



Suhung Shen^{1,2}, Dana M. Ostrenga^{1,3}, Jennifer Wei¹, Daniel Tong², Angela Li¹, Bruce E. Vollmer¹, David J. Meyer¹
suhung.shen@nasa.gov ¹NASA Goddard Space Flight Center, ²George Mason University, ³ADNET

Satellite Observed Data

Air Quality Data			
Measurements	Platform/Sensor	Data Collections	Description
Nitrogen Dioxide (NO ₂)	OMI/Aura	OMNO2d_v003	Level 3 daily global gridded, 0.25x0.25 degree (2004.10 – present)
		OMNO2_v003	Level 2 swath, 13x24 km (2004.10 to 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)
Sulfur dioxide (SO ₂)	OMI/Aura	OMSO2e_v003	Level 3 daily global gridded, 0.25x0.25 degree (2004.10 – present)
		OMSO2_v003	Level 2 swath, 13x24 km (2004.10 – present)
Formaldehyde (HCHO)	OMI/Aura	OMHCHO_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
Carbon Monoxide (CO)	TROPOMI/Sentinel-5P	S5P_L2_CO_v01	Level 2 swath, 7x7 km (2018.06 – present)
		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)
Precipitation	TRMM	TRMM_3B42_daily_v7	Level 3 daily gridded, 0.25x0.25 degree, between 50°S-50°N (1998.01 – 2018.05)
	GPM	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)	
Soil moisture	TRMM	LPRM_TMI_DY_SOILM3_v001 (daytime)	Level 3 daily 0.25x0.25 degree between 40°S-40°N (1997.12 – 2015.04)
		LPRM_TMI_NT_SOILM3_v001 (nighttime)	
Soil moisture	AMSR-E	LPRM_AMSR2_DS_A_SOILM3_v002 (daytime)	Level 3 daily global 0.25x0.25 degree (2012.07 – present)
		LPRM_AMSR2_DS_D_SOILM3_v002 (nighttime)	

* Coming soon: global NH₃ (Ammonia) from AIRS/Aqua

Reanalysis or Assimilated Model Data

Model	Measurements	Data Collections	Description
MERRA-2	CO	M2TINXCHM_5.12.4	Global hourly gridded 0.5x0.625 degree (1980.01 – present)
	SO ₂ , PM _{2.5} , PM ₁₀	M2TINXAER_5.12.4	Global hourly gridded 0.5x0.625 degree (1980.01 – present)
	O ₃	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	M2TINXFLX_5.12.4 M2TMNXFLX_5.12.4	Global hourly and monthly gridded 0.5x0.625 degree (1980.01 – present)
	Soil moisture	M2TINXNDL_5.12.4 M2TMNXNDL_5.12.4	Global hourly and monthly gridded 0.5x0.625 degree (1980.01 – present)
GLDAS NLDAS	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)
	Soil moisture		NLDAS : 0.125x0.125 degree over North American

How to find, visualize and download only the data of interest?

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

Refine Search by:

- ✓ Measurement
- ✓ Source (Platform/Instrument)
- ✓ Processing Level
- ✓ Project
- ✓ Temporal Resolution
- ✓ Spatial Resolution

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 subsetted 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>

