

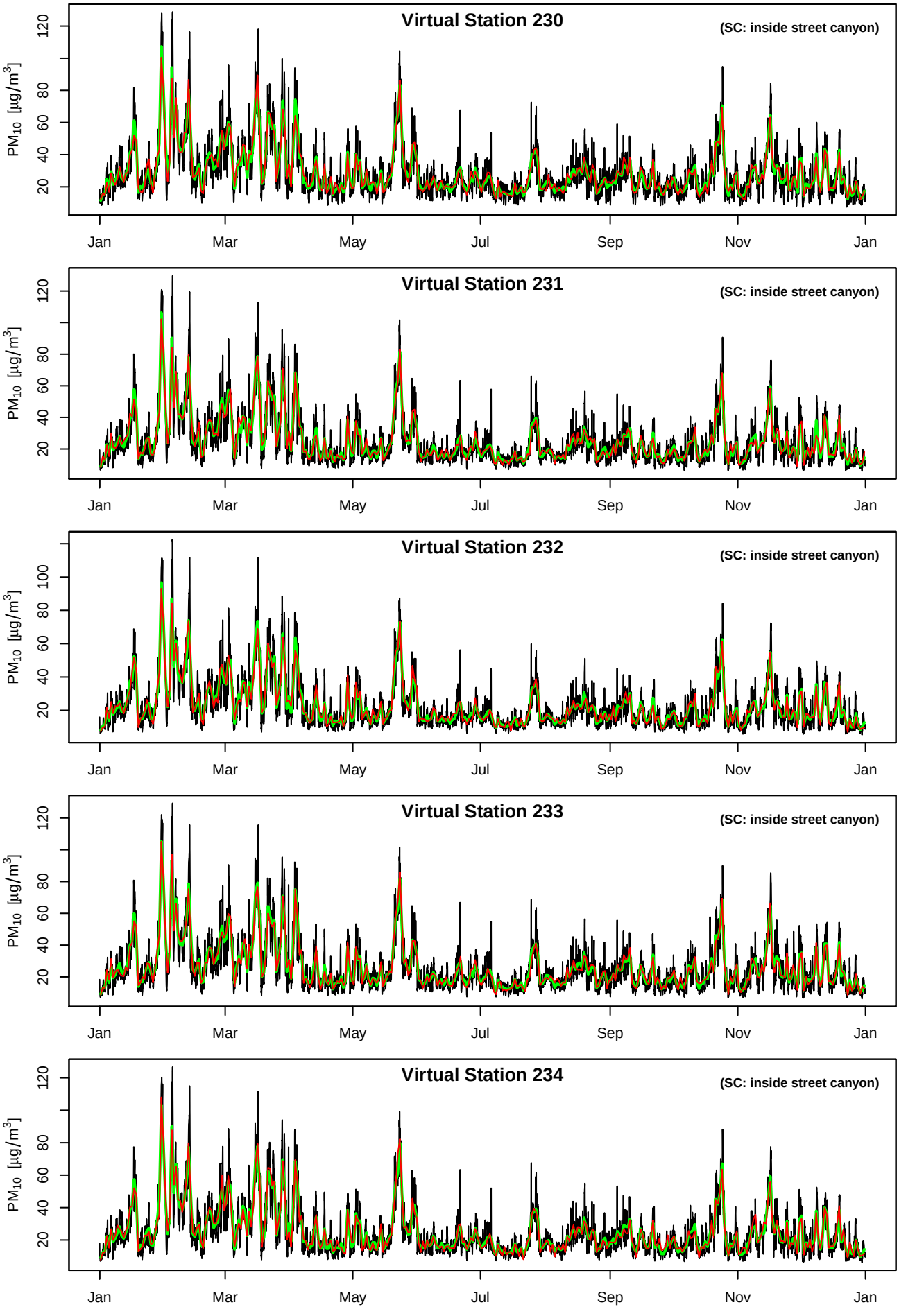

Virtual Station 205
(no SC: outside of street canyon)
Virtual Station 206
(no SC: outside of street canyon)
Virtual Station 207
(no SC: outside of street canyon)
Virtual Station 208
(no SC: outside of street canyon)
Virtual Station 209
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

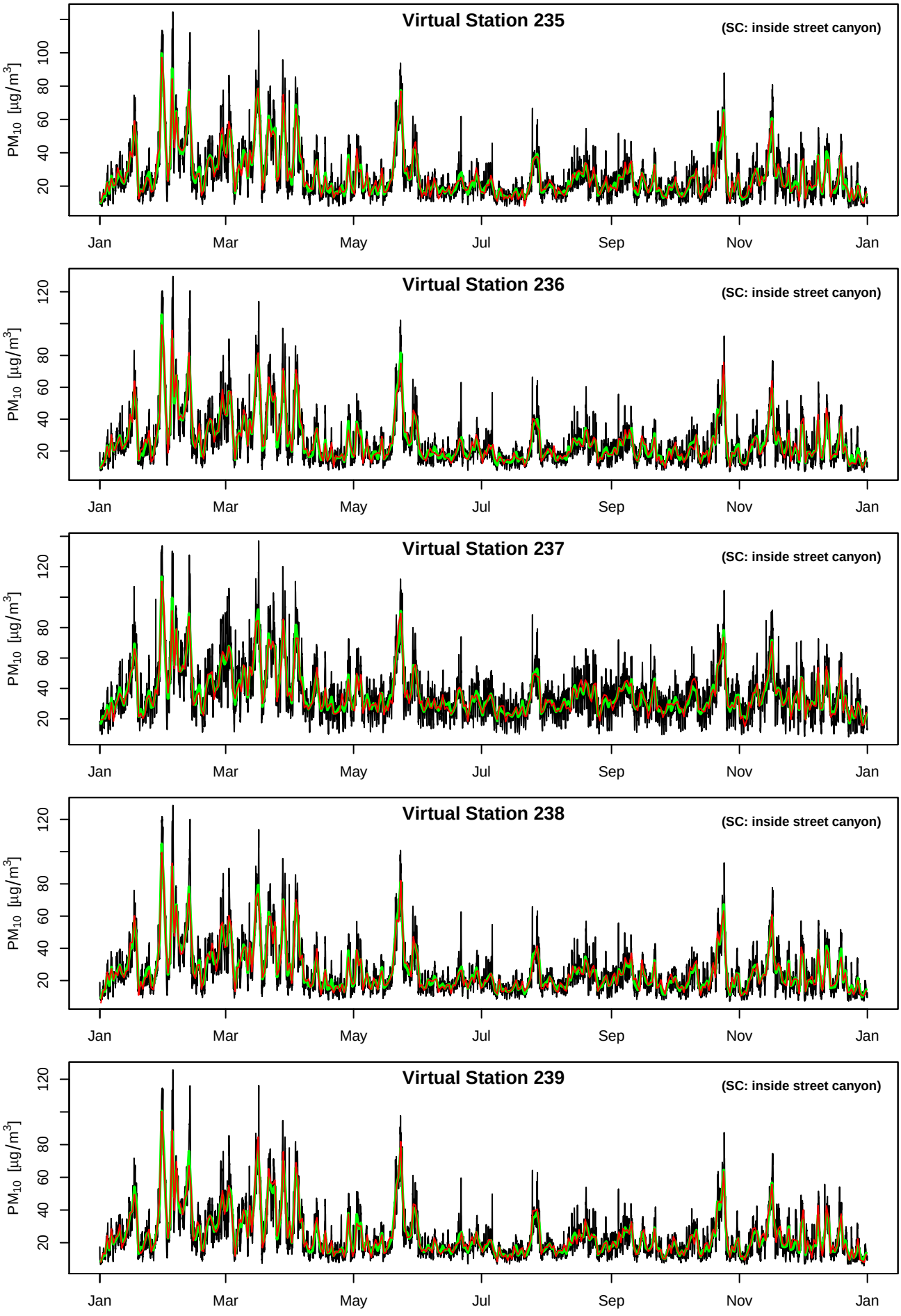

Virtual Station 210
(no SC: outside of street canyon)
Virtual Station 211
(no SC: outside of street canyon)
Virtual Station 212
(no SC: outside of street canyon)
Virtual Station 213
(no SC: outside of street canyon)
Virtual Station 214
(SC: inside street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

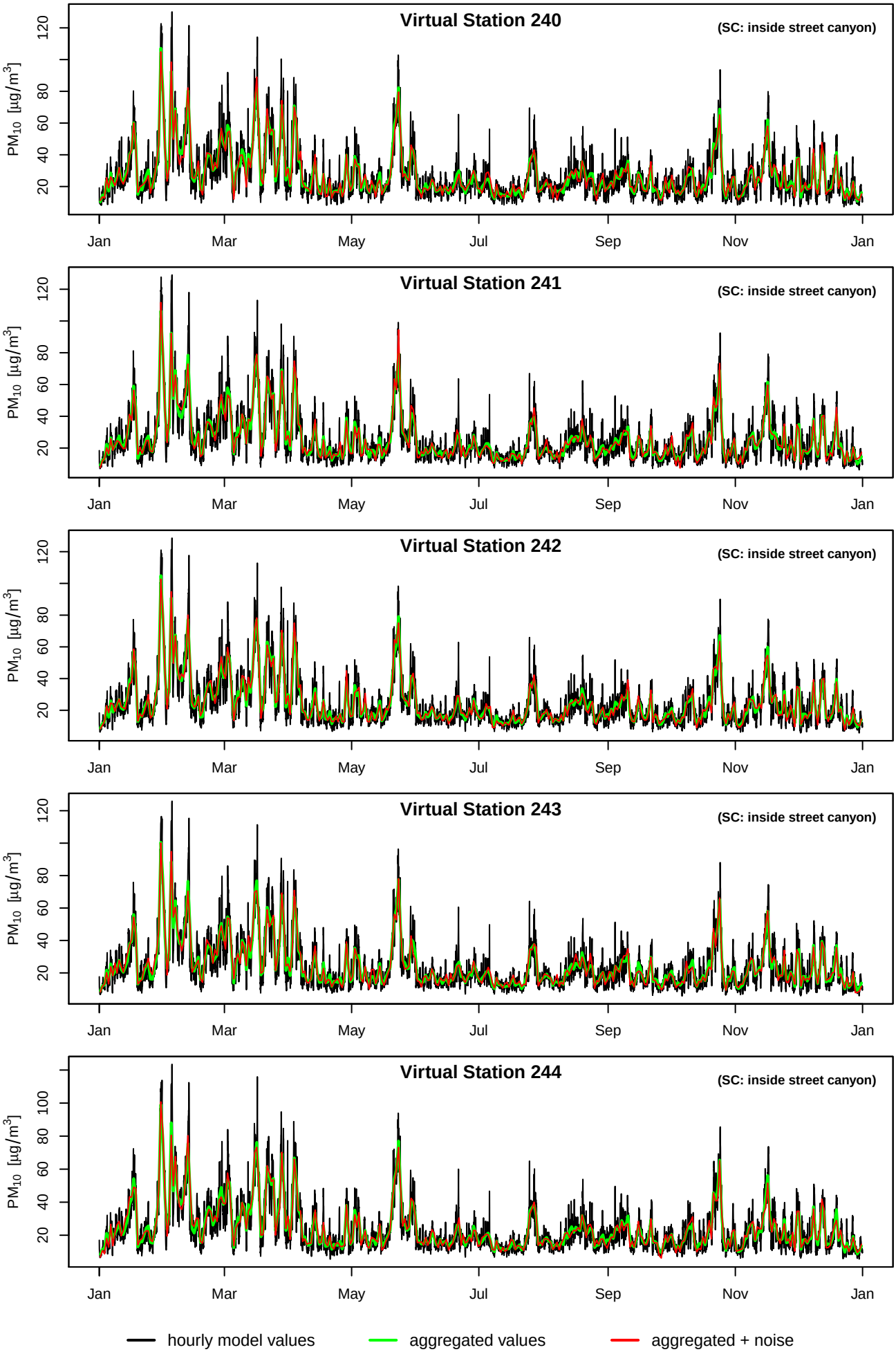

Virtual Station 215
(SC: inside street canyon)
Virtual Station 216
(SC: inside street canyon)
Virtual Station 217
(SC: inside street canyon)
Virtual Station 218
(SC: inside street canyon)
Virtual Station 219
(SC: inside street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

