

# Satellite and Reanalysis Air Quality Data and Services at NASA GES DISC for Public Health Study

GH33B-1251

AGU 2018 Fall Meeting  
Washington, D.C.  
December 10-14 2018

NASA/Goddard EARTH SCIENCES DATA and INFORMATION SERVICES CENTER (GES DISC)

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## Satellite Observed Data

### Air Quality Data

Measurements	Platform/Sensor	Data Collections	Description
Nitrogen Dioxide (NO <sub>2</sub> )	OMI/Aura	OMNO2d_v003	Level 3 daily global gridded, 0.25x0.25 degree (2004.10 to present)
		OMNO2_v003	Level 2 swath, 13x24 km (2004.10 to present)
	TROPOMI/Sentinel-5P	S5P_L2_NO2_v1	Level 2 swath, 7x3.5 km, (2018.06-present)
Carbon monoxide (CO)	AIRS/Aqua	AIRS3STD_v006	Level 3 daily global gridded, 1x1 degree (2002.08.31 - present)
		AIRS2RET_v006	Level 2 swath, 50x50 km (2002.08 - present)
	MLS/Aura	ML2CO_v004	Level 2 swath, 165x3 km (2004.08 - present)
Sulfur dioxide (SO <sub>2</sub> )	OMI/Aura	OMSO2e_v003	Level 3 daily global gridded, 0.25x0.25 degree (2004.10 - present)
		ML2SO2.004	Level 2 swath, 165x3 km (2004.08-present)
	OMPS/SUOM I-NPP	OMPS_NPP_NMSO2_L2_v2	Level 2 swath, 50x50 km (2012.01 - present)
Formaldehyde (HCHO)	OMI/Aura	OMHCHOG_v003	Level 3 daily global gridded, 0.25x0.25 degree (2004.10 - present)
		OMHCHO_v003	Level 2 swath, 13x24 km (2004.10 - present)
Aerosol Index or AOD	OMI/Aura	OMAEROe_v003	Level 3 daily global gridded, 0.25x0.25 degree (2004.10-present)
		OMAERO_v003	Level 2 swath, 13x24 km, 2004.10-present
	TROPOMI/Sentinel-5P	S5P_L2_AER_AI_v1	Level 2 swath, 7x3.5 km, 2018.06 - present

### Meteorology Data

Measurements	Platform/Sensor	Data Collections	Description
Surface temperature	AIRS/Aqua	AIRS3STD_v006	Level 3 daily global gridded, 1x1 degree (2002.08.31 - present)
		AIRS2RET_v006	Level 2 swath, 50x50 km (2002.08 - present)
Precipitation	TRMM	TRMM_3B42_daily_v7	Level 3 daily gridded, 0.25x0.25 degree, between 50°S-50°N (1998.01 -2018.05)
		GPM_3IMERGDF_v05	Level 3 daily global gridded, 0.1x0.1 degree (2014.03 - present)
Relative Humidity	AIRS/Aqua	AIRS3STD_v006	Level 3 daily global gridded, 1x1 degree (2002.08.31 - present)
Soil moisture	AMSR-2	LPRM_AMSR2_DS_A_SOILM3_v001 (daytime)	Level 3 daily global 0.1x0.1 degree (2012.07 - present)
		LPRM_AMSR2_DS_D_SOILM3_v001 (nighttime)	
		LPRM_TMI_DY_SO_ILM3_v001 (daytime)	
	TRMM	LPRM_TMI_NT_SO_ILM3_v001: (nighttime)	Level 3 daily 0.25x0.25 degree between 40°S-40°N (1997.12 - 2015.04)
		LPRM_AMSR2_A_SOILM3_v002 (daytime)	
	AMSR-E	LPRM_AMSR2_D_SOILM3_v002 (nighttime)	Level 3 daily global 0.25x0.25 degree (2012.07 - present)

