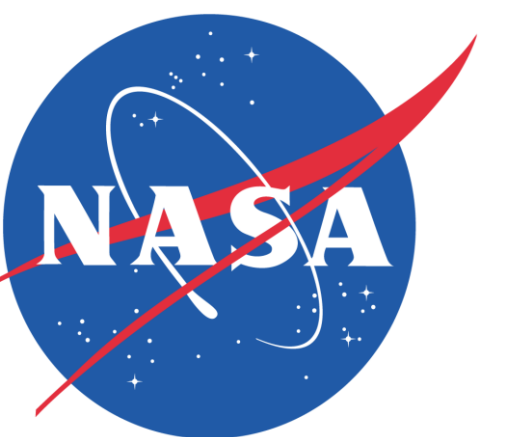




Data and Services at GES DISC for HAQAST

HAQAST-Utah Meeting

Salt Lake City, UT
October 19-20, 2023



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

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HAQAST Data Gateway at GES DISC

- One stop shop for air quality data generated by HAQAST

Introduction

Related Projects

Resources

HAQAST Data Collections

Data Collections outside GES DISC

References

Introduction

HAQAST is part of a decade-long effort by NASA's Applied Science Program to re-examine how applied science teams work. The effort began with the Air Quality Applied Science Team (AQAST), which ran from 2011 – 2016. Recognizing that health was an integral component of applied air quality research, NASA formed the first HAQAST team, which ran from 2019 – 2020. Due to the success of both AQAST and HAQAST, NASA expanded the newest version of HAQAST (2021 – 2025) to fourteen members composed of air quality and public health scientists led by Dr. Tracey Holloway at the University of Wisconsin-Madison. Though HAQAST is headquartered at UW-Madison, its members are spread across the U.S., in government offices and public and private universities.

Our interests are both focused – we use NASA satellite data to help solve real-world public health and air quality problems – and diverse: we work all around the world on issues from wildfire smoke to diesel emissions. We collaborate with public stakeholders, who help guide our research. We also pursue short-term, high-impact projects in small groups called "Tiger Teams" – you can find out more about those here. The HAQAST team provides many additional ways to keep informed about their work, including a newsletter, Twitter, public meetings, or through email.

Related Projects

HAQAST Global Daily PM2.5

Hourly and daily mean PM2.5 mass concentration for 2019 to 2022 based on the annual average, weekly cycle, effect of temperature and correlation with surface NO2 concentration.

HAQAST CONUS Monthly NO2

This dataset offers a detailed look at the annual average, weekly cycle, effect of temperature and correlation with surface NO2 concentration.