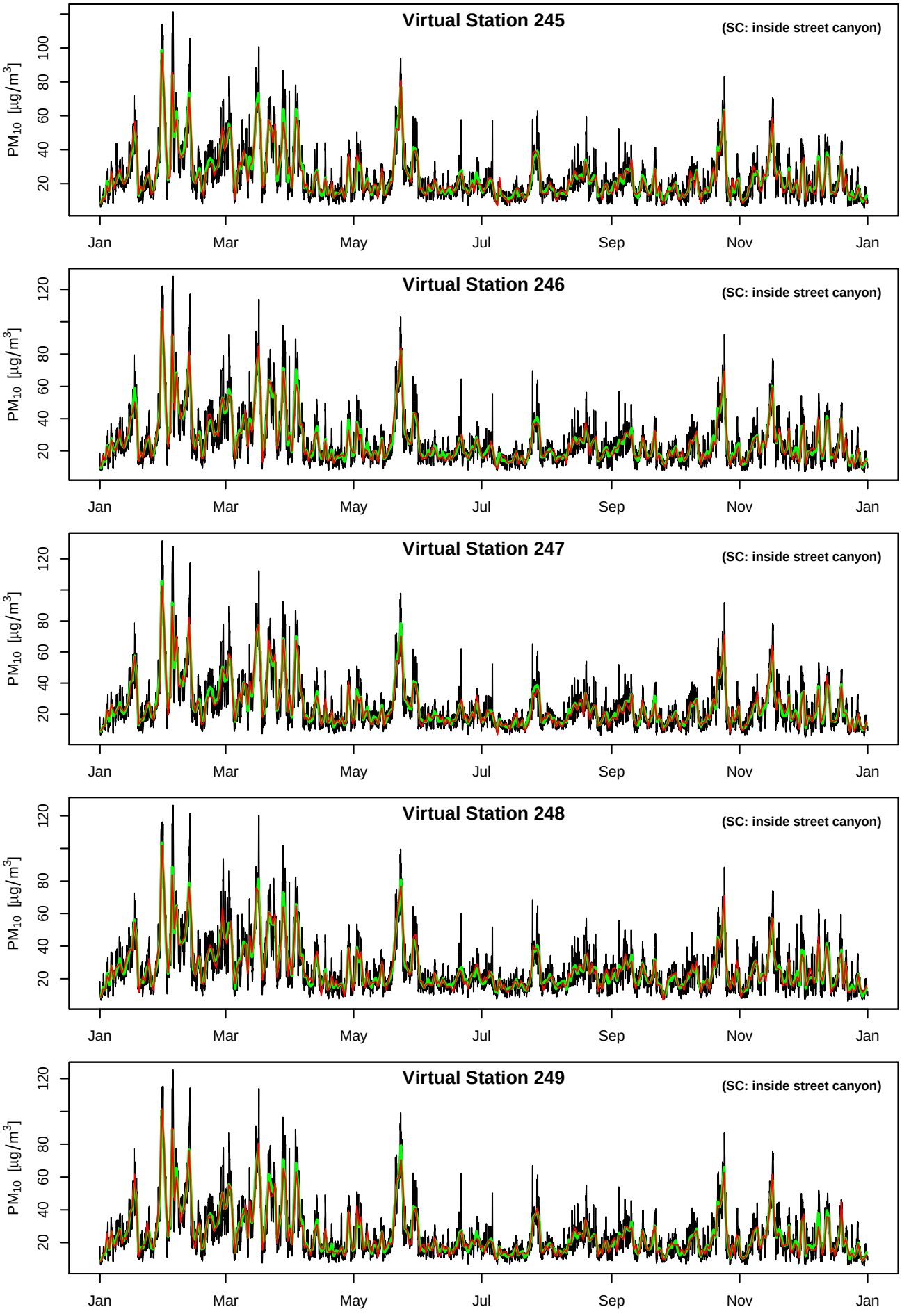

Virtual Station 220
(SC: inside street canyon)
Virtual Station 221
(SC: inside street canyon)
Virtual Station 222
(SC: inside street canyon)
Virtual Station 223
(SC: inside street canyon)
Virtual Station 224
(SC: inside street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

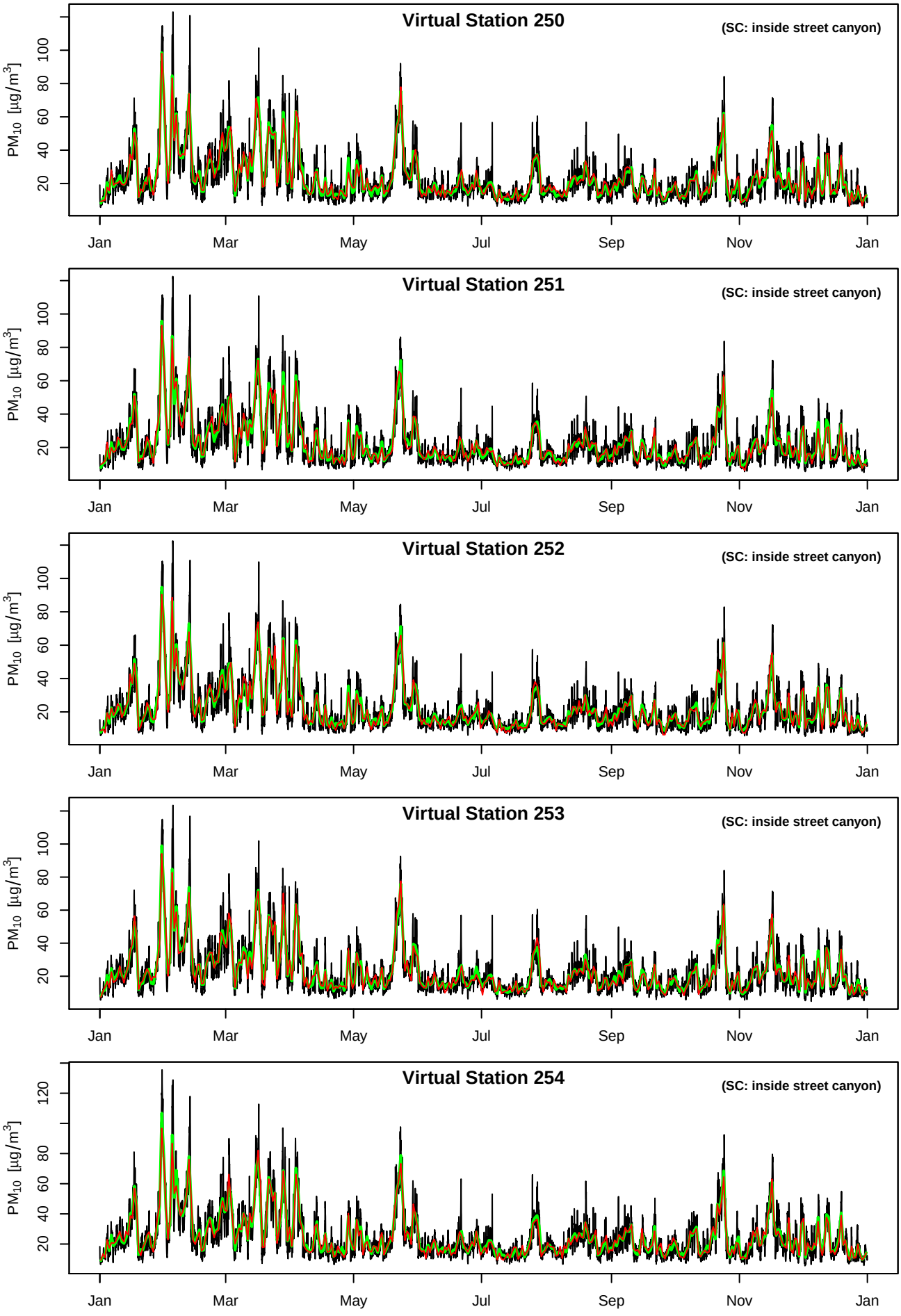

Virtual Station 225
(SC: inside street canyon)
Virtual Station 226
(SC: inside street canyon)
Virtual Station 227
(SC: inside street canyon)
Virtual Station 228
(SC: inside street canyon)
Virtual Station 229
(SC: inside street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

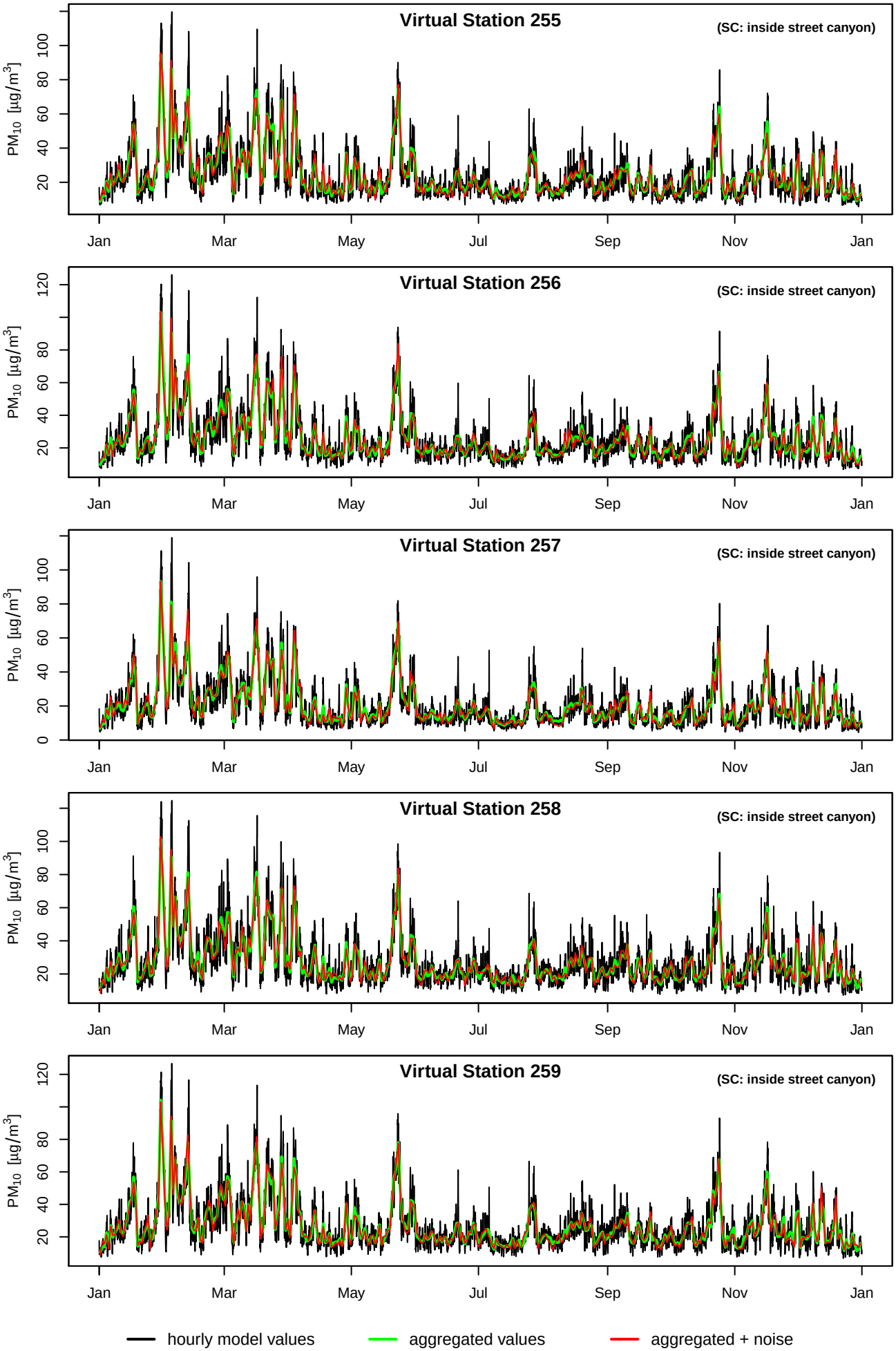

Virtual Station 230
(SC: inside street canyon)
Virtual Station 231
(SC: inside street canyon)
Virtual Station 232
(SC: inside street canyon)
Virtual Station 233
(SC: inside street canyon)
Virtual Station 234
(SC: inside street canyon)
PM10 [µg/m3]
20
40
60
80
100
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