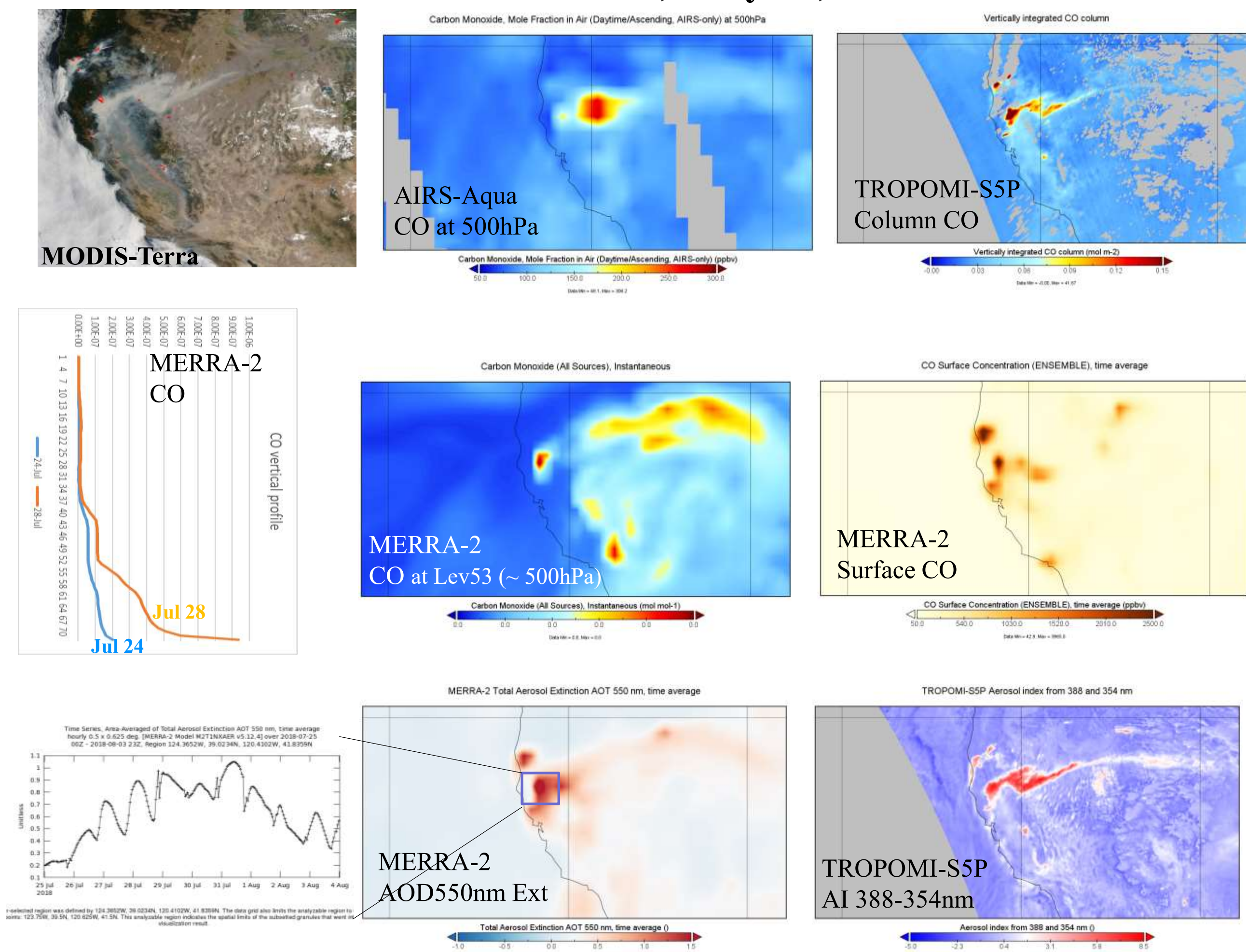
\* Coming soon: global NH<sub>3</sub> (Ammonia) from AIRS/Aqua

