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Early meteorological series from Geneva, 1760-1798

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Abstract

The series from Geneva is currently the longest Swiss meteorological series, reaching back to 1753. However, the series, which was generated in the early 1960s, uses data from Neuchâtel until 1768, and the original data behind the series have up to now only been digitally available back to 1799 for temperature and pressure. In this paper, we analyse measurements taken in Geneva and in its surroundings (Genthod, Avully) between 1760 and 1798. The measurements were made by Charles de Lubières, Guillaume-Antoine Deluc, Jacques-André Mallet, and Frédéric-Guillaume Maurice. Together, these series may help to corroborate, complement, and possibly extend the currently available series. In this paper, we briefly present the observers, the series, and discuss their quality by means of mutual comparisons. This shows that back to 1768 indeed a good series can be generated, while the early data back to 1760 are somewhat more uncertain. At the same time, we recommend unmerging the current series and remove the Neuchâtel segment.

1. Introduction

The Geneva series is one of the only two hitherto available long Swiss series and reaches back to 1768, or 1753 when using extrapolated data. It was re-evaluated by Bider and Schüepp (1961) and Schüepp (1961) and has found its way into the main global data sets. However, Schuepp (1961) published only daily means, and the first 15 years of the series were taken from Neuchâtel (this series is described by Wyer et al., 2021). In a previous project (Füllemann et

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al., 2011) we have digitised the original data back to 1796, but not other 18th century segments. In this paper we present earlier segments from the Geneva series, reaching back to 1760.

While the merging of Neuchâtel and Geneva may be suitable for monthly mean values, the two cities experience different weather, such that in a daily time scale, the long series from Geneva should be unmerged. Furthermore, the Neuchâtel series is affected by many location changes (Wyer et al., 2021), which makes it difficult to homogenise.

It is therefore important to digitise and analyze those data that are available from Geneva for the 18th century. In fact, measurements in Geneva were taken since 1760. Within the MeteoSwiss GCOS project "Long Meteorological Series from Switzerland" we have digitised and re-evaluated several of these old data sources. In this paper we describe records by Charles de Lubières and Guillaume-Antoine Deluc taken in Geneva, Jacques-André Mallet (in Avully) and Frédéric-Guillaume Maurice (in Genthod) in the 18th century. This paper thus continues the work performed in the framework of the MeteoSwiss project DIGIHOM III (Füllemann et al., 2011), where subdaily data were digitised back to 1796 (Auchmann et al., 2011, Brönnimann et al., 2020), the SNF project CHIMES (Pfister et al., 2019; Brugnara et al., 2020a) and a paper in this volume describing data from the 1780s from Jean Senebier and other observers (Häderli et al., 2020).

The meteorological records from Geneva are well studied (e.g., Gautier, 1843; Picot, 1843; Plantamour, 1863, 1876; Grenon, 2010). The precipitation records were digitised by Pfister (1988) and included in the EURO-CLIMHIST database (Pfister et al., 2017). The observers also allow a glimpse at the science history in Geneva in the 18th century.

In this paper we present the compiled metadata on four series by Lubières, Deluc, Mallet (in Avully), and Maurice (in Genthod). A short record was also digitised from Mallet in Geneva (6 March to 18 May 1786). We describe information on observers, locations and (where available) on instruments and practices (Section 2). Then we describe processing and quality control of the data series and results from their mutual comparisons (Section 3). The data can be obtained from MeteoSwiss, EURO-CLIMHIST (Pfister et al., 2017), and the Copernicus Climate Change Service database (Noone et al., 2021).

2. The 18th century Geneva series

In this Section, we summarise the metadata for each of the series based on literature and archival sources. An overview of all Geneva series is given in Table 1 (the series presented in this paper are highlighted in italics; note that the Table is modified with respect to Häderli et al., 2020, as further research has brought to light a few mistakes concerning the exact locations). Figure 1 gives the locations of the stations in Geneva and surroundings. In addition to the series discussed here, in Häderli et al. (2020), and in Brönnimann et al. (2020), there are some additional measurements made by members of the *Observatoire de Mallet* for astronomical purposes. They were not digitised as they were taken only during clear days and nights. The manuscript sources of all series discussed in this paper are kept at the Library of the Observatory of Geneva.

Table 1. Overview table of historical meteorological measurements in Geneva, 1760-1863. # indicates the number of the location in Fig. 1, Alt = altitude in m asl. Italics: series described in this paper, * described in Häderli et al. (2020), ** described in Brönnimann et al. (2020), † corrected location.

Location	#	Lat	Lon	Alt	Observer	Start	End
Petit-Saconnex (summer) *Unknown/Rue Beauregard*	*10*	*46.221* *46.199*	*6.122* *6.149*	*445* *400*	*Charles Benjamin de Lubières*	*1760*	*1789*
†Rue de la Cité 219	*1*	*46.20284*	*6.14439*	*386*	*Guillaume-Antoine Deluc*	*1768*	*1800*
*Observatoire de Mallet, Bastion de St-Antoine I	3	46.19974	6.15148	399	J.-A. Mallet, M.-A-Pictet, J. Trembley Jacques Paul, others	1774 1787	1779 1791
Avully, route du Moulin-Roget 8 *Maison Mallet, rue du Cloître 4*	*5*	*46.16955* *46.20151*	*6.00038* *6.14838*	*424* *389*	*Jacques-André Mallet*	*1778* *1786*	*1786* *1786*
Genthod, Maison Maurice *Genthod, Maison Bonnet*		*46.25930* *46.2644*	*6.15332* *6.158*	*410* *405*	*Frédéric-Guillaume Maurice*	*1787* *1796*	*1795* *1798*
Cartigny, Château, r. de Vallière 27 Place Bourg-de-Four 10 Maison Perdriau	6 9	46.17268 46.20046 46.19875	6.01892 6.14909 6.1483	429 399 400	Marc-Auguste Pictet	1775 1776 1779	1786 1779 1786
*†Musée de l'Académie, rue Théodore de Bèze 2	2	46.20105	6.15095	401	Jean Senebier	1782	1789
**Jardin Botanique	8	46.199	6.1474	395.6	Marc-Auguste Pictet, Vaucher	1798	1821
**Nouveau Jardin Botanique, Parc des Bastions	7	46.20011	6.14523	380	Unknown	1822	1825
**†Pont des Tranchées, Bastion du Pin	11	46.17720	6.13579	405	Unknown	1826	1835
**†Observatoire de Genève, Bastion de St-Antoine II	4	46.19981	6.15221	406	Observatory's staff	1836	1863