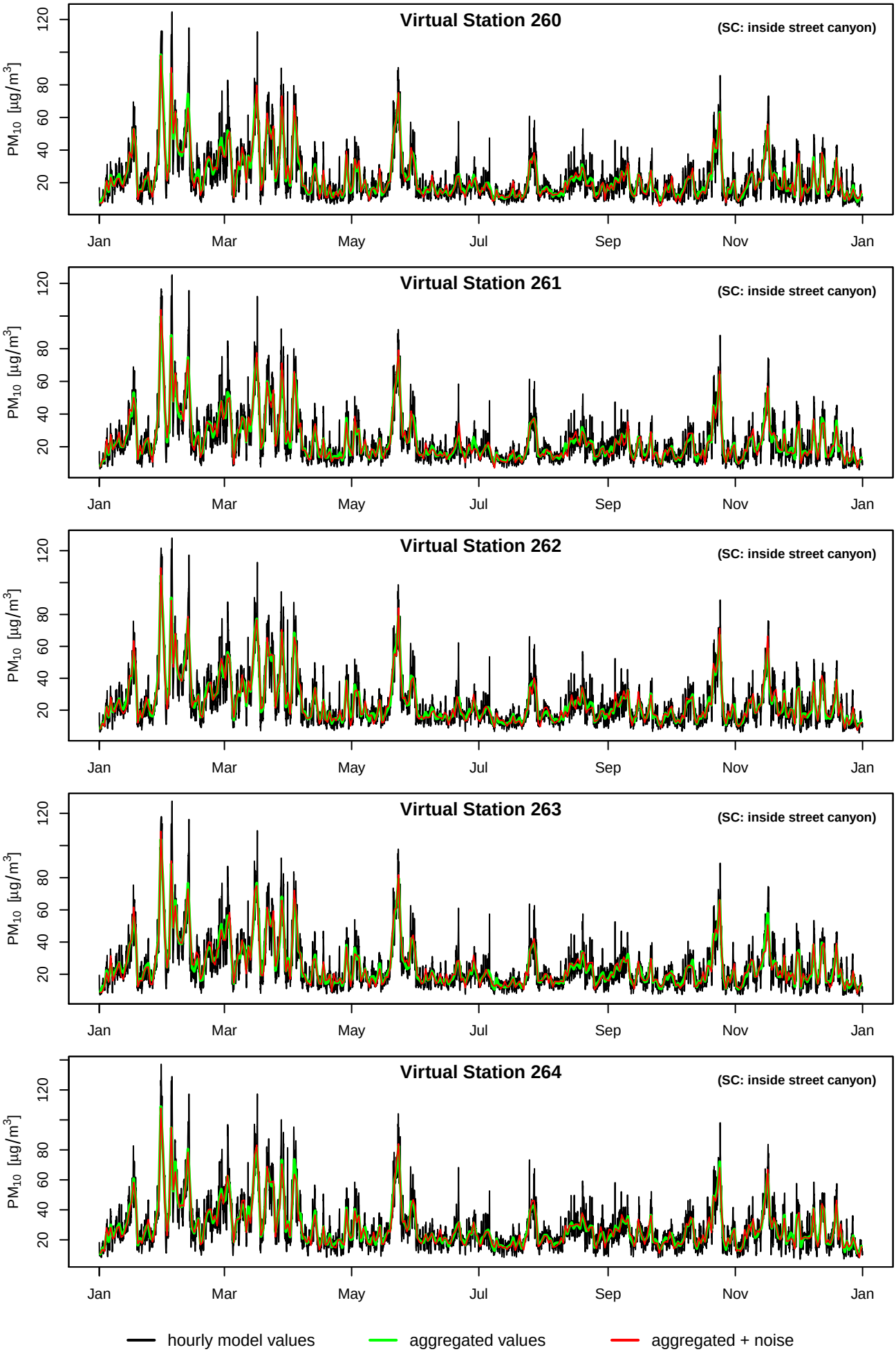

Virtual Station 235
(SC: inside street canyon)
Virtual Station 236
(SC: inside street canyon)
Virtual Station 237
(SC: inside street canyon)
Virtual Station 238
(SC: inside street canyon)
Virtual Station 239
(SC: inside street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

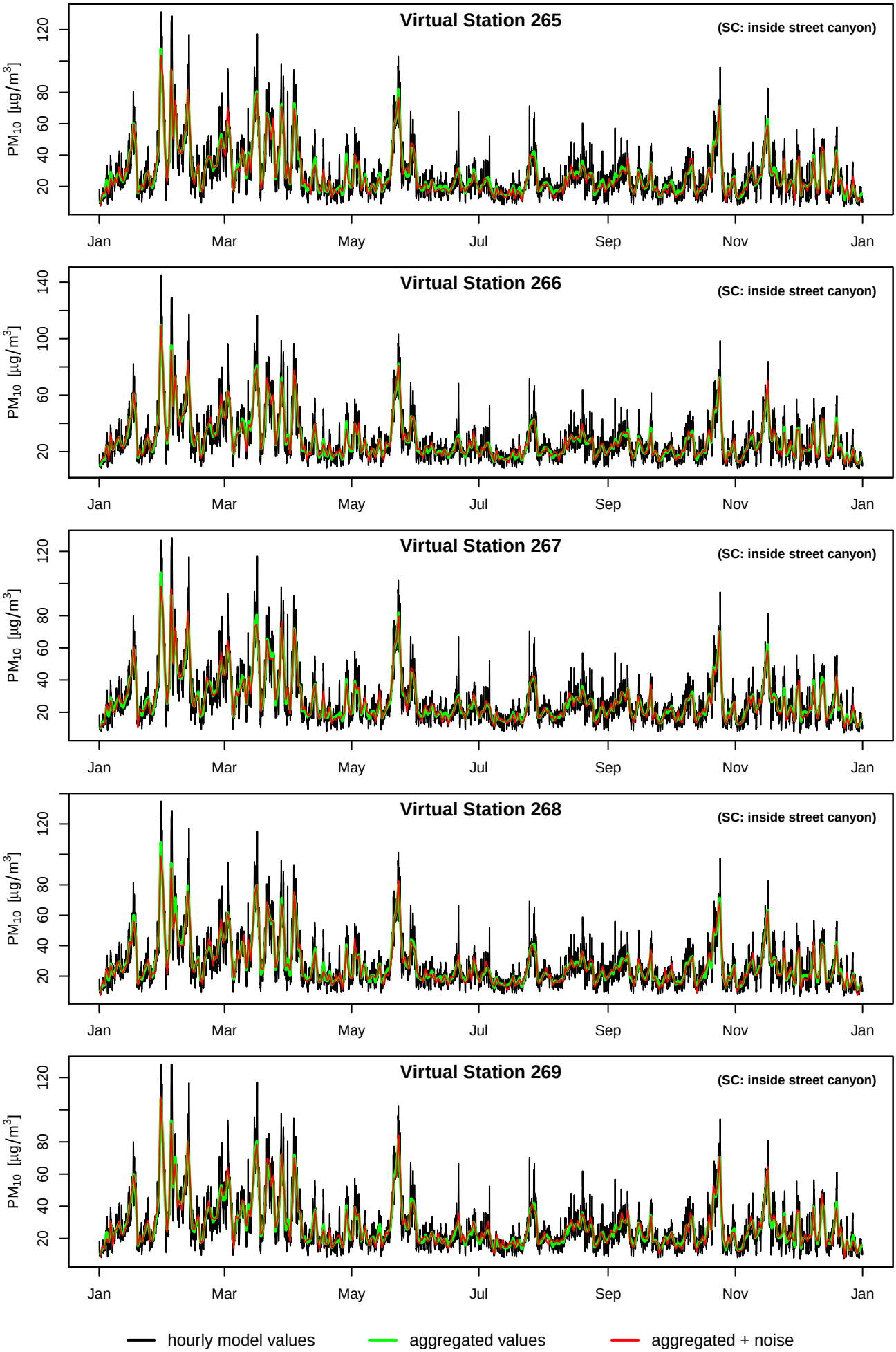

Virtual Station 240
(SC: inside street canyon)
Virtual Station 241
(SC: inside street canyon)
Virtual Station 242
(SC: inside street canyon)
Virtual Station 243
(SC: inside street canyon)
Virtual Station 244
(SC: inside street canyon)
PM10 [µg/m3]
20
40
60
80
100
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

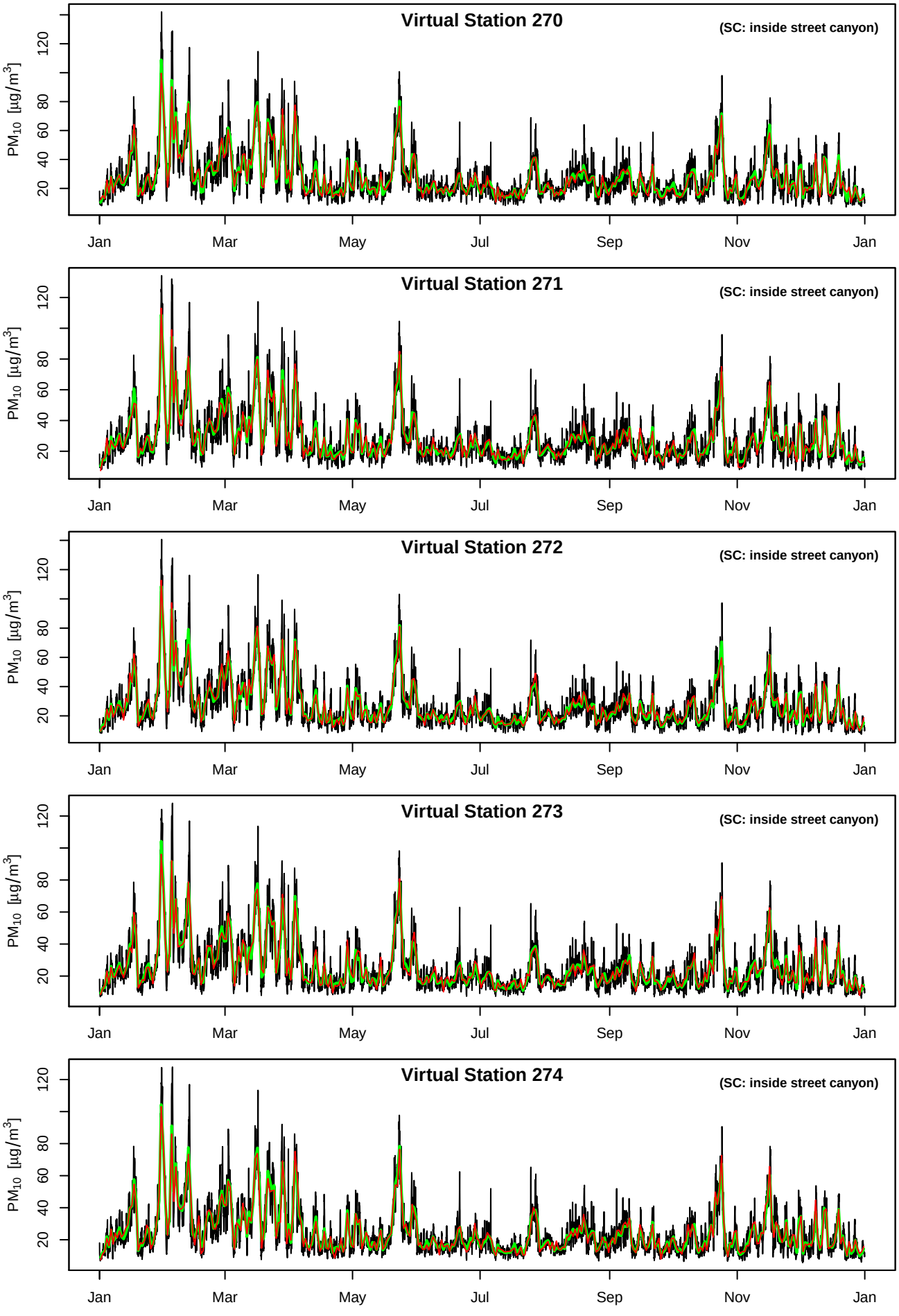

Virtual Station 245
(SC: inside street canyon)
Virtual Station 246
(SC: inside street canyon)
Virtual Station 247
(SC: inside street canyon)
Virtual Station 248
(SC: inside street canyon)
Virtual Station 249
(SC: inside street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