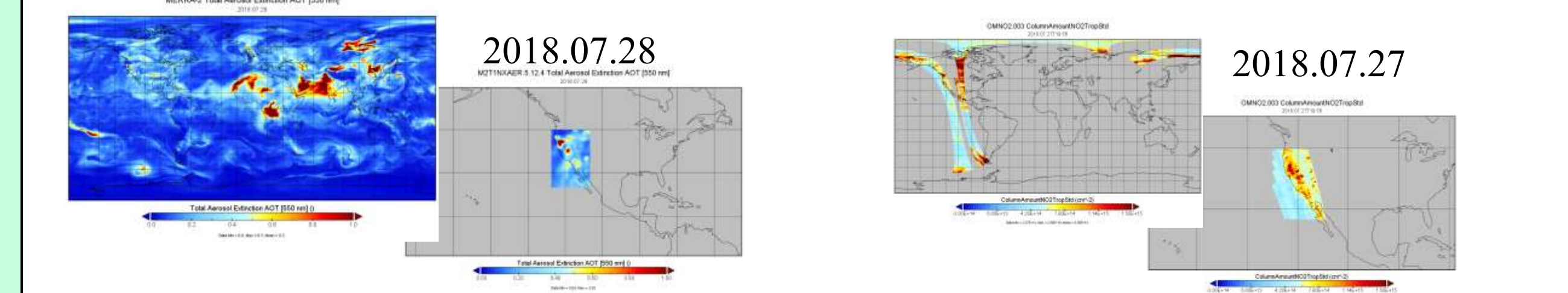
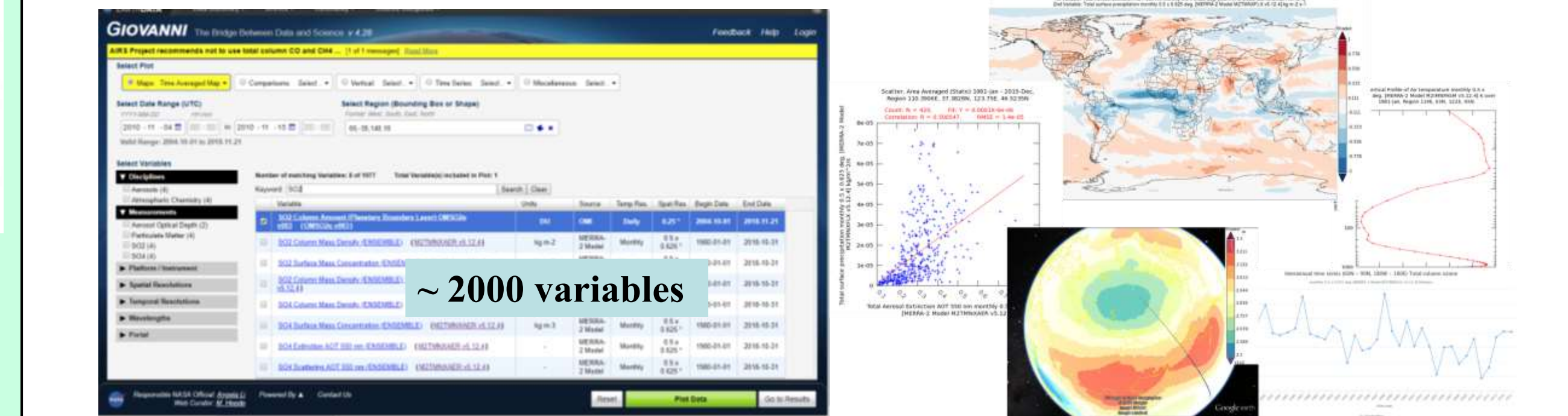


Figure 4a: Grid Data sample: M2TINXAER.5.12.4
Original: 51 variables, file size ~49000 KB
Subset: 1 variable (AOD in Figure 1), file size ~80 KB

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/

NASA Applied Sciences Air Quality Resources:

- NASA Health and Air Quality (AQ) <https://appliedsciences.nasa.gov/programs/health-air-quality-program>
- GSEC 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>