2.1. Charles Lubières

Charles-Benjamin (1714-1790, Fig. 2) was the son of Francois de Lubières, governor from the principality of Orange and of Marie Calandrini from Geneva. He had to organise the exile of 2-3000 huguenots reluctant to abjure their religion. The family moved first to Geneva and then to Berlin, where Charles-Benjamin was born. In 1720, Marie Calandrini, now widow, returned to her family in Geneva. In 1732 Charles-Benjamin de Lubières became a citicen of Geneva and in 1752 a member of "Conseil des Deux-Cents". Lubières was a member of the "Société des Gens de Lettres Genève", where he acquired an encyclopedia-like culture.

Lubières measured usually daily (though not every day) in the early morning – at 6 AM from May to September, at 7 AM the rest of the year. From 1776 onward the measurement are more regular and taken twice per day. We do not know where he lived and measured in Geneva before the mid-1770s, when he moved to Rue Beauregard. In 1768 he bought a domain at Petit-Saconnex (Fig. 1), where he spent every summer afterwards. Unfortunately, Lubières did not note the dates when he moved from the winter to the summer residence and vice versa. Lubières noted temperature, pressure, and (starting in 1770) precipitation, as well as the wind direction. He was very interested in climate differences across Europe and continuously compared his data with those of Louis Cotte in Montmorency (Paris).

Lubières' observations cover the period 1760 to 1787. However, only the first of the five volumes, covering the period 1760-1769, was considered suitable to be imaged with a simple camera and tripod. An excerpt of a data sheet from the first volume is given in Figure 3.

Figure 1. Top: Map of Geneva City around 1835 (Lithography by Jacques Freydig, Briquet & Dubois Eds.) with locations of historical meteorological measurements for 1760–1863 (numbers refer to Table 1). Bottom: The Geneva Republic territory after 1754. In hatched upward: parcels obtained from France in 1749. Hatched downward: from Sardinia in 1754, by exchanges with more distant territories. Red squares: sites of Meteorological series outside Geneva City for agronomical purpose (Pt-Saconnex, Genthod, Cartigny and Avully). Green squares: research sites (Château de Jussy / Micheli du Crest for thermometry; Geneva, Palais Lullin de Saussure / H.-B. de Saussure [S] for hygrometry). Map by M. Grenon, adapted from Geisendorf (1952).

Figure 2. Portrait of Charles-Benjamin de Langes de Montmirail, Baron de Lubières (pastel by Jean-Étienne Liotard, Getty Research Institute's Open Content Program).

2.2. Guillaume-Antoine Deluc

Guillaume-Antoine Deluc (1729-1812) was the son of watchmaker Jacques-François Deluc in Geneva (see Sigrist, 2005, for the following). With his brother Jean-André he shared the passion for geology, in particularly for volcanic rocks, for palaeontology (they identified more than a hundred species of fossil shellfish), and for meteorology. Jean-André was an authority in the field of meteorological instruments and is especially known today for advocating the use of mercury instead of spirit of wine in thermometers and for his barometers (Deluc, 1772). We can therefore assume that Guillaume-Antoine Deluc was an expert user of scientific instruments. He also was a member of the “Conseil des Deux-Cents” in Geneva, but withdrew during the revolutionary period.