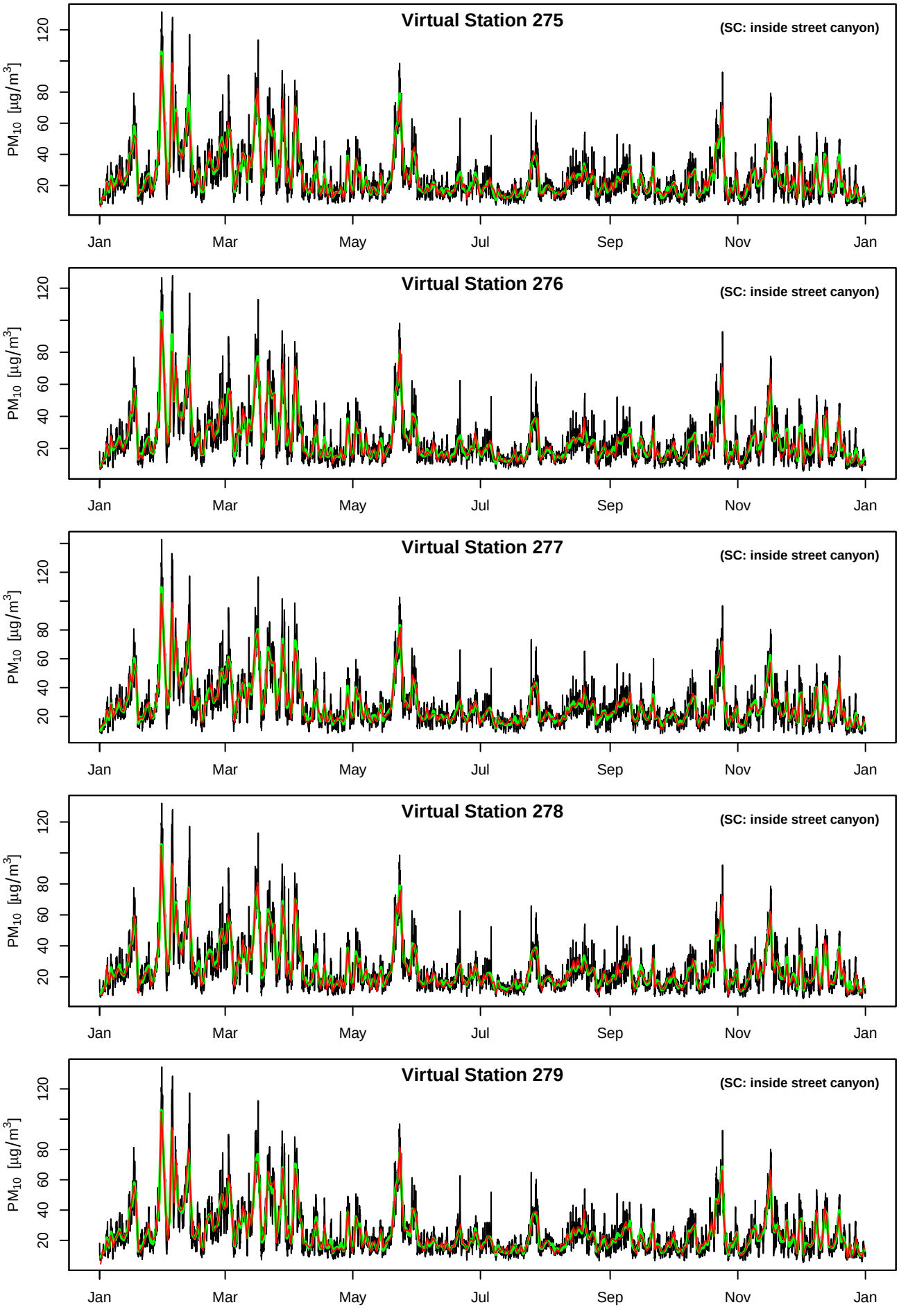

Virtual Station 250
(SC: inside street canyon)
Virtual Station 251
(SC: inside street canyon)
Virtual Station 252
(SC: inside street canyon)
Virtual Station 253
(SC: inside street canyon)
Virtual Station 254
(SC: inside street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

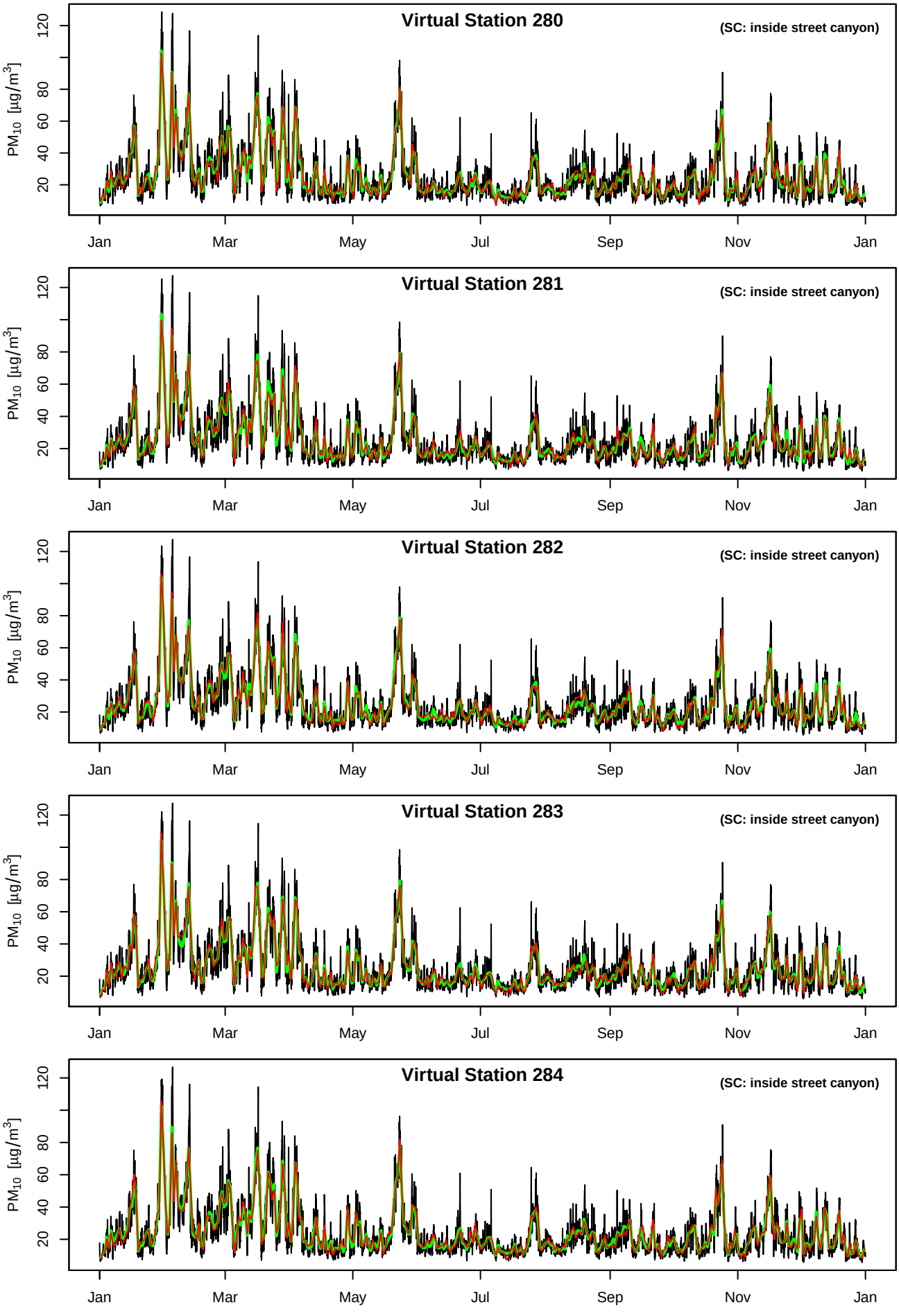

Virtual Station 255
(SC: inside street canyon)
Virtual Station 256
(SC: inside street canyon)
Virtual Station 257
(SC: inside street canyon)
Virtual Station 258
(SC: inside street canyon)
Virtual Station 259
(SC: inside street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

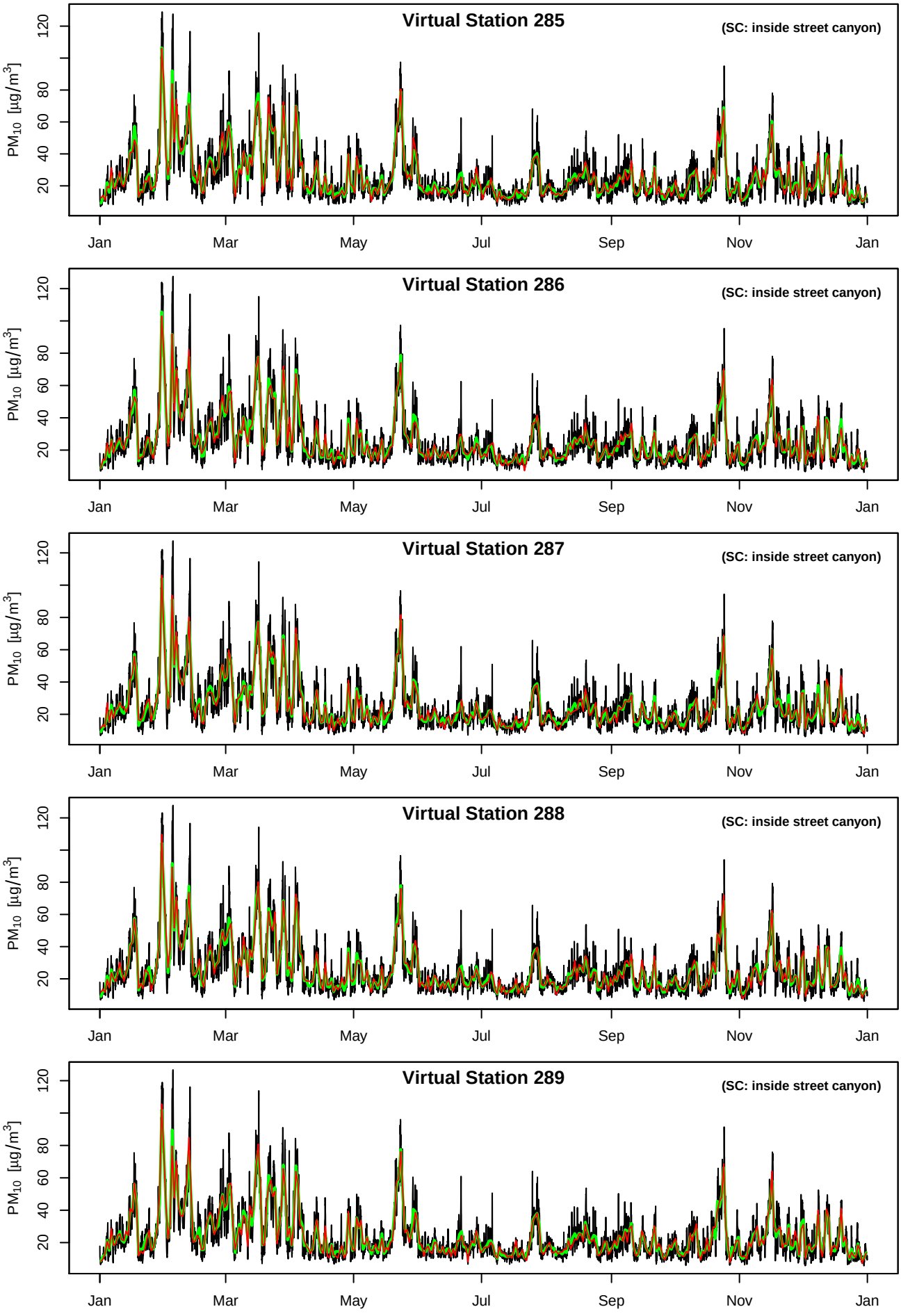

Virtual Station 260
(SC: inside street canyon)
Virtual Station 261
(SC: inside street canyon)
Virtual Station 262
(SC: inside street canyon)
Virtual Station 263
(SC: inside street canyon)
Virtual Station 264
(SC: inside street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