## Reanalysis or Assimilated Model Data

Model	Measurements	Data Collections	Description
MERRA-2	CO	M2T1NXCHM_5.12.4	Global hourly gridded 0.5x0.625 degree (1980.01-present)
	SO <sub>2</sub> , PM <sub>2.5</sub> , PM <sub>10</sub>	M2T1NXAER_5.12.4	Global hourly gridded 0.5x0.625 degree (1980.01-present)
	O <sub>3</sub>	M2I3NPASM_5.12.4	Global hourly gridded 0.5x0.625 degree, L42 (1980.01-present)

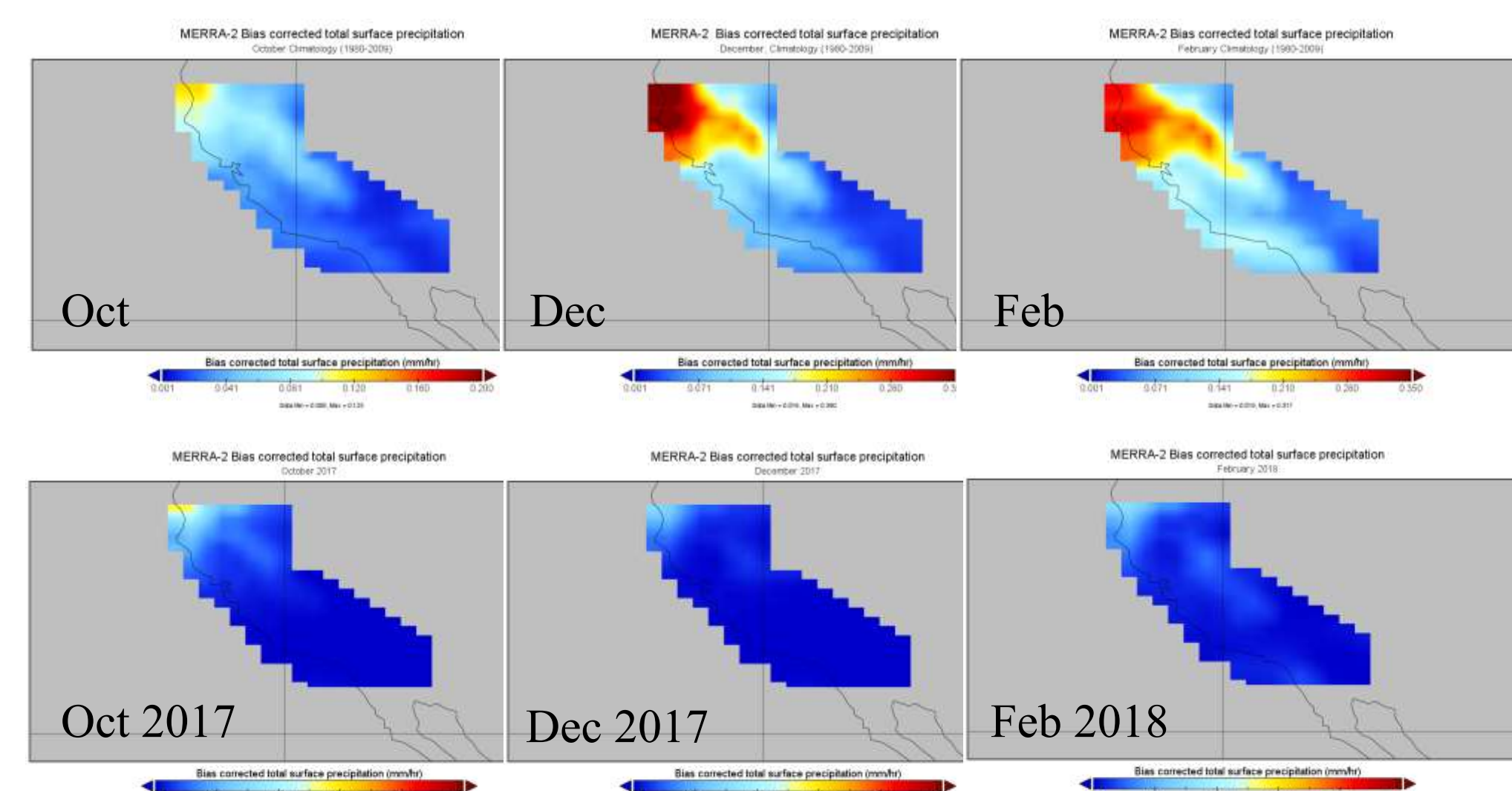
Model	Measurements	Data Collections	Description
MERRA-2	Wind speed, humidity, temperature, precipitation	M2T1NXFLX_5.12.4 M2TMNXFLX_5.12.4	Global hourly and monthly gridded 0.5x0.625 degree (1980.01-present)
	Soil moisture	M2T1NXLND_5.12.4 M2TMNXLND_5.12.4	Global hourly and monthly gridded 0.5x0.625 degree (1980.01-present)
	Wind speed, humidity, temperature, precipitation	GLDAS_NOAH025_3H_V2.1 NLDAS_NOAH0125_3H_V2.1	Global 3-hourly and monthly gridded 0.25x0.25 degree (2000.01-present)
GLDAS NLDAS	Soil moisture		NLDAS : 0.125x0.125 degree over North American