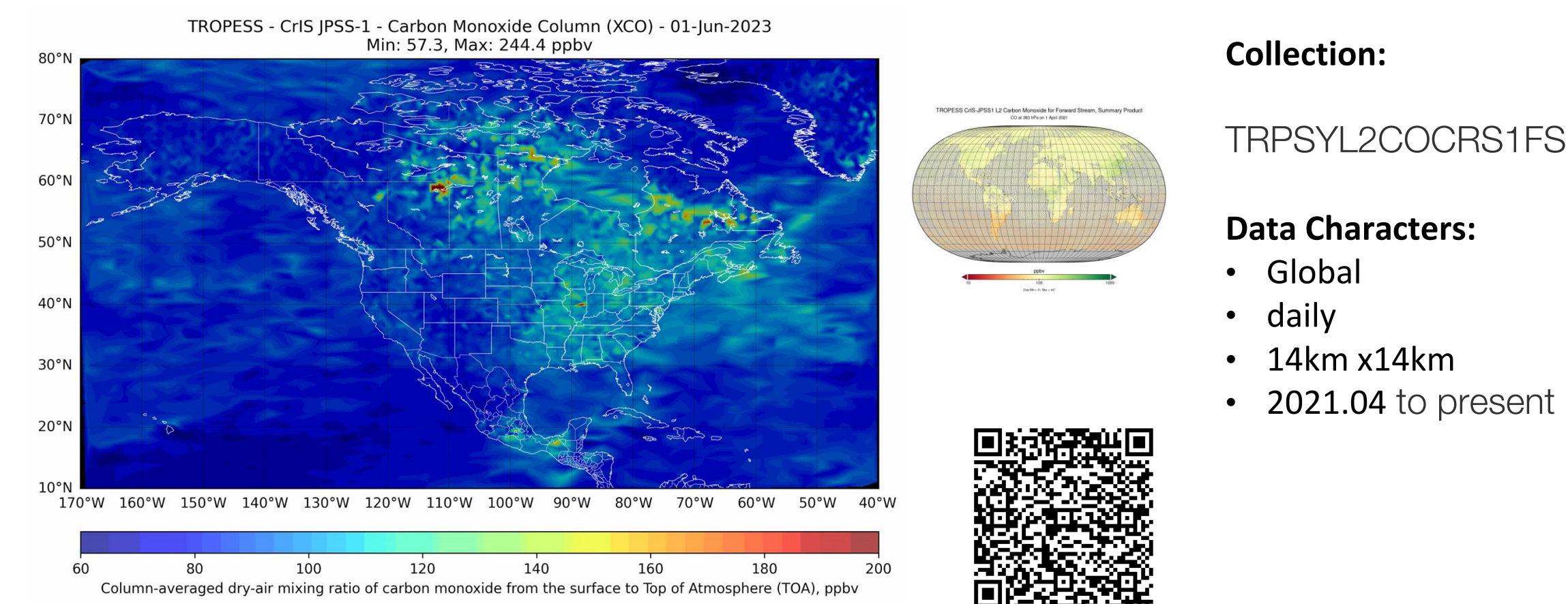
HAQAST SEDAC

Air Quality Data for Health Related Applications at SEDAC

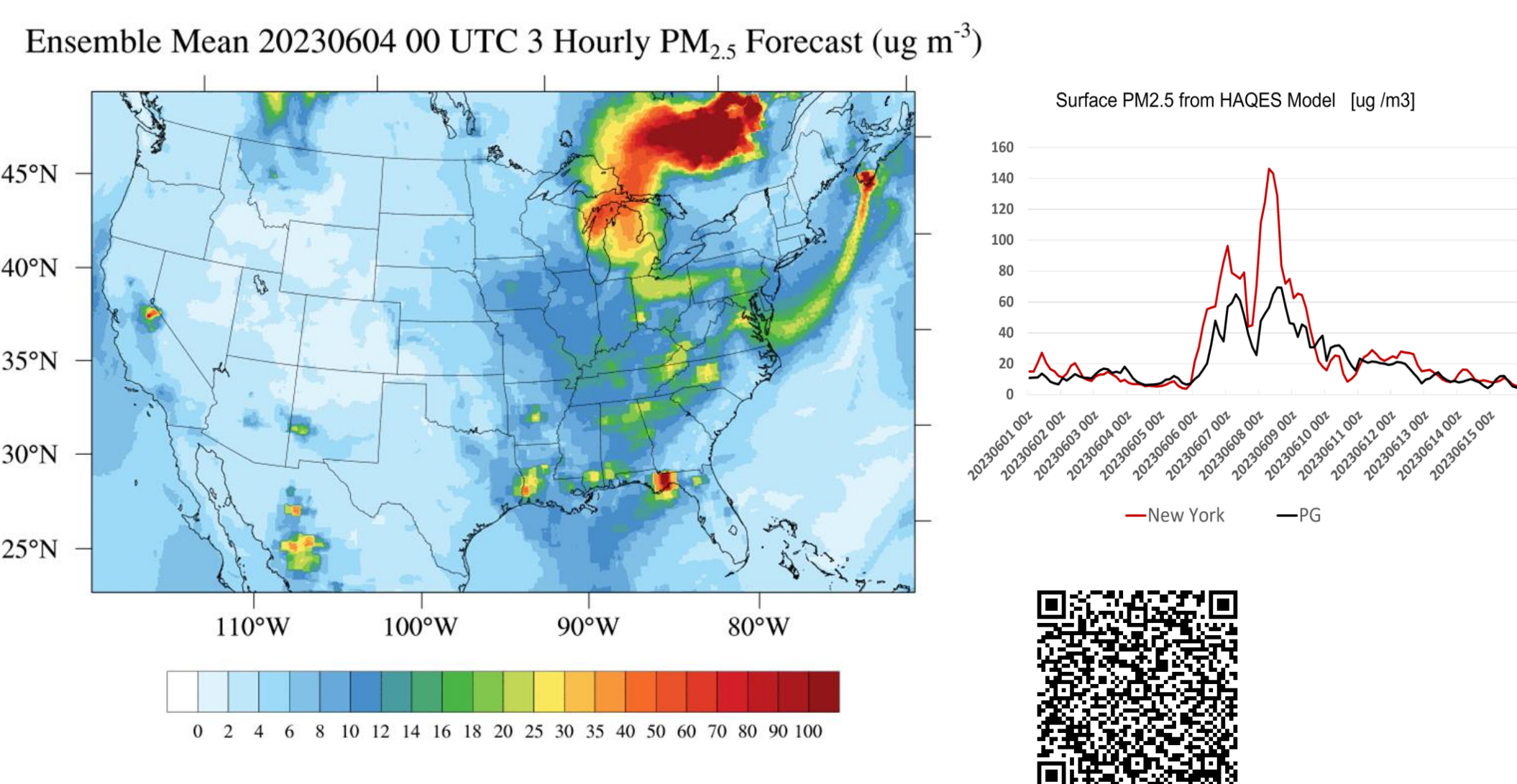
HAQAST Global and Regional

GES DISC model forecasts of surface O3, NO2 and PM2.5 everywhere in the world, plus localized, data-centered model forecasts based on model operational data bases.