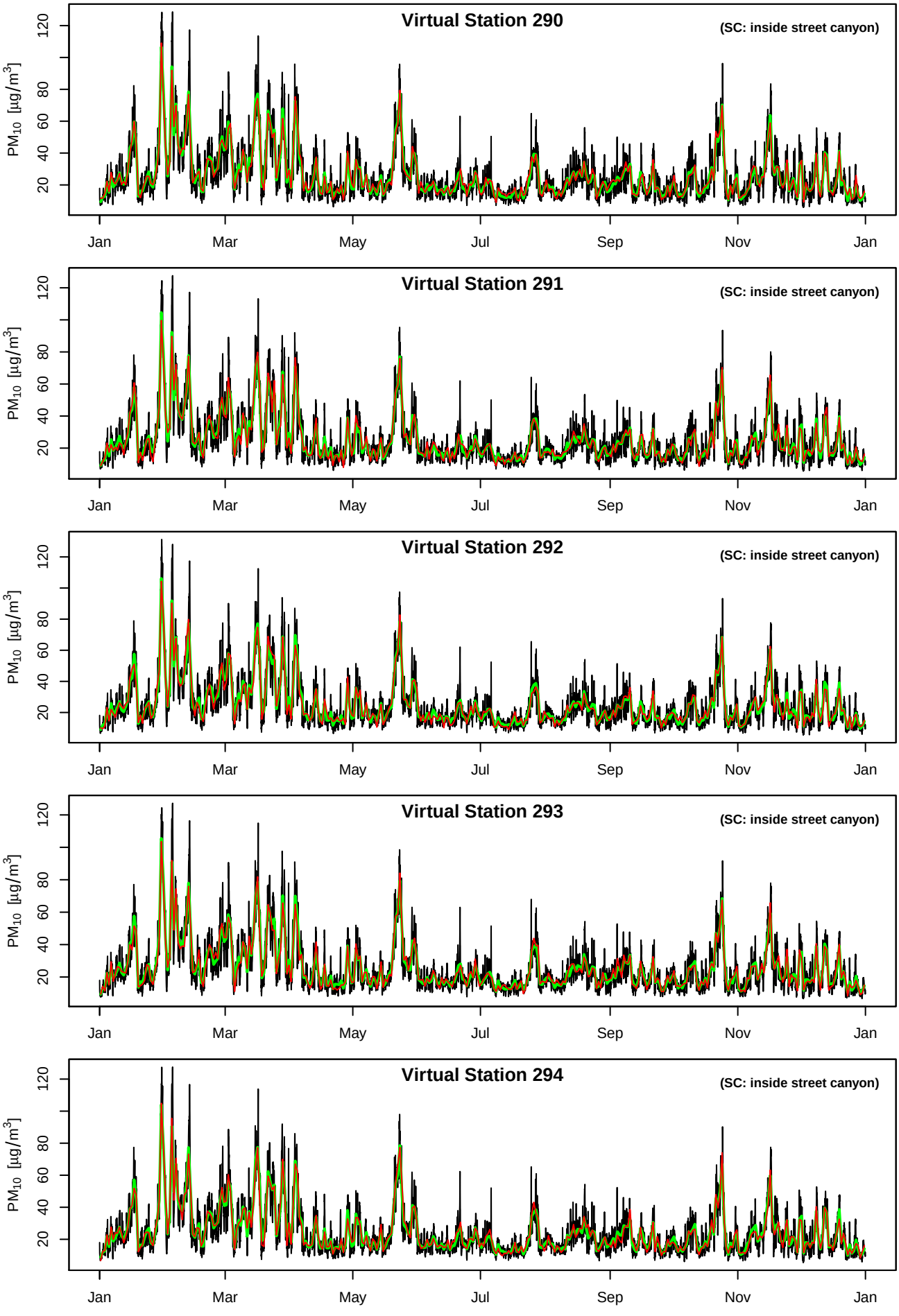

Virtual Station 265
(SC: inside street canyon)
Virtual Station 266
(SC: inside street canyon)
Virtual Station 267
(SC: inside street canyon)
Virtual Station 268
(SC: inside street canyon)
Virtual Station 269
(SC: inside street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

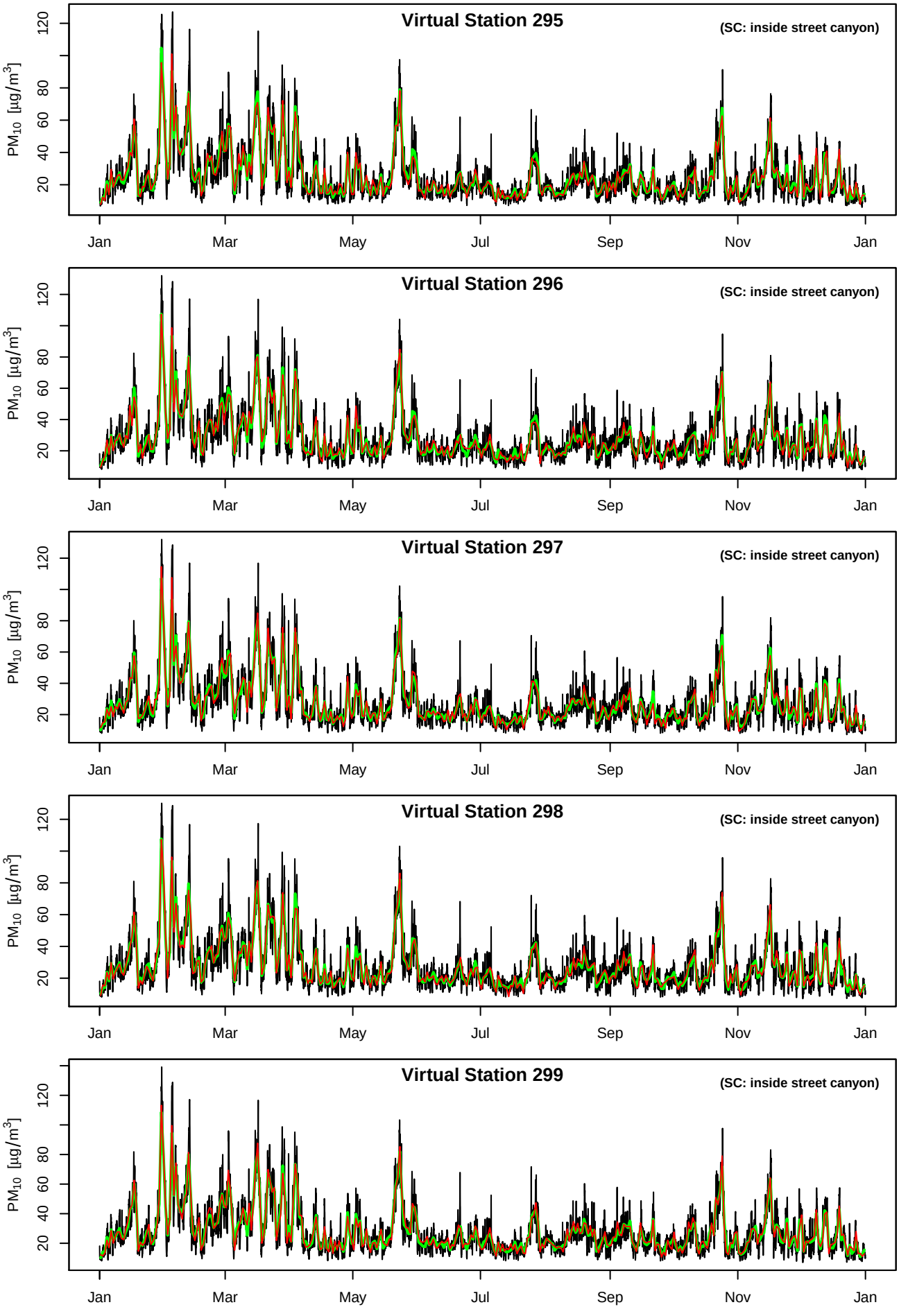

Virtual Station 270
(SC: inside street canyon)
Virtual Station 271
(SC: inside street canyon)
Virtual Station 272
(SC: inside street canyon)
Virtual Station 273
(SC: inside street canyon)
Virtual Station 274
(SC: inside street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

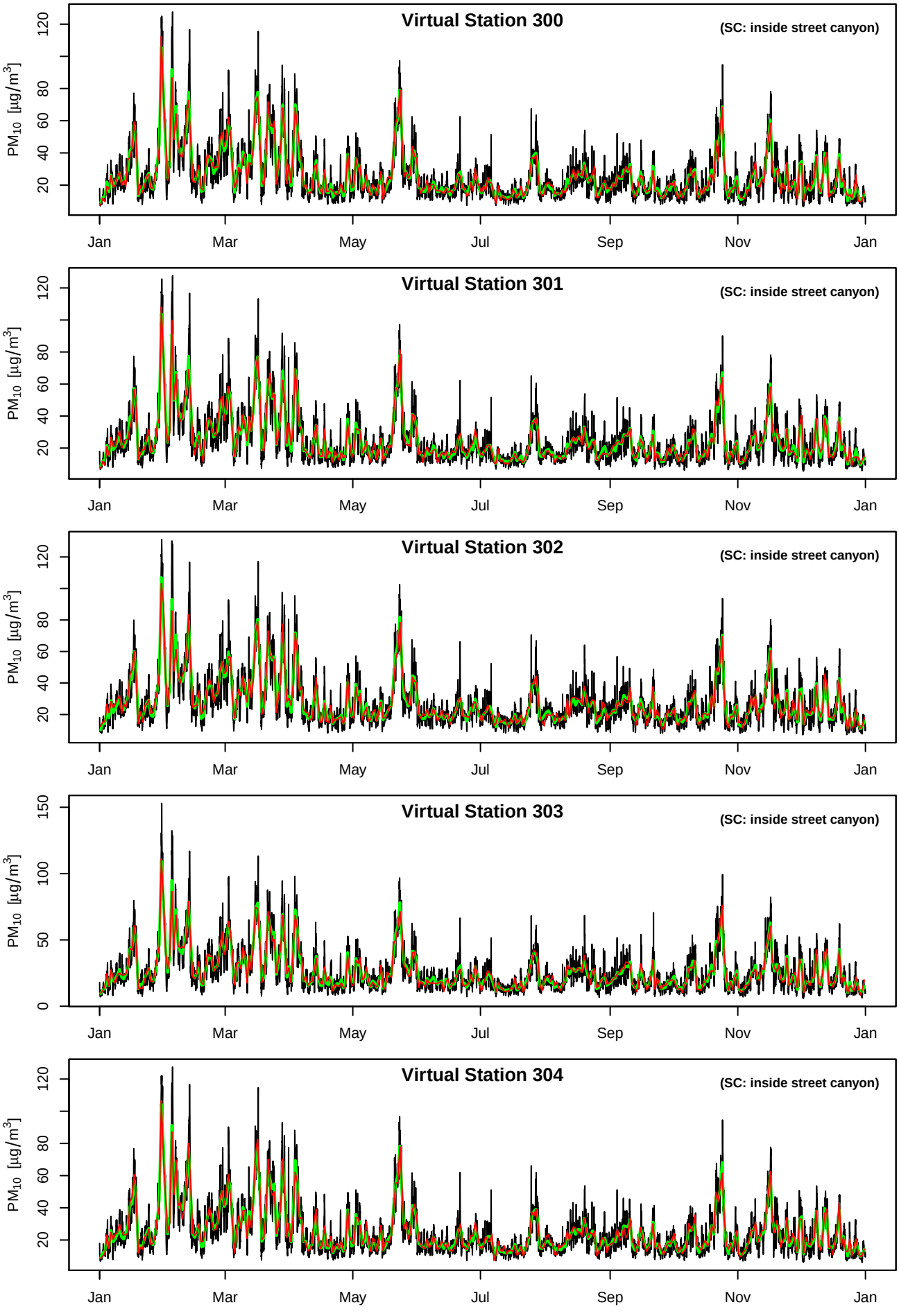

Virtual Station 275
(SC: inside street canyon)
Virtual Station 276
(SC: inside street canyon)
Virtual Station 277
(SC: inside street canyon)
Virtual Station 278
(SC: inside street canyon)
Virtual Station 279
(SC: inside street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