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

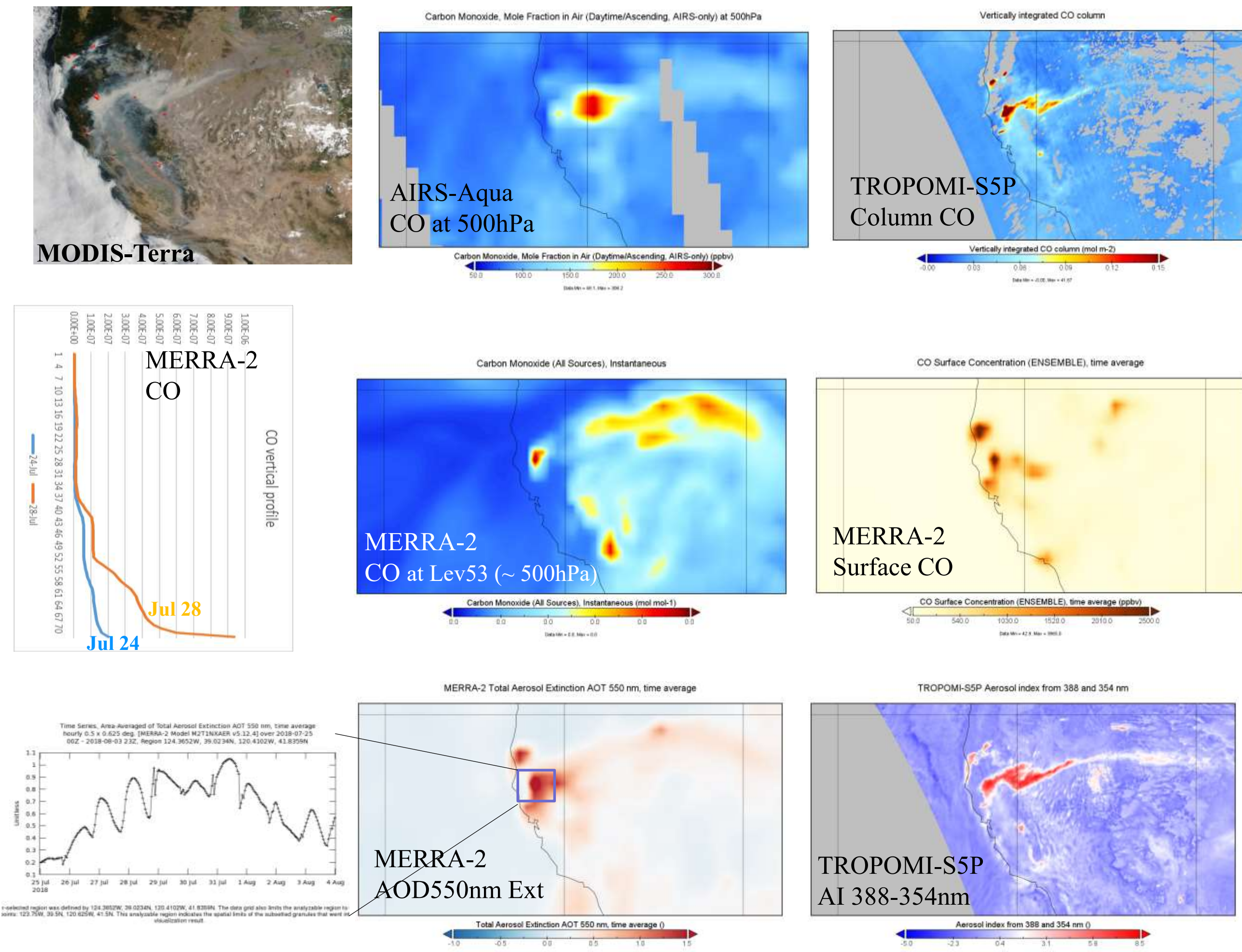


Figure 1. Images demonstrating the large-scale elevated Carbon Monoxide (CO) and aerosols observed by satellite sensors (AIRS/Aqua and TROPOMI/Sentinel-5P), and model assimilated data from MERRA-2, during a fire event in California on July 28, 2018. The true-color image is from MODIS-Terra.