Example: June 2023 Canadian Wildfires smoke over Eastern US – visualized with TROPESS data



Example: June 2023 Canadian wildfires smoke over Eastern US – visualized with HAQAST/HAQES data



Example: Reduced NO2 levels during pandemic – visualized with OMI/Aura data

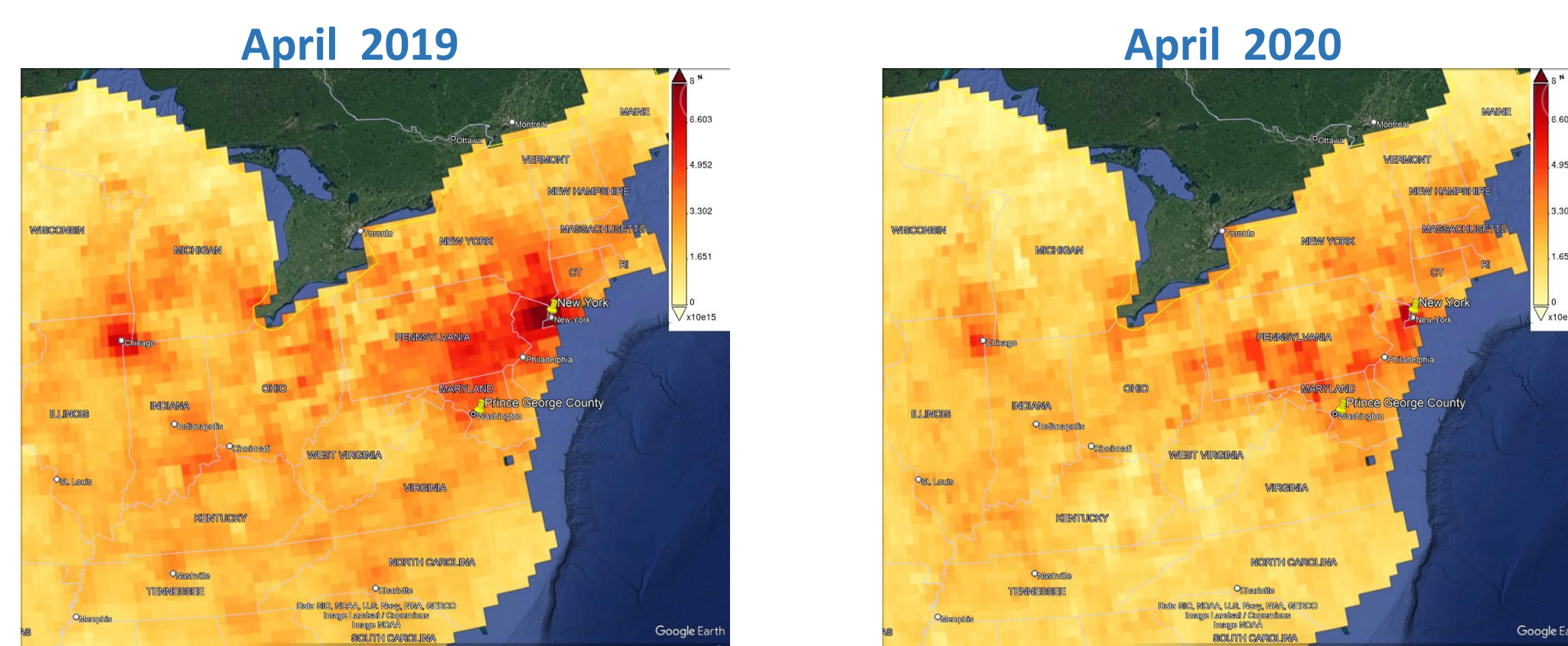


Figure: The animated images show the total surface mass concentration of PM2.5 from HAQES real-time ensemble forecast (PI: Daniel Tong) for June 4-10, 2023. Time series shows the surface concentrations of fine particles (PM2.5) [unit: $\mu\text{g}/\text{m}^3$] at New York City of New York and Prince George's County (PG) of Maryland. Image is from the [HAQES project page](#). Read more in data-in-action: [HAQES Real-time Forecast of the June 2023 Eastern US Air Pollution Event from Canadian Wildfire](#)

HAQAST Projects and Products – Archived at GES DISC

PIs	Project Title	Pollutant	Resolution	Coverage	Processing Level	Data Format
Susan Anenberg	Global Surface NO2 Concentrations Incorporating OMI NO2	NO2	~ 1x1 km^2 annual	global 1990-2020	4	NetCDF
Qian Xiao	Annual Summary of Artificial Light at Night from VIIRS/S-NPP at CONUS county and Census Tract	ALAN	county and census tract	2012-2020	4	ASCII
Daniel Tong	Surface PM2.5 Composition Products from the Hazardous Air Quality Ensemble System	OC, BC, PM2.5	~ 12x12 km^2 county and census tract 3-hourly	CONUS 2022.01.01 -	4	NetCDF, ASCII
Dan Goldberg	CONUS Monthly NO2 (TROPOMI) (in progress)	NO2	0.01° x 0.01°	CONUS 2018-present	4	NetCDF
Pawan Gupta	Global Daily PM2.5 (machine learning derived from MERRA-2) (in progress)	PM2.5	0.5° x 0.625° hourly	global