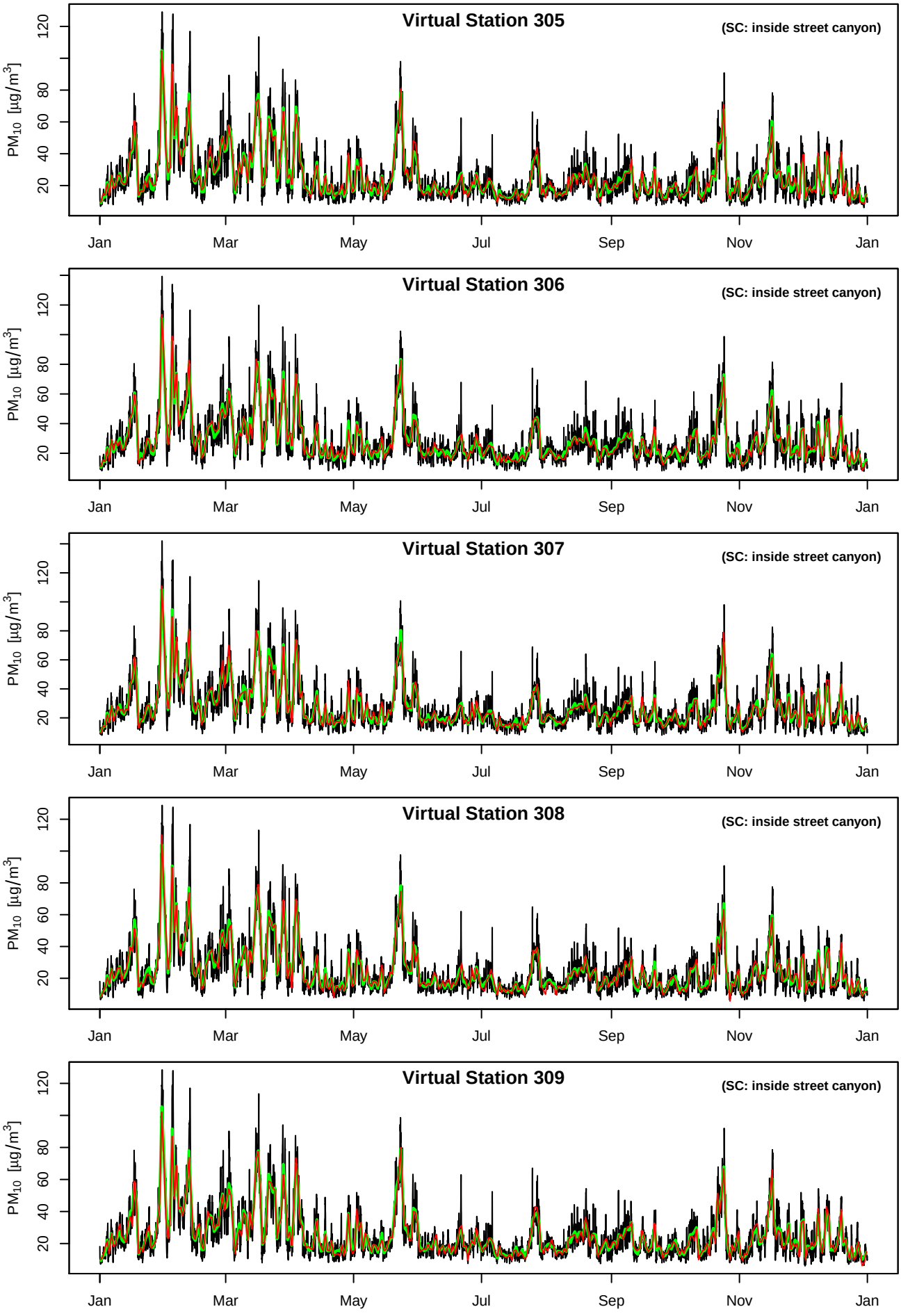

Virtual Station 280
(SC: inside street canyon)
Virtual Station 281
(SC: inside street canyon)
Virtual Station 282
(SC: inside street canyon)
Virtual Station 283
(SC: inside street canyon)
Virtual Station 284
(SC: inside street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

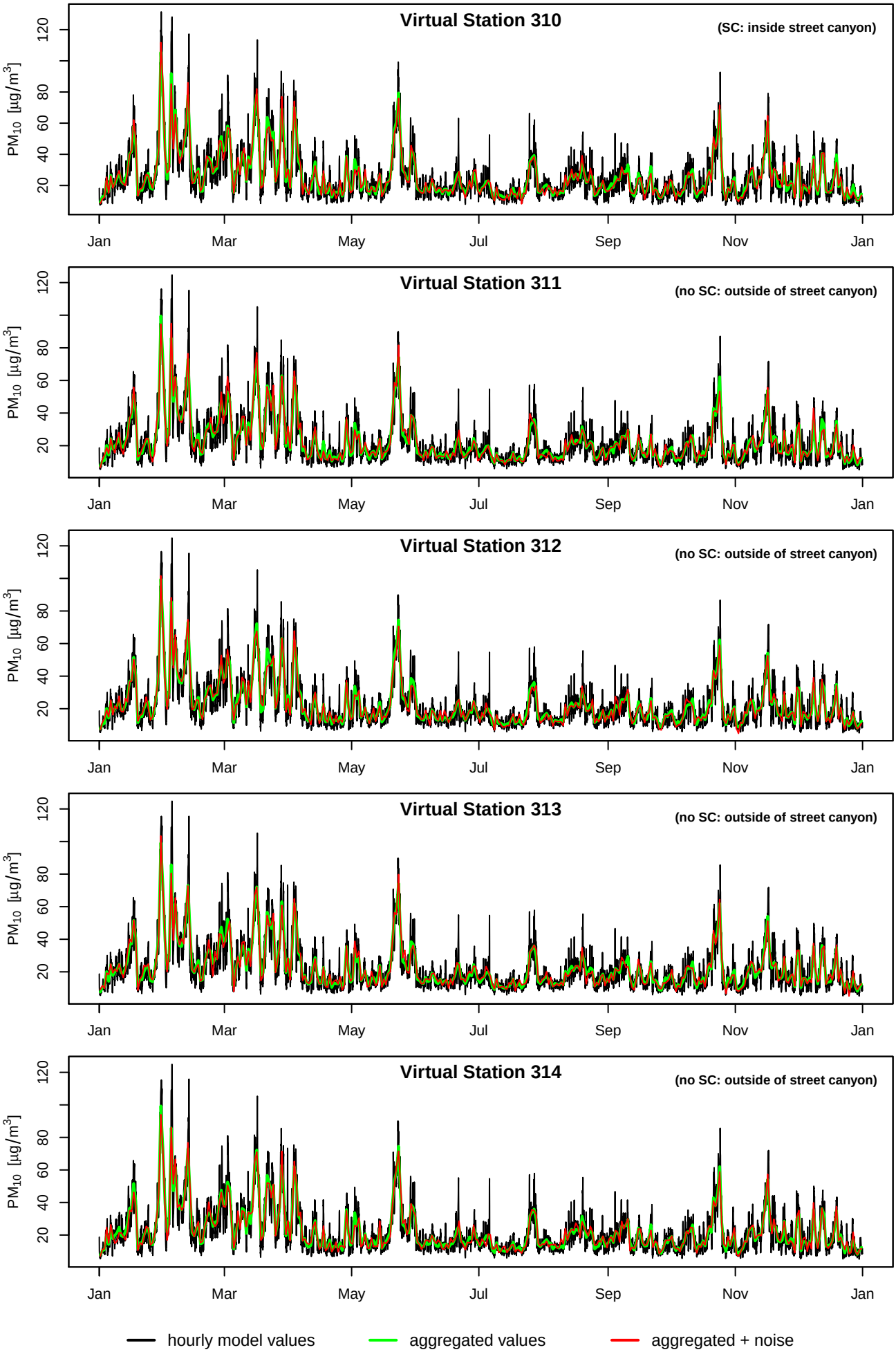

Virtual Station 285
(SC: inside street canyon)
Virtual Station 286
(SC: inside street canyon)
Virtual Station 287
(SC: inside street canyon)
Virtual Station 288
(SC: inside street canyon)
Virtual Station 289
(SC: inside street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

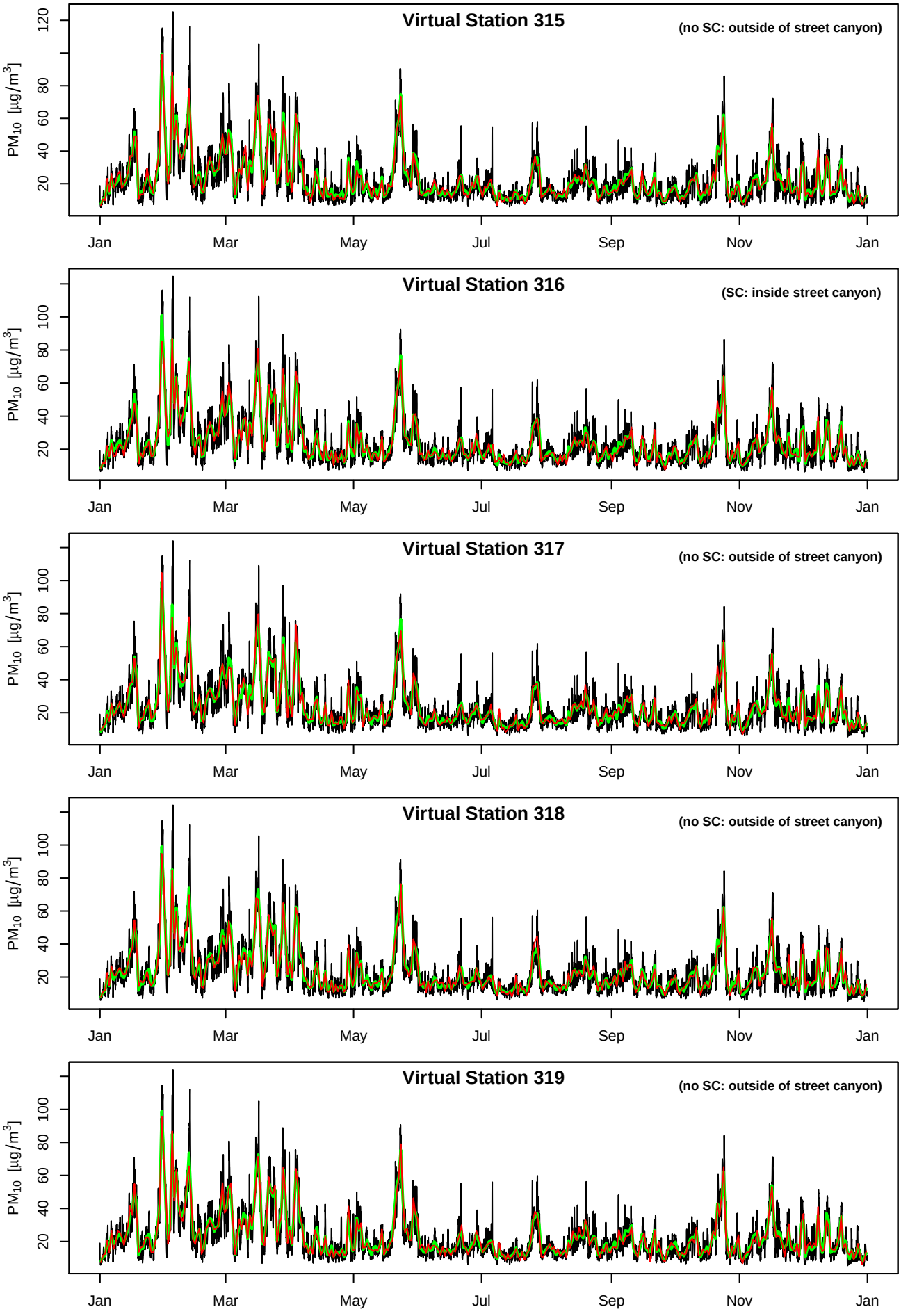

Virtual Station 290
(SC: inside street canyon)
Virtual Station 291
(SC: inside street canyon)
Virtual Station 292
(SC: inside street canyon)
Virtual Station 293
(SC: inside street canyon)
Virtual Station 294
(SC: inside street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

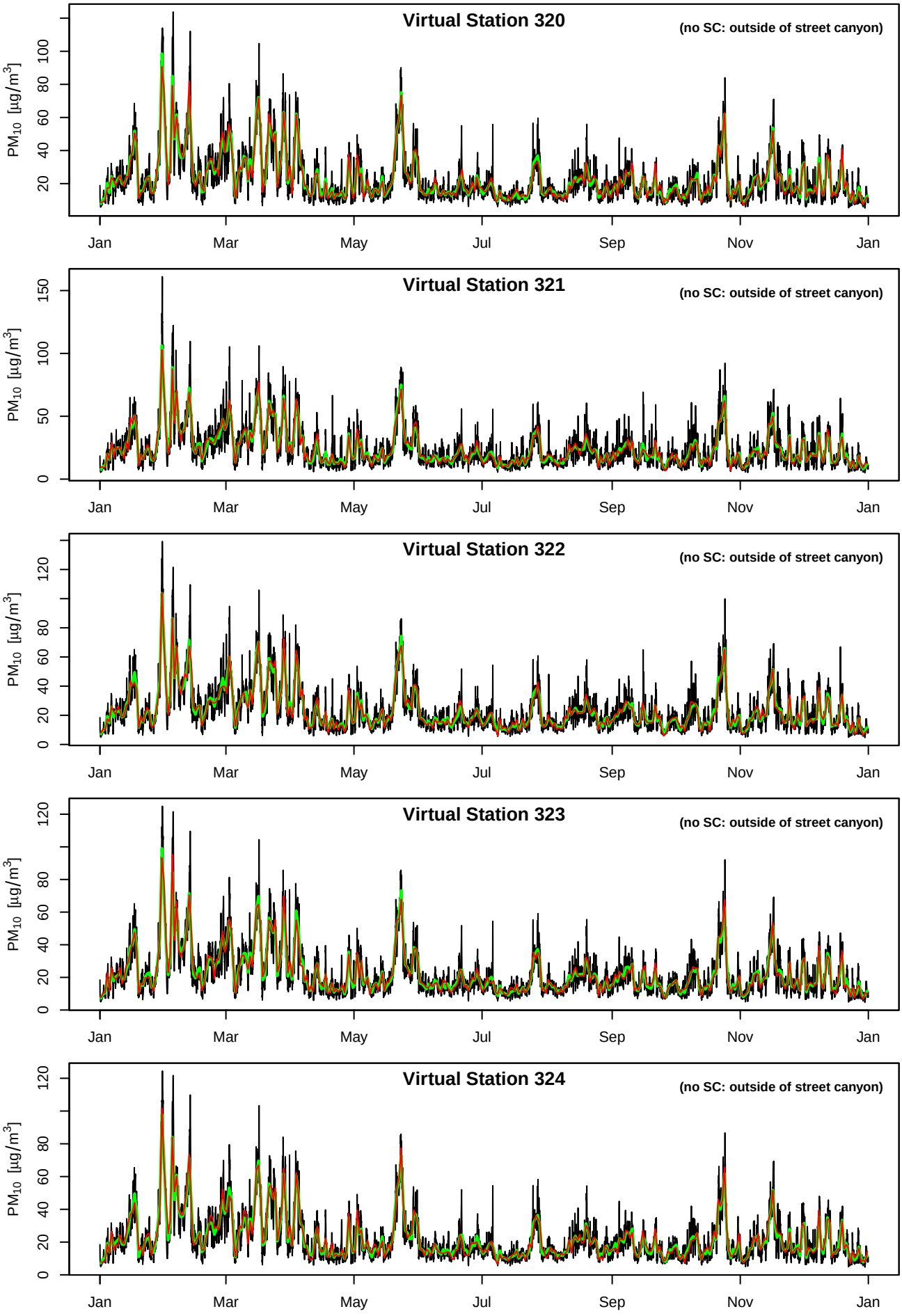

Virtual Station 295
(SC: inside street canyon)
Virtual Station 296
(SC: inside street canyon)
Virtual Station 297
(SC: inside street canyon)
Virtual Station 298
(SC: inside street canyon)
Virtual Station 299
(SC: inside street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