Meteorology and Land Surface Conditions Before the Fire Event

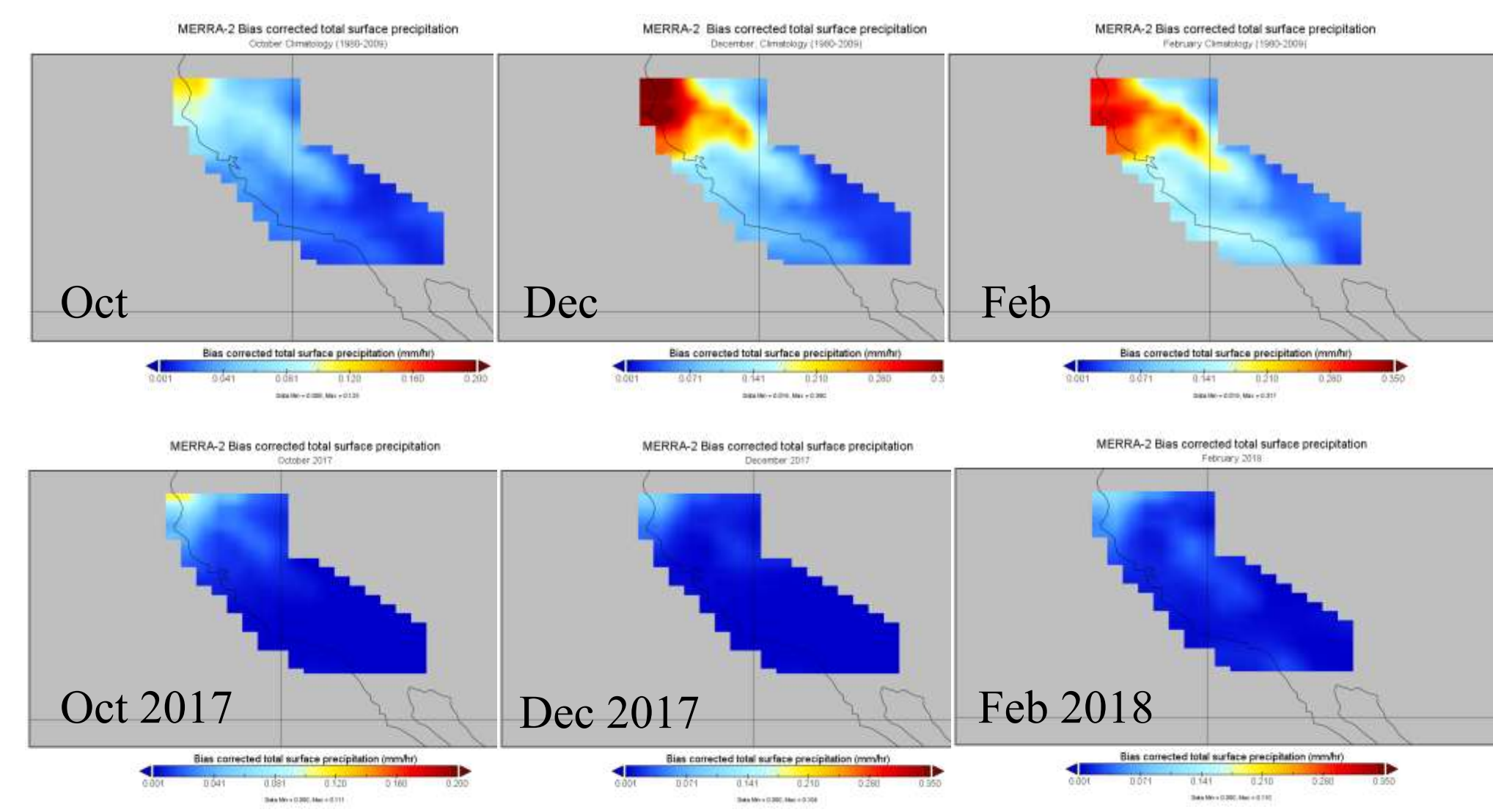


Figure 2. Monthly precipitation images from MERRA-2, showing that precipitation during the 2017-2018 rain season is significantly below the corresponding climatological values.