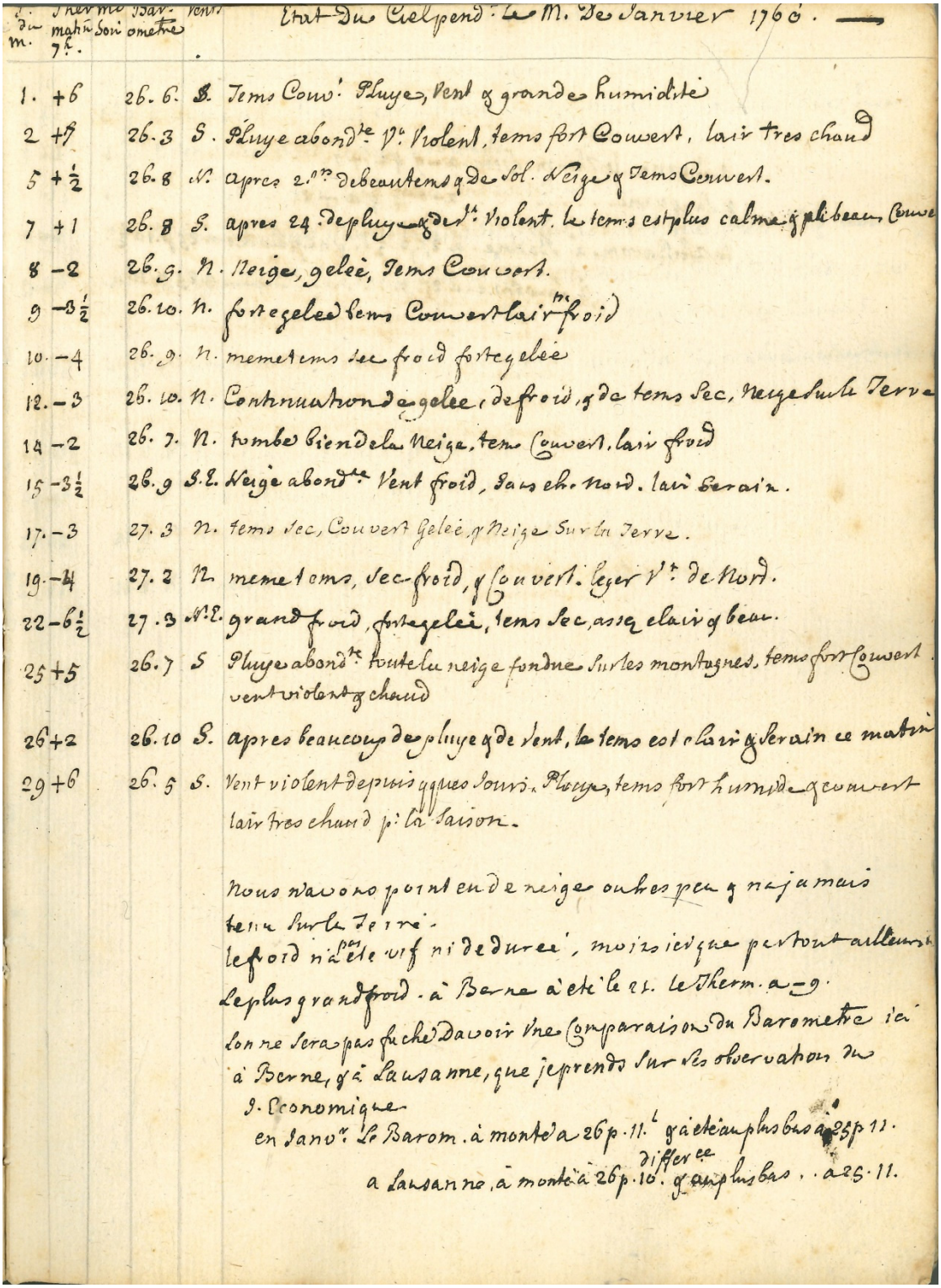

Figure 3. Data sheet from Charles de Lubières, 1760.

According to Gautier (1843), the barometer of Deluc was of high quality but it was located in a room exposed to sunlight in the afternoon in some parts of the year. The room was not heated. Surprisingly, Deluc did not write down the temperature of the barometer, not allowing a reduction to 0°C. The thermometer was exposed to the north outside a garret-window on the 5th and last floor of his house, some 30 meters above the level of the lake.

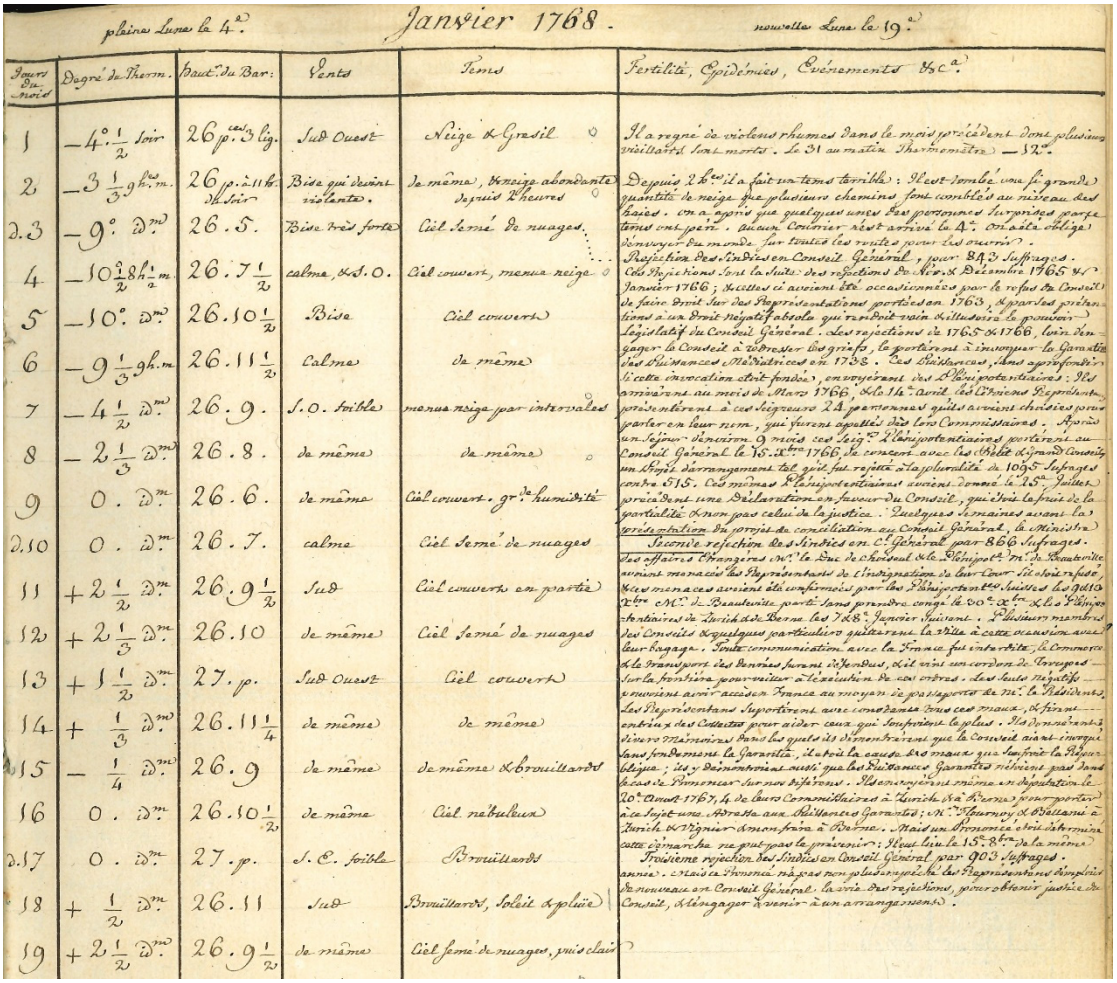

Figure 4. Data sheet from Guillaume-Antoine Deluc, January 1768 (excerpt).