## Carbon Monoxide and Aerosol from Satellites and MERRA-2 California Fire, July 28, 2018

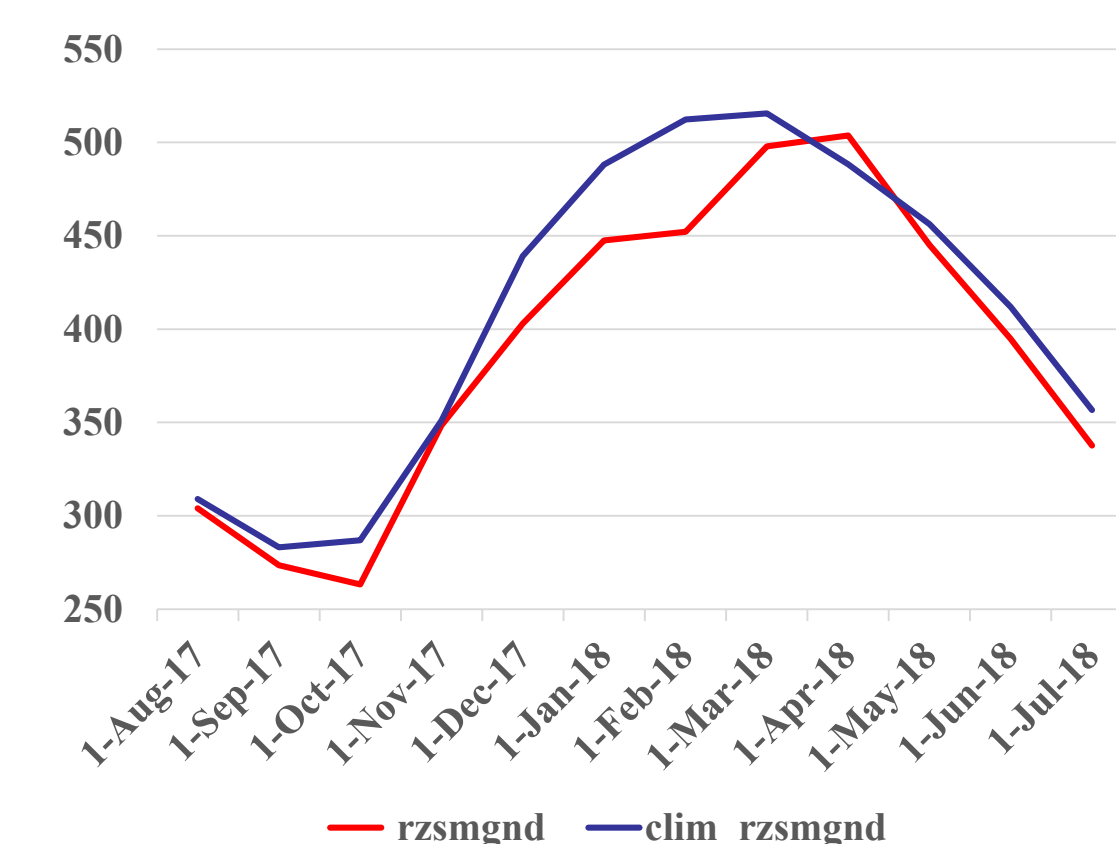


**Figure 1.** Images demonstrating the large-scale elevated Carbon Monoxide (CO) and aerosols observed by satellite sensors (AIRS/Aqua and TROPOMI/Sentinel-5P), and model assimilated data from MERRA-2, during a fire event in California on July 28, 2018. The true-color image is from MODIS-Terra.

## Meteorology and Land Surface Conditions Before the Fire Event



**Figure 2.** Monthly precipitation images from MERRA-2, showing that precipitation during the 2017-2018 rain season is significantly below the corresponding climatological values.