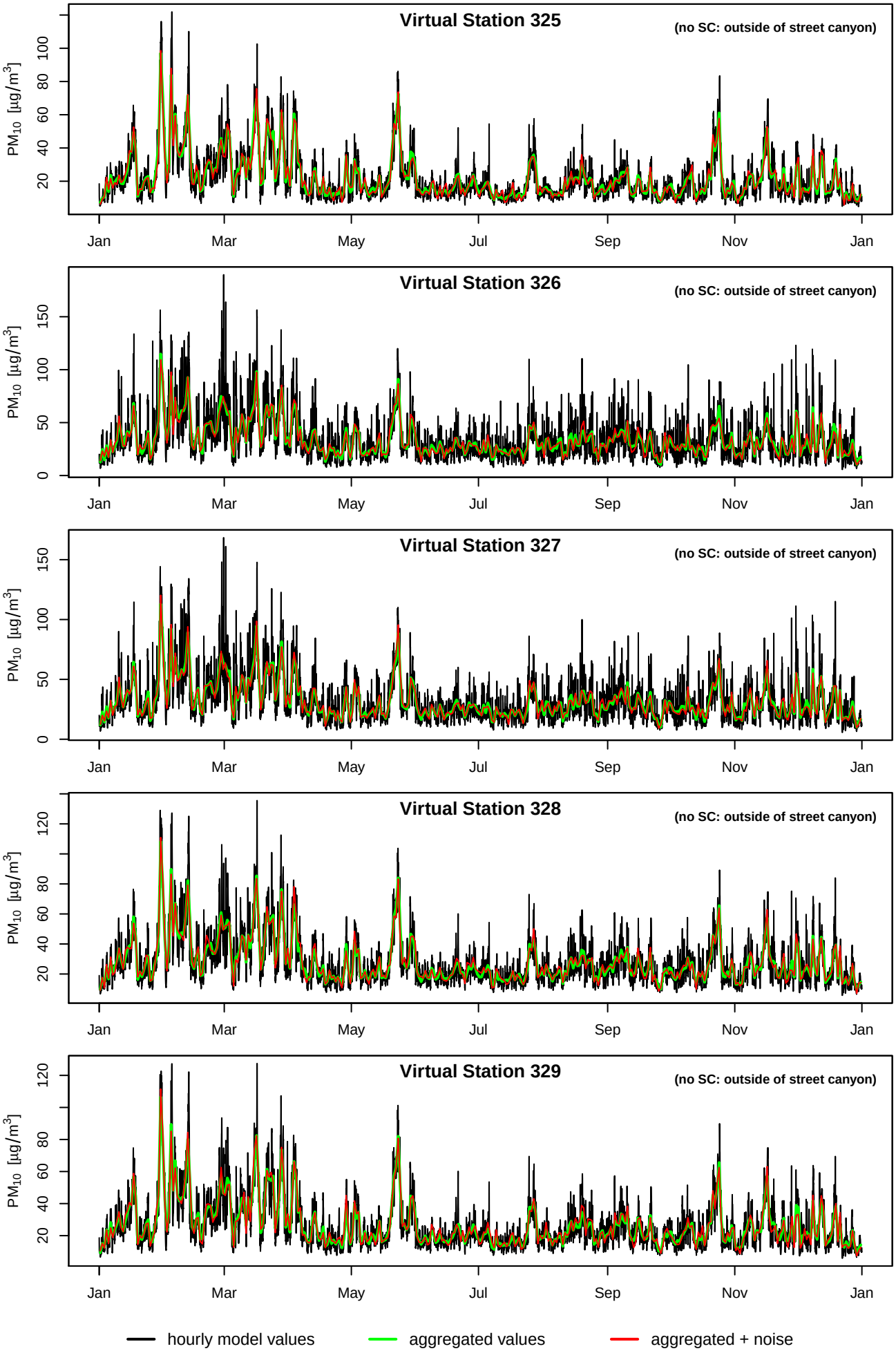

Virtual Station 300
(SC: inside street canyon)
Virtual Station 301
(SC: inside street canyon)
Virtual Station 302
(SC: inside street canyon)
Virtual Station 303
(SC: inside street canyon)
Virtual Station 304
(SC: inside street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

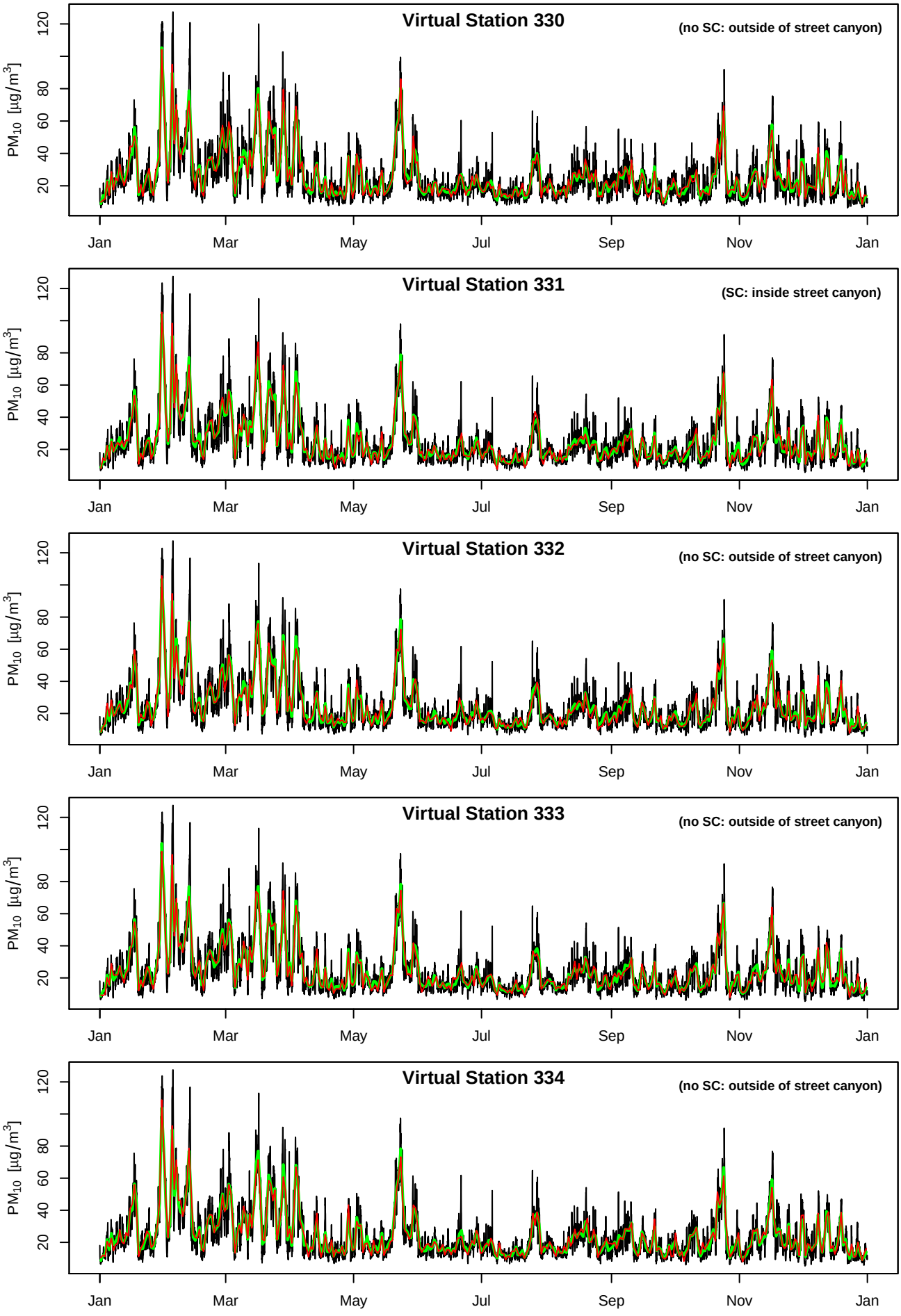

Virtual Station 305
(SC: inside street canyon)
Virtual Station 306
(SC: inside street canyon)
Virtual Station 307
(SC: inside street canyon)
Virtual Station 308
(SC: inside street canyon)
Virtual Station 309
(SC: inside street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

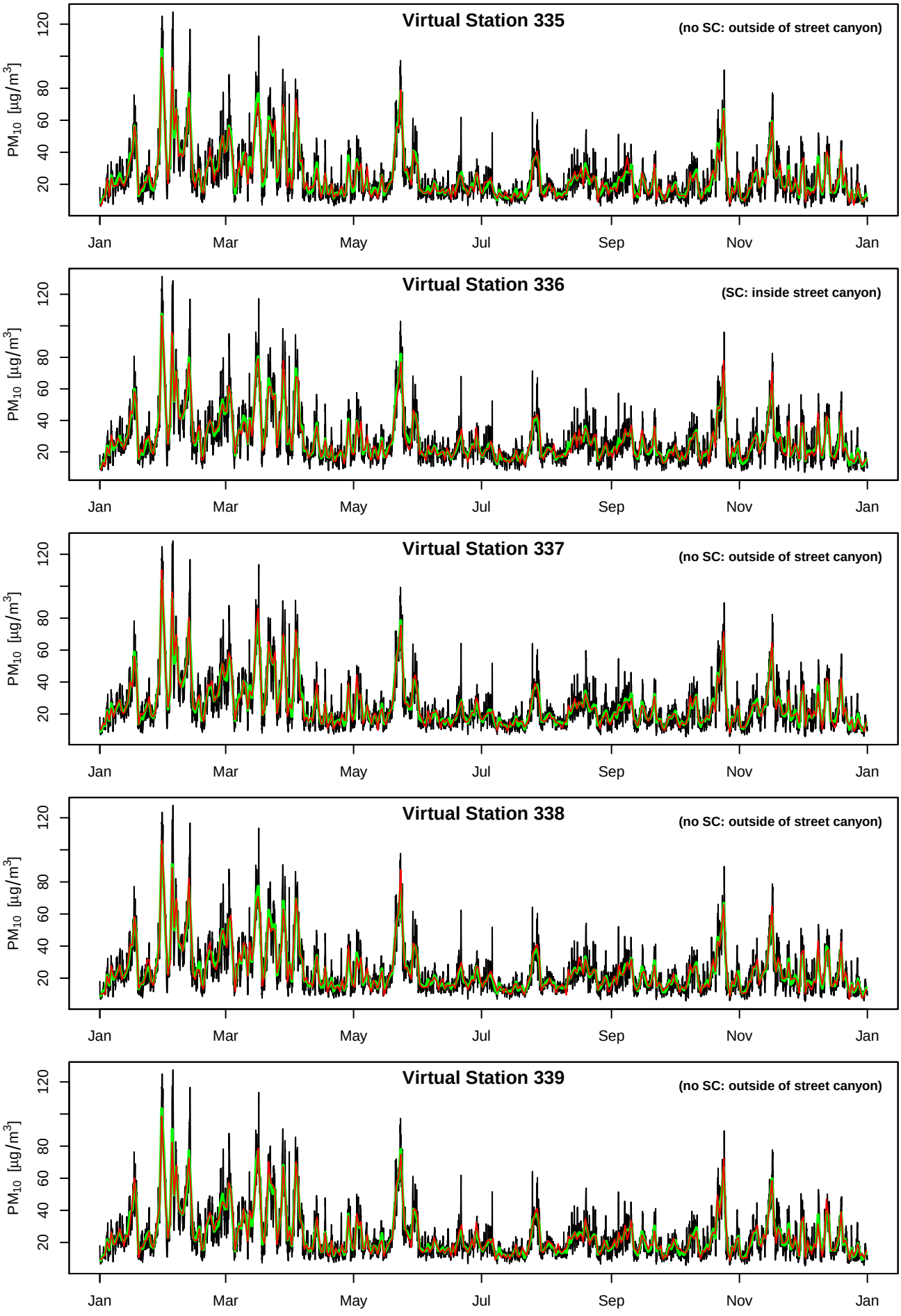

Virtual Station 310
(SC: inside street canyon)
Virtual Station 311
(no SC: outside of street canyon)
Virtual Station 312
(no SC: outside of street canyon)
Virtual Station 313
(no SC: outside of street canyon)
Virtual Station 314
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