Deluc measured once per day, usually in the morning, sometimes also in the afternoon. He measured temperature and pressure and observed the wind. The data cover the period 1768-1800, although sporadic observations exist for January 1767. A data sheet from Deluc is shown in Figure 4.

2.3. Jacques-André Mallet

Jacques-André Mallet (1740-1790) was the son of a Geneva officer in French service and, more crucially, the grandson of Gédeon Mallet, an extremely rich business man (see Golay, 2008, for the following). Mallet studied mathematics in Geneva, then in Basel (under Daniel Bernoulli). He was selected to join the Russian expeditions to observe the transit of Venus in 1769. He travelled to St. Petersburg in spring 1768 to prepare all expeditions and was sent to the Arctic Circle in Lapland in June 1769. Despite unfavorable weather conditions, Mallet could observe half a transit, contributing to the determination of the solar parallax, leading to the distance of the Earth from the Sun.

After his return to Geneva in 1769, he was elected to the "Conseil des Deux-Cents". A new Chair in Astronomy was created for him and he became honorary professor at the Académie de Genève. The year after, he asked the council for permission to build an

observatory on the City walls, which was finalised in 1772 and equipped at his own expense. Mallet was the director of the observatory until his death in 1790. He was supported by his assistants Marc-Auguste Pictet and Jean Trembley. He observed numerous eclipses and transits, the orbits of planets and comets as well as the solar activity.

Specific meteorological observations were carried out by Mallet and his assistants at the observatory between 1774-1779. Their purpose was to compute the atmospheric refraction of celestial objects, from pressure and outdoor temperature, and to monitor the drift of astronomic clocks as function of the indoor temperature. These observations were made only in clear sky conditions.

In parallel to his astronomical activity, Mallet was a very active agronomist in the Société des Arts section dedicated to agriculture. In 1781, he moved to his country home in Avully. From 1785 on, he was in charge of the vast domain (36 ha) bought by his mother. He developed a climatic research program in collaboration with F.-G. Maurice to monitor the vegetation cycle in the period between mid-April and the end of December.

The measurements discussed in this paper were made in Avully and cover the period 1778-1786. The months of January to mid-April are usually missing. The measurements for the spring of 1786 were made at Mallet's house in Geneva. The observed variables are pressure, temperature, wind and precipitation. A sample data sheet is shown in Figure 5.

2.4. The Genthod series by Frédéric-Guillaume Maurice

Frédéric-Guillaume Maurice (1750-1826) was an agronomist, advocate, auditor, castellan and caretaker of a hospital (Sigrist, 2007). As all other observers discussed in this paper, Maurice was also a member of the "Conseil des Deux-Cents". During the Geneva Revolution of 1782, Maurice retreated to the countryside (Genthod) and devoted himself to meteorological measurements and agricultural experiments. He was co-founder, in 1796, of the "Bibliothèque britannique" and edited the publication of meteorological data in this journal. During te period 1801-1814 he served as Mayor of Geneva, appointed by Napoleon (Sigrist, 2007).

Maurice made measurements at his mansion in Genthod with meteorological instruments built by the Genevan instrument maker Jacques Paul. Given that the initial aim was mainly the selection of more productive varieties of corn, the focus was on temperature (including soil temperature) and humidity. A barometer was initially not part of the instrumentation. In 1796 the station was moved to the former Bonnet Mansion, also in Genthod at a similar elevation but better exposed to all winds. The observations from that year until 1798 were published in the "Bibliothèque britannique" and had already been digitised in the DIGIHOM III project. We have additionally digitised the unpublished data for the period 1789-1795. They contain three times daily temperature, pressure (from 1793), relative humidity, and daily precipitation, as well as soil temperature at various depths. Unfortunately, we found the journal for the year 1792 too late and could not digitise it in time for this publication. The "Bibliothèque britannique" also published metadata, according to which the station in 1796 was located 362.5 m (186 *toises*) from Lake Geneva and 26 m (80 *pieds*) above the water level. The thermometer and the hygrometer were located between 1.3-1.6 m above the ground, "in the shadow of a stake".