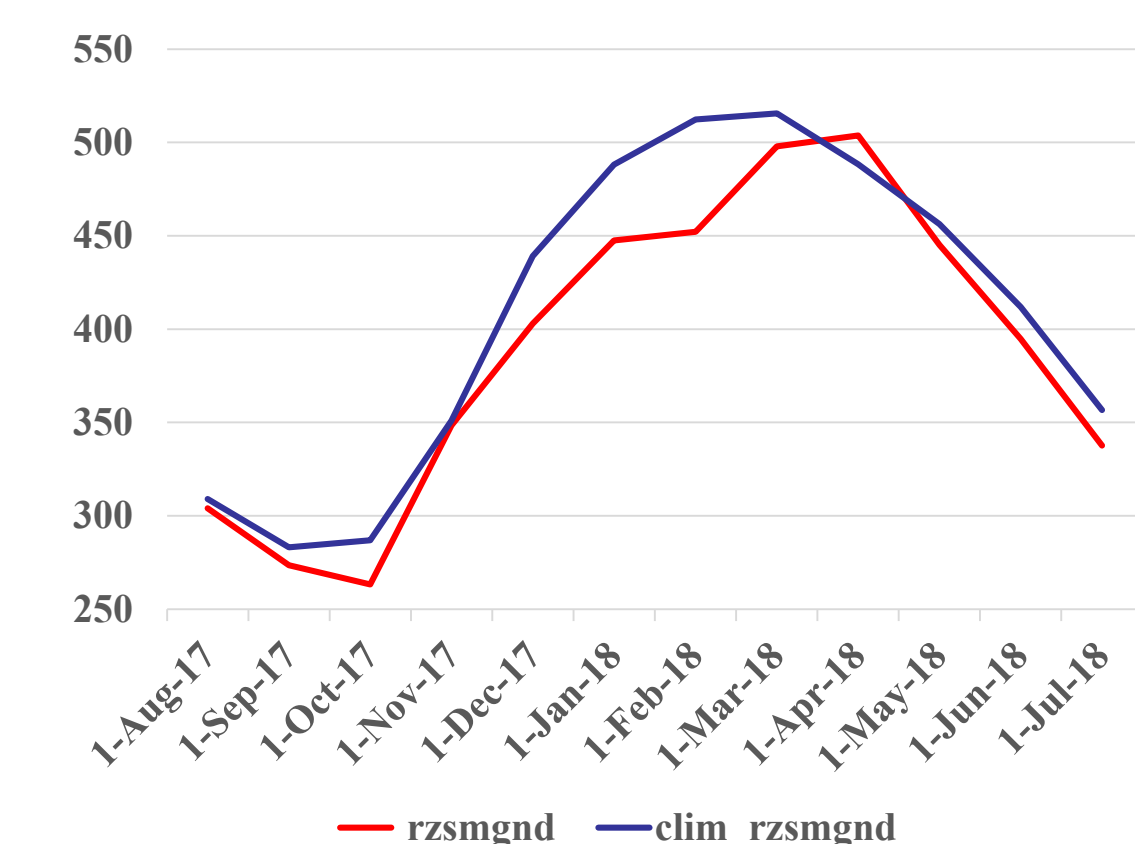


Figure 3. Time series of monthly soil moisture at root zone from NLDAS_NOAH5 for northern California (-124.0, 38.9, -120.3, 41.5) from August 2017 to July 2018 (red line) and corresponding monthly climatology (blue line).