**Figure 3.** Time series of monthly soil moisture at root zone from NLDAS\_NOAH over northern California (~124.0, 38.9, -120.3, 41.5) from August 2017 to July 2018 (red line) and corresponding monthly climatology (blue line).

<https://disc.gsfc.nasa.gov>

Refine search

Product Document

Subsetting Downloading

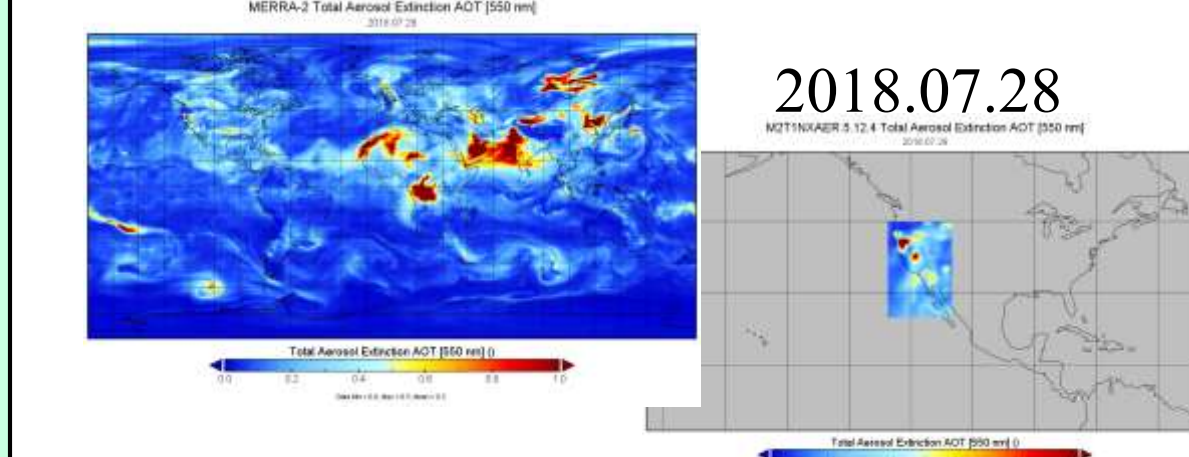
Data Access Services:

- ✓ Subsetting service
- ✓ Direct download (HTTPS)
- ✓ OPeNDAP
- ✓ GDS (GrADS Data Server)
- ✓ TDS (THREDDS Data Server)
- ✓ WMS, WCS
- ✓ Giovanni: visualization online