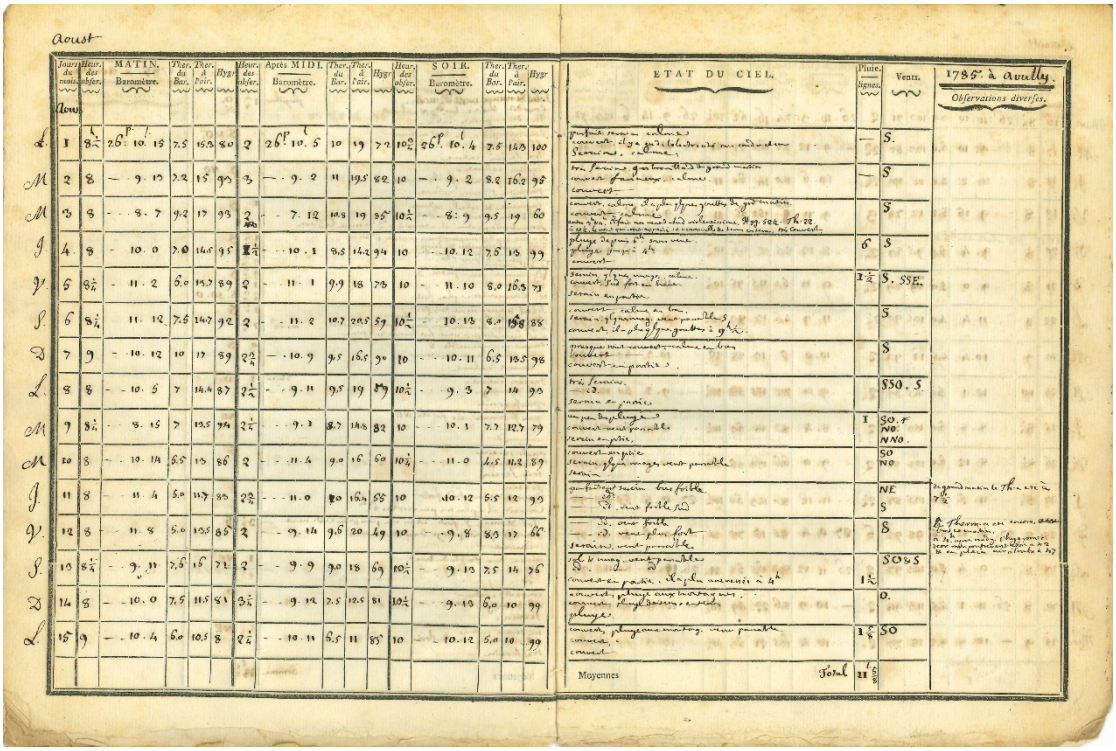

Figure 5. Data sheet from Jacques-André Mallet, August 1785.

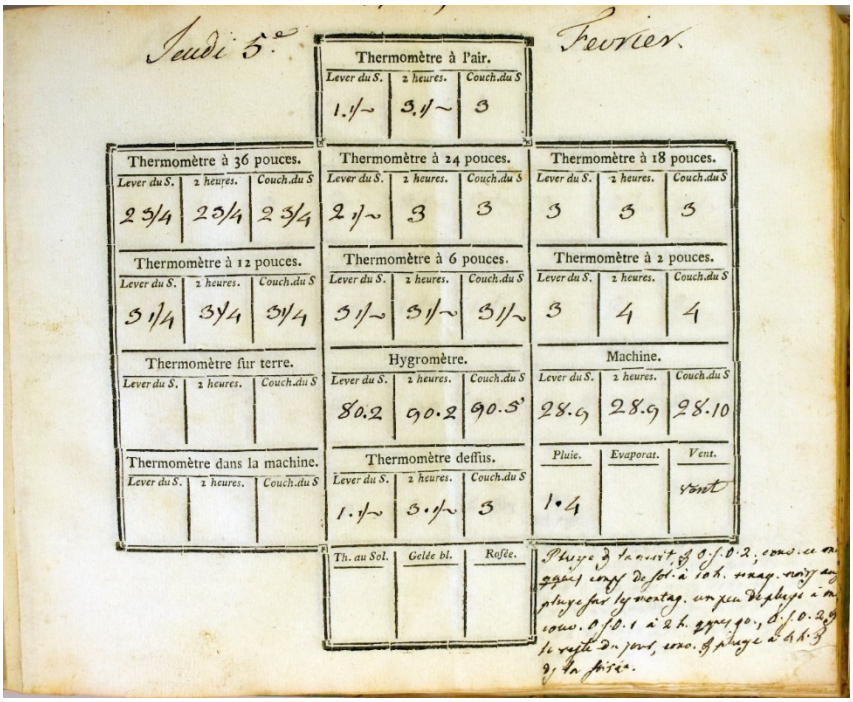

Figure 6. Data sheet from Maurice for 5 February 1789 during a particularly cold winter (Pappert et al. 2021).

Häderli et al. (2020) erroneously assigned to Maurice observations made in Geneva at *Observatoire de Mallet* and published in the Journal de Genève. A more thorough research in the archives of the Observatory and other sources revealed that Maurice was not involved in those observations.

3. Processing and Quality Assessment

In this section, we present the results from the quality control procedure, similar as described in Brugnara et al. (2020b). We present results on the internal consistency of the series (comparing measurements at different times of the day) and of the outlier screening. Additionally, as all series overlap, we also mutually compared the series during the overlapping period.

Since the series by Deluc and Lubieres are daily, internal consistency cannot be checked. Figure 7 shows, for Mallet's series in Avully, the comparison of morning, noon, and evening series. Generally correlations are high, and there is no indication for a change in the relation; the series form Avully appears useful.

The corresponding figure for Maurice's measurements in Genthod (Fig. 8) shows a better correlation for pressure, but worse for temperature. Note that only morning and evening measurements could be compared.

Next we performed mutual comparisons between the series (Fig. 9). Note that overlaps are often short. Very high correlations are found for pressure for Mallet (Avully) versus Deluc (Geneva) and for Maurice (Genthod) versus Deluc (Geneva). This is a bit surprising given that the pressure measurements by Deluc were supposedly not corrected for temperature. The pressure data of all three series are arguably of good quality. Pressure from Lubières and Deluc agree clearly less well. Note that the resolution of Lubières measurement is very coarse. Still, a correlation of 0.83 must be considered a low correlation. For temperature, the agreement between Lubières and Deluc is better. Finally, we also compared the very short series by Mallet in Geneva (1786) with Deluc and found a good agreement. This analysis shows that all series from Geneva and surroundings seem to be of relatively high quality, except the series from Lubières, which not only suffers from a low measurement resolution, but do not fit well with the overlapping record from Deluc at least for pressure.