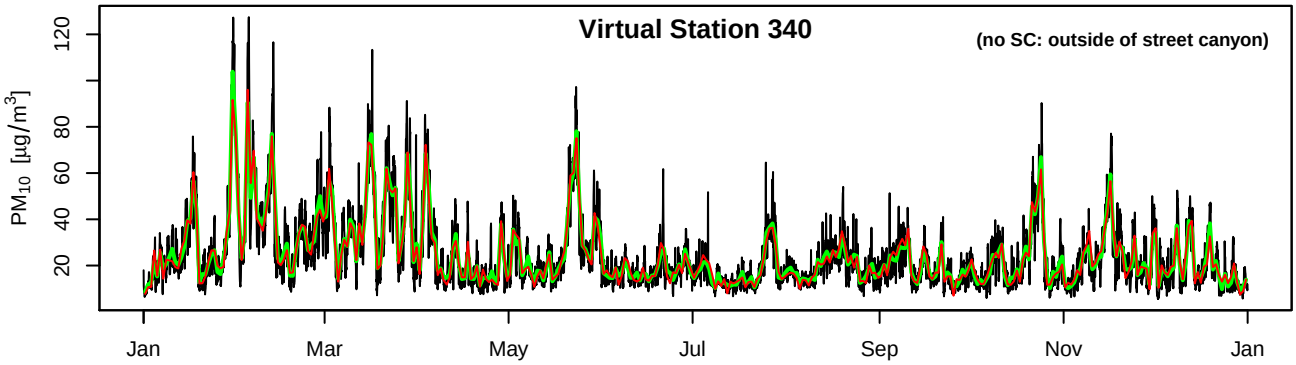

Virtual Station 315
(no SC: outside of street canyon)
Virtual Station 316
(SC: inside street canyon)
Virtual Station 317
(no SC: outside of street canyon)
Virtual Station 318
(no SC: outside of street canyon)
Virtual Station 319
(no SC: outside of street canyon)
PM10 [µg/m3]
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise


Virtual Station 320
(no SC: outside of street canyon)
PM10 [µg/m3]
20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 321
(no SC: outside of street canyon)
PM10 [µg/m3]
0 50 100 150
Jan Mar May Jul Sep Nov Jan
Virtual Station 322
(no SC: outside of street canyon)
PM10 [µg/m3]
0 20 40 60 80 120
Jan Mar May Jul Sep Nov Jan
Virtual Station 323
(no SC: outside of street canyon)
PM10 [µg/m3]
0 20 40 60 80 120
Jan Mar May Jul Sep Nov Jan
Virtual Station 324
(no SC: outside of street canyon)
PM10 [µg/m3]
0 20 40 60 80 120
Jan Mar May Jul Sep Nov Jan
hourly model values
aggregated values
aggregated + noise


Virtual Station 325
(no SC: outside of street canyon)
PM10 [µg/m3]
20 40 60 80 100
Jan Mar May Jul Sep Nov Jan
Virtual Station 326
(no SC: outside of street canyon)
PM10 [µg/m3]
0 50 100 150
Jan Mar May Jul Sep Nov Jan
Virtual Station 327
(no SC: outside of street canyon)
PM10 [µg/m3]
0 50 100 150
Jan Mar May Jul Sep Nov Jan
Virtual Station 328
(no SC: outside of street canyon)
PM10 [µg/m3]
20 40 60 80 120
Jan Mar May Jul Sep Nov Jan
Virtual Station 329
(no SC: outside of street canyon)
PM10 [µg/m3]
20 40 60 80 120
Jan Mar May Jul Sep Nov Jan
hourly model values
aggregated values
aggregated + noise

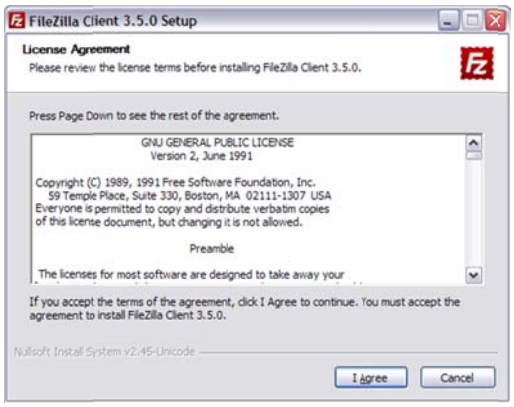

Virtual Station 330
(no SC: outside of street canyon)
Virtual Station 331
(SC: inside street canyon)
Virtual Station 332
(no SC: outside of street canyon)
Virtual Station 333
(no SC: outside of street canyon)
Virtual Station 334
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise


Virtual Station 335
(no SC: outside of street canyon)
Virtual Station 336
(SC: inside street canyon)
Virtual Station 337
(no SC: outside of street canyon)
Virtual Station 338
(no SC: outside of street canyon)
Virtual Station 339
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan
hourly model values
aggregated values
aggregated + noise

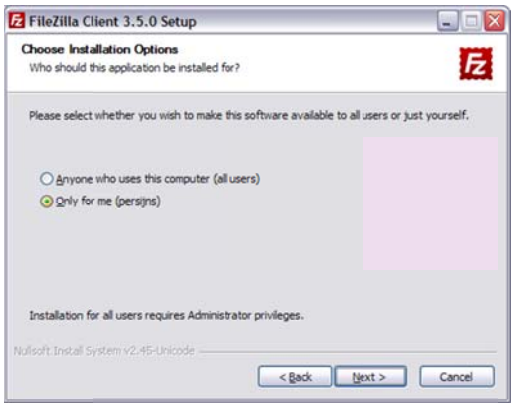

Virtual Station 340
(no SC: outside of street canyon)
PM10 [µg/m3]
20
40
60
80
120
Jan
Mar
May
Jul
Sep
Nov
Jan

Appendix 3: Installing FileZilla

1. Go to https://filezilla-project.org/download.php?type=client
2. Download the file FileZilla_3.18 in 32 or 64 bits according to you OS to your computer
3. Run the set-up of the program (the screenshots below guide you through the different steps of the installation).

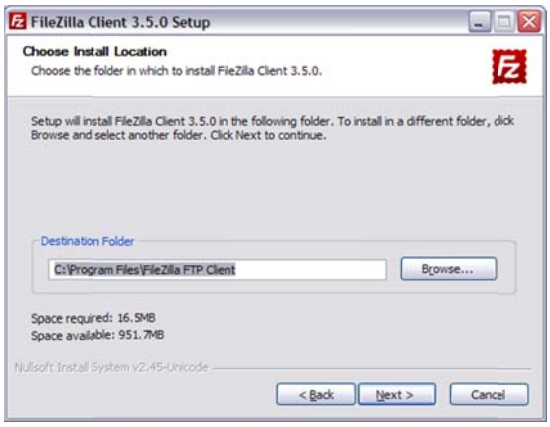


Select 'I agree'

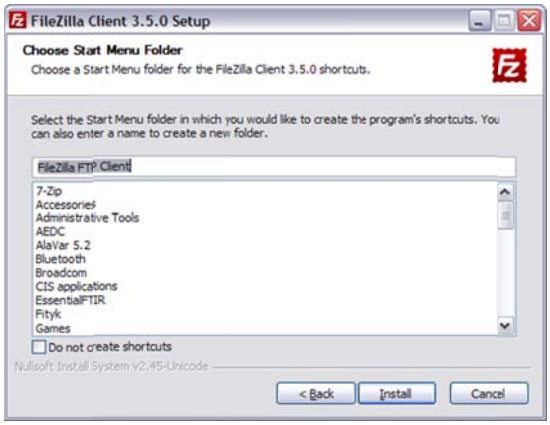


Select the users for which you would like to install the application

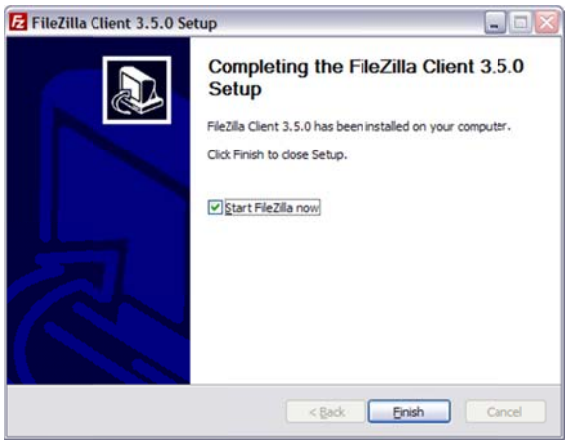
Select desktop icon if you like to have an icon of the programme on your desktop



Select the directory where you would like to install the programme



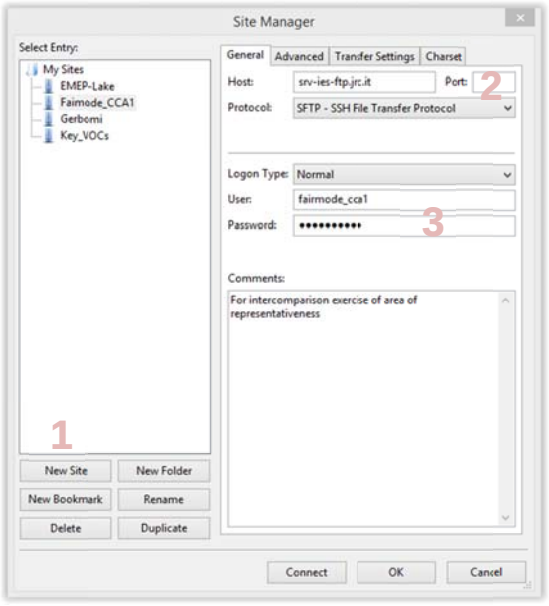
Select the start menu folder and press 'install'

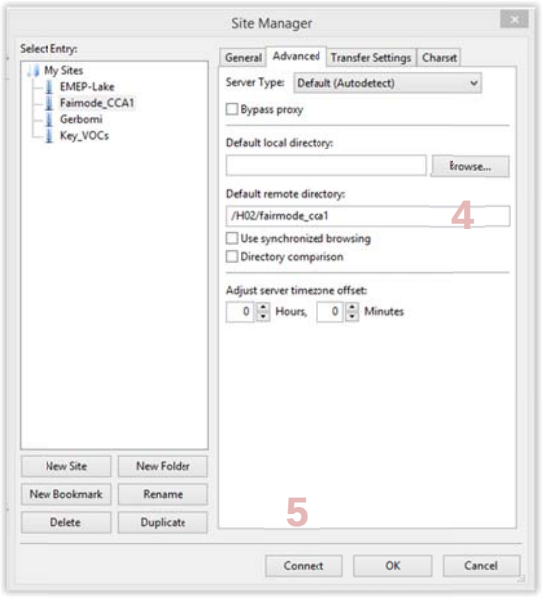


Select 'Finish' and Filezilla will start

Once FileZila is installed proceed as follows:

1. Type CTRL S in the main window, click on “New site”
2. Under tab General, in “host type” entersrv-ies-ftp.jrc.it, in “Protocol” choose sFTP
3. In “logon type” choose Normal, in user type “fairmode_cca1”. The password will be communicated at later stage by mail.
4. Under tab “Advanced”, in “Default remote directory” enter ‘/H02/fairmode_cca1”
5. Click on Connect
6. Upload you file that should start by the name of your Institute.





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