Sulfur Dioxide (SO₂) from Satellites and MERRA-2: Annual Mean and Volcanic Activity

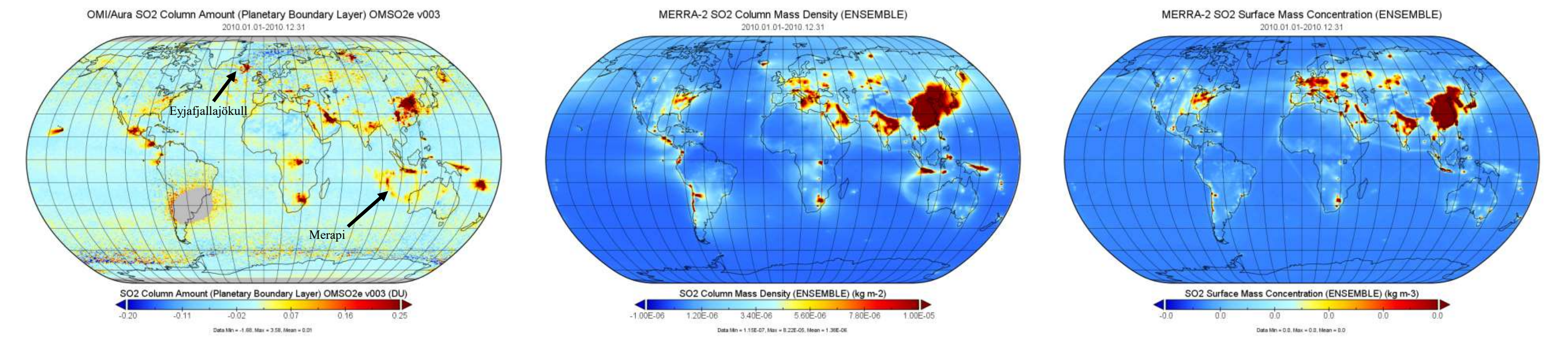


Figure 5. Global SO₂ averaged for one year (2010.01.01 – 2010.12.31), illustrating the distribution of an annual mean SO₂ with high values over large cities and volcanic events, e.g. Eyjafjallajökull, Iceland (Apr-Jun 2010), and Mount Merapi, Indonesia (November 2010). The image at left is boundary layer column SO₂ from OMI/Aura daily Level 3 (OMSO2e.v003), and the middle and right images are the surface and total column SO₂ from MERRA-2.

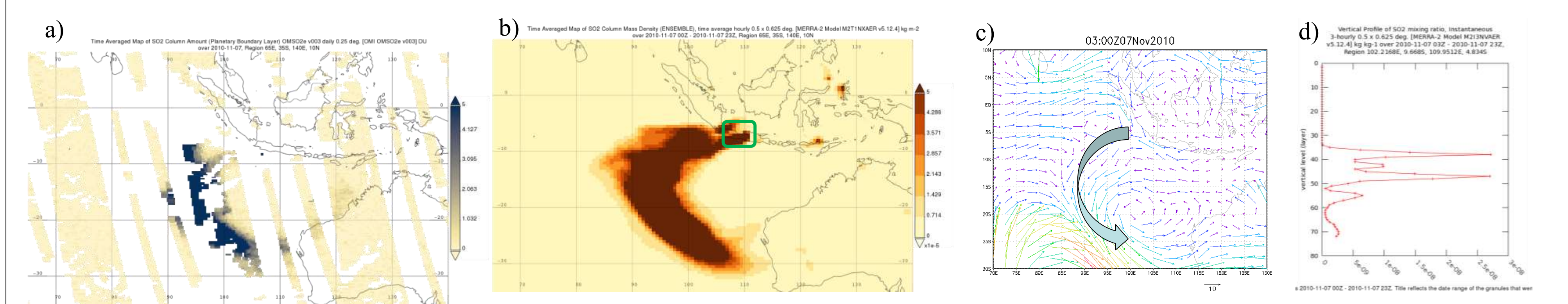


Figure 6. a) Boundary Layer SO₂ from OMI during the Mount Merapi eruption on November 7, 2010; and data on the same day for b) column total SO₂ from MERRA-2; c) wind vector in model layer 48 (~400 hPa); and d) SO₂ vertical profile from MERRA-2 for the green box region in b). MERRA-2 model assimilated data shows high values of SO₂ from this volcanic eruption in the middle-to-high troposphere and stratosphere.