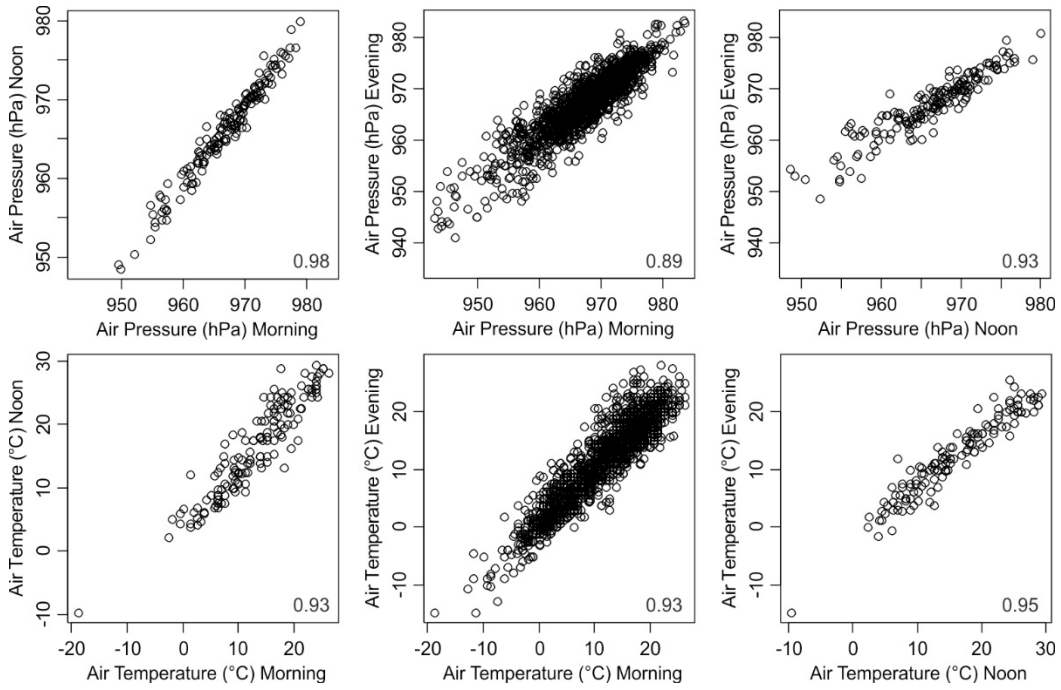

Figure 7. Mutual comparisons of morning, noon, and evening measurements in the series of from Avully. Top: pressure, bottom: temperature. Numbers indicate the Pearson correlation coefficient.

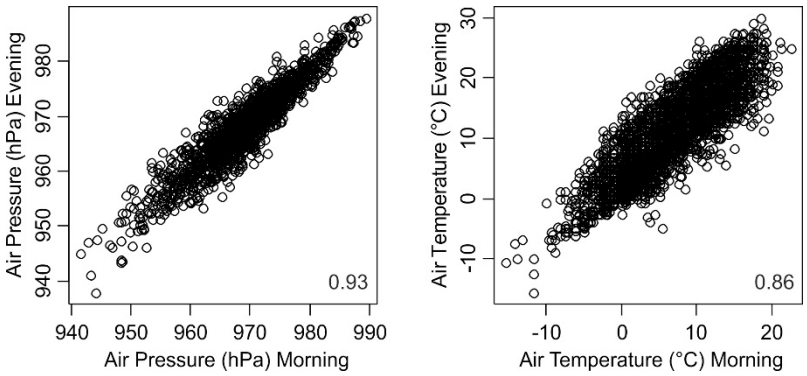

Figure 8. Comparison of morning and evening measurements in the series from Genthod for (left) pressure and (right) temperature. Numbers indicate the Pearson correlation coefficient.

A comparison with the diurnal cycle measured at the MeteoSwiss station at Geneva airport and the historical Observatory (Fig. 10; the airport is located between Geneva and Genthod) shows a warm bias in Deluc's measurement, as was already found by Gautier (1843). The bias is related, on the one hand, to the large height from the ground, which mitigates nighttime temperatures; on the other hand, summer temperatures are probably influenced by solar radiation in the early morning. Lubières' data are probably affected by a similar bias, at least in summer. Genthod appears to be the most reliable record, although perhaps slightly too warm in winter in the afternoon. However, note that Avully is located much further away from the lake and closer to the Jura mountains than the other stations, therefore its climate might be too different for a meaningful comparison.