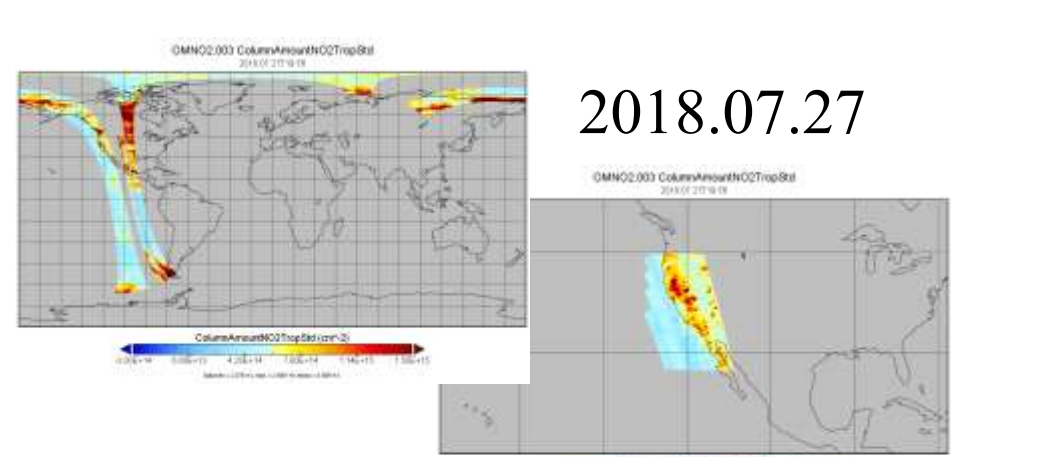
\* Data How-to (step-by-step instructions on accessing, reading, & viewing data with various data tools)

## Examples of acquiring subsetting data

Step-by-step instructions “How to use the Level 3 and 4 Subsetter and Regridder” and “How to Subset Level-2 Data” at <https://disc.gsfc.nasa.gov/information/howto>



**Fig 4a:** Grid Data sample: M2T1NXAER.5.12.4  
Original: 51 variables, file size ~49000 KB  
Subset: 1 variable (AOD in Figure 1, file size ~80 KB)



**Fig4b:** Swath data sample: OMNO2.003  
Original: 53 variables, file size ~35800 KB  
Subset: 2 variables, file size ~270 KB

## Giovanni Interface and Sample Plot Types



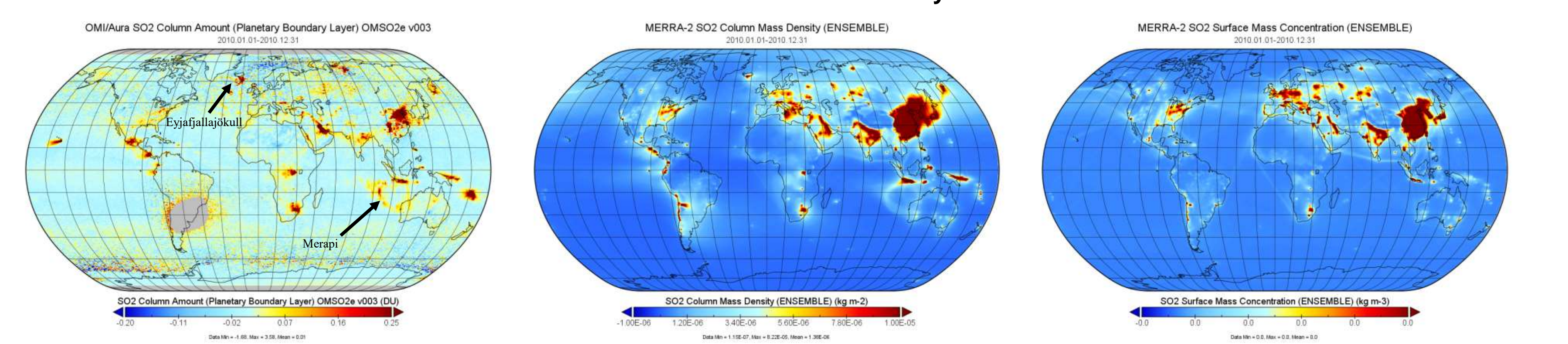
## NASA Air Quality Exploration Tools:

Worldview: <https://worldview.earthdata.nasa.gov>  
Giovanni: <https://giovanni.gsfc.nasa.gov/giovanni/>  
Multi-sensor Aerosol Products Sampling System: MAPSS: <https://giovanni.gsfc.nasa.gov/mapss/>  
MAPSS Explorer: [https://giovanni.gsfc.nasa.gov/mapss\\_explorer/](https://giovanni.gsfc.nasa.gov/mapss_explorer/)

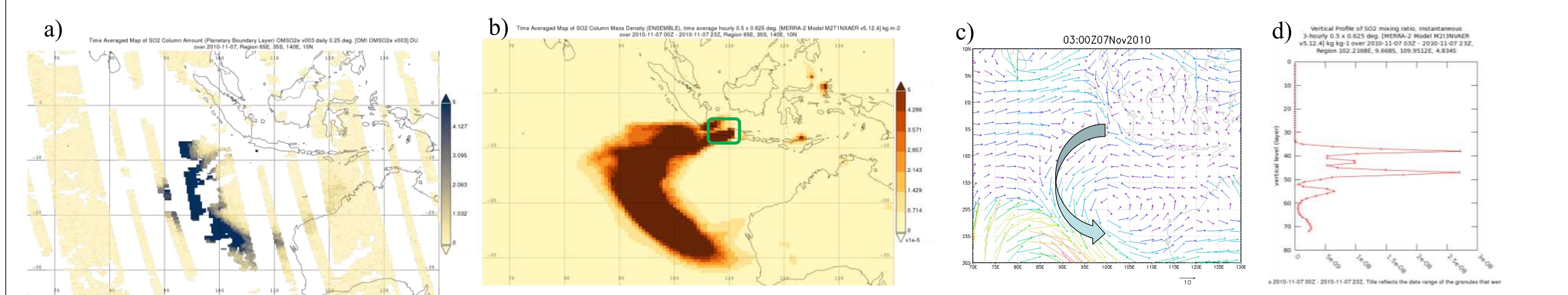
## NASA Applied Sciences Air Quality Resources:

NASA Health and Air Quality (AQ) <https://appliedsciences.nasa.gov/programs/health-air-quality-program>  
GSFC Air Quality <https://airquality.gsfc.nasa.gov>  
NASA Applied Remote Sensing Training (ARSET) <https://arset.gsfc.nasa.gov/airquality>  
NASA Health and Air Quality Applied Sciences Team (HAQAST) <https://haqast.org/>  
NASA Earth Observatory: <https://earthobservatory.nasa.gov>

## Sulfur Dioxide (SO<sub>2</sub>) from Satellites and MERRA-2: Annual Mean and Volcanic Activity



**Figure 5.** Global SO<sub>2</sub> averaged for one year (2010.01.01 – 2010.12.31), illustrating the distribution of an annual mean SO<sub>2</sub> with high values over large cities and volcanic events, e.g. Eyjafjallajökull, Iceland (Apr-Jun 2010), and Mount Merapi, Indonesia (November 2010). The image at left is boundary layer column SO<sub>2</sub> from OMI/Aura daily Level 3 (OMSO2e.v003), and the middle and right images are the surface and total column SO<sub>2</sub> from MERRA-2.



**Figure 6.** a) Boundary Layer SO<sub>2</sub> from OMI during the Mount Merapi eruption on November 7, 2010; and data on the same day for b) column total SO<sub>2</sub> from MERRA-2; c) wind vector in model layer 48 (~400 hPa); and d) SO<sub>2</sub> vertical profile from MERRA-2 for the green box region in b). MERRA-2 model assimilated data shows high values of SO<sub>2</sub> from this volcanic eruption in the middle-to-high troposphere and stratosphere.