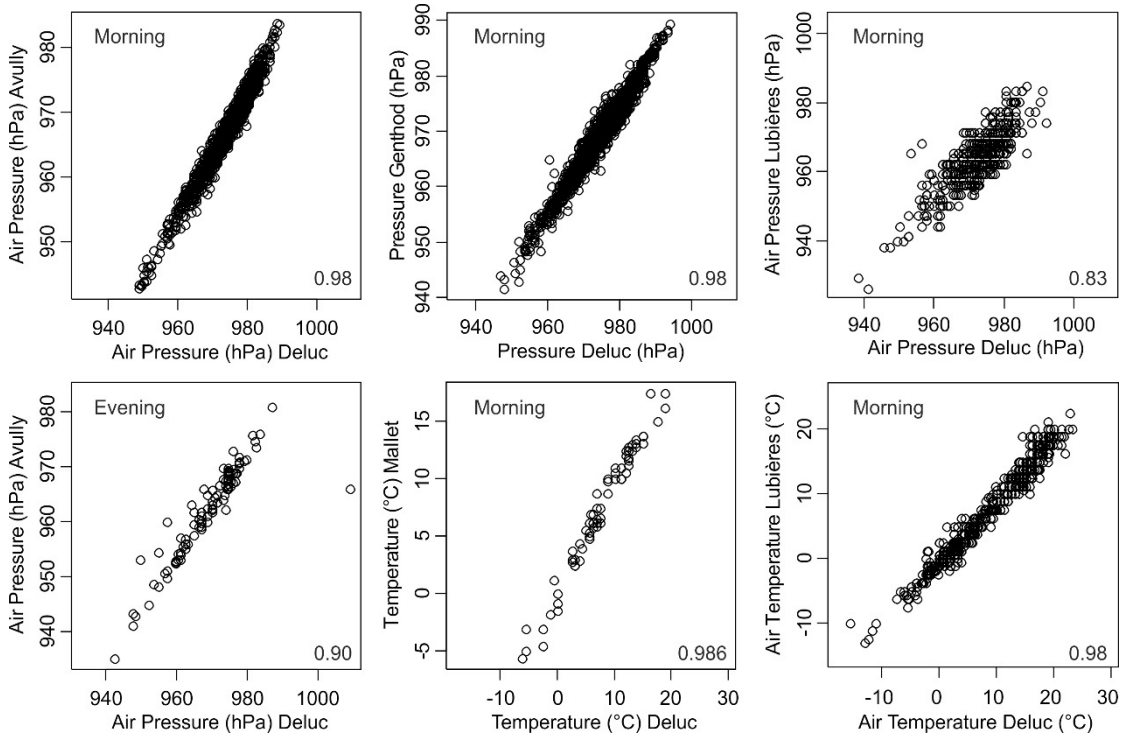

Figure 9. Comparisons of pressure and temperature measurements in Avully and Genthod as well as Geneva (Lubières), plotted against data from Geneva from Deluc. Numbers indicate the Pearson correlation coefficient.

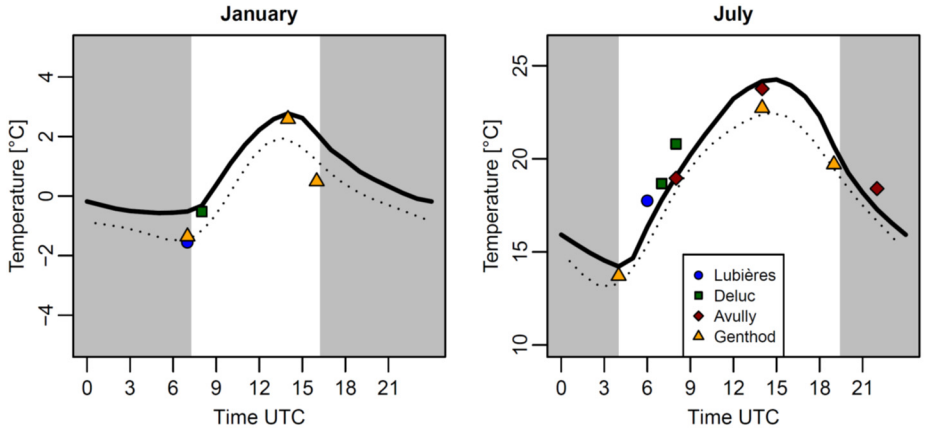

Figure 10. Diurnal temperature cycle in January (left) and July (right) in present-day (1981–2010, -1 °C to account for climate change) MeteoSwiss data from Geneva-Cointrin (thick black line), at the Observatory (dotted line; from Plantamour, 1863) and in the analyzed historical series. Observation times are rounded to the nearest hour. Grey shading indicates nighttime.

4. Conclusions

This paper presents meteorological series from Geneva from the 18th century. The series include that from Deluc, in which the present electronic version of the Geneva series is based, but also series from other observers in Geneva and surroundings. The series were imaged, digitised, and assessed with respect to their quality. The four observers considered in this paper belonged to the scientific and also political elite of Geneva and well embedded in the European enlightenment network. They were well educated, experienced in the construction and use of scientific instruments and arguably good observers.

In general a sufficient quality of all series is found, with the exception of the oldest series by Lubières. This series has a low correlation with concurrent measurements by Deluc, which may however also partly be due to the low measurement resolution. Furthermore, the series is not complete as the last four volumes were too thick to be imaged with the hardware available.

Conversely, the measurements made in Avully and Genthod seem to be of high quality and may help to complement or support the Geneva series. Together with later segments (Häderli et al., 2020; Brönnimann et al., 2020) the long Geneva series could be revisited. However, it will be very difficult to use the Lubières series for a long Geneva series. The Deluc series is itself not ideal since it has only one daily observation.

Measurements made at the Geneva observatory by various observers had astronomical goals and were not digitised. Another record by Pictet (partly from various locations in Geneva and partly from Cartigny) remains to be evaluated and digitised.

The hitherto available Geneva series is extended backward from 1768 to 1753 using data from Neuchâtel. We recommend unmerging the current series and remove the Neuchâtel segment. First, Neuchâtel is too far away from Geneva particularly when considering the daily and not the monthly temperature. Second, our re-evaluation of the Neuchâtel series (Wyer et al., 2021) revealed uncertainties as to the exact locations of the measurements, which changed frequently and without proper documentation.

The data are made publicly available by MeteoSwiss. They will also be available from the C3S data Global Land and Marine Observations Database (Noone et al., 2021).

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References

Auchmann, R., S. Brönnimann, L. Breda, M. Bühler, R. Spadin, and A. Stickler (2012) Extreme climate, not extreme weather: The summer of 1816 in Geneva, Switzerland. *Clim. Past,* **8,** 325-335.

Bider, M., and M. Schüepp (1961) Luftdruckreihen der letzten zwei Jahrhunderte von Basel und Genf. *Arch. Meteorol. Geophys. Biokl. B,* **11,** 1–36.

Brönnimann, S., M. Bühler, and Y. Brugnara (2020) The Series from Geneva, 1799–1863. In: Brönnimann, S. (Ed.) *Swiss Early Instrumental Meteorological Series.* Geographica Bernensia G96, p. 47–59, DOI: 10.4480/GB2020.G96.04.

Brugnara, Y., L. Pfister, L. Villiger, C. Rohr, F. A. Isotta, and S. Brönnimann (2020a) Early instrumental meteorological observations in Switzerland: 1708–1873. *Earth Syst. Sci. Data,* **12,** 1179–1190.

Brugnara, Y., J. Flückiger, and S. Brönnimann (2020b) Instruments, Procedures, Processing, and Analyses. In: Brönnimann, S. (Ed.) *Swiss Early Instrumental Meteorological Series.* Geographica Bernensia G96, p. 17–32, doi: 10.4480/GB2020.G96.02.

Deluc, J. A. (1772) *Recherches sur les modifications de l'atmosphère. Contenant l'histoire critique du baromètre et du thermomètre, un traité sur la construction de ces instrumens, des expériences relatives à leurs usages et principalement à la mesure des hauteurs & à la correction des refractions moyennes,* Geneva.

Füllemann, C., M. Begert, M. Croci-Maspoli, S. Brönnimann (2011) Digitalisieren und Homogenisieren von historischen Klimadaten des Swiss NBCN – Resultate aus DigiHom. *Arbeitsb. MeteoSchweiz,* **236**, 48 pp.

Gautier, A. (1843) Notice historique sur les observations météorologiques faites à Genève. *Archives des Sciences*, **43**, 128–162.

Geisendorf, P.-F. (1952) *La vie quotidienne à Genève au temps de l'Escalade,* Genève.

Golay, M. (2008) Mallet, Jacques-André, in: *Historisches Lexikon der Schweiz (HLS)*, https://hls-dhs-dss.ch/de/articles/026055/2008-08-25/, consulted 18 March 2022.

Grenon, M. (2010) Jean Senebier: de l'astro–météorologie au prévisionnisme empirique – en passant par la météorologie instrumentale. *Archive des Sciences,* **63,** 147–176.

Häderli, S., S. Pfister, L. Villiger, Y. Brugnara, and S. Brönnimann (2020) Two meteorological series from Geneva, 1782–1791. In: Brönnimann, S. (Ed.) *Swiss Early Instrumental Meteorological Series.* Geographica Bernensia G96, p. 33–46, doi: 10.4480/GB2020.G96.03.

Noone, S., C. Atkinson, D. I. Berry, R. J.H. Duun, E. Freeman, I. Perez Gonzalez, J. J. Kennedy, E. C. Kent, A. Kettle, S. McNeill, M. Menne, A. Stephens, P. W. Thorne, W. Tucker, C. Voces, and K. M. Willett (2021) Progress towards a holistic land and marine surface meteorological database and a call for additional contributions. *Geosci. Data J.,* **8,** 103–120.

Pappert, D., Brugnara, Y., Jourdain, S., Pospieszyńska, A., Przybylak, R., Rohr, C., and S. Brönnimann (2021) Unlocking weather observations from the Societas Meteorologica Palatina (1781–1792). Clim. Past, **17,** 2361–2379

Pfister, C. (1988) *Klimageschichte der Schweiz 1525–1860. Das Klima der Schweiz von 1525–1860 und seine Bedeutung in der Geschichte von Bevölkerung und Landwirtschaft.* Haupt Verlag, Bern.

Pfister, C., C. Rohr, and A. C. C. Jover (2017) Euro-Climhist: eine Datenplattform der Universität Bern zur Witterungs-, Klima- und Katastrophengeschichte. *Wasser Energie Luft,* **109,** 45–48.

Pfister, L., F. Hupfer, Y. Brugnara, L. Munz, L. Villiger, L. Meyer, M. Schwander, F. A. Isotta, C. Rohr, and S. Brönnimann (2019) Swiss Early Instrumental Meteorological Measurements. *Clim. Past,* **15,** 1345–1361.

Picot, G. (1843) Notice sur la température de Genève. *Mémoires de la Société de Physique et d'Histoire Naturelle*, **10**, 247–264.

Plantamour, E. (1863) *Du climat de Genève.* Henri Georg, Geneva.

Plantamour, E. (1876) *Nouvelles etudes sur le climat de Genève*. Henri Georg, Geneva.

Schüepp, M. (1961). *Lufttemperatur.* Beiheft zu den Annalen der SMZ.

Sigrist, R. (2005) Deluc, Guillaume-Antoine, in: *Historisches Lexikon der Schweiz (HLS),* Online: https://hls-dhs-dss.ch/de/articles/015897/2005-08-22/, consulted 9 March 2022.

Sigrist, R. (2007) Maurice, Frédéric-Guillaume, in: *Historisches Lexikon der Schweiz (HLS)*, https://hls-dhs-dss.ch/de/articles/021588/2007-08-29/, consulted 18 March 2022.

Wyer, V., Y. Brugnara, and S. Brönnimann (2021) Meteorological Series from Neuchâtel, Bern and Gurzelen. In: Brönnimann, S. (Ed.) *Swiss Early Instrumental Meteorological Series.* Geographica Bernensia G96, p. 169-182, DOI: 10.4480/GB2020.G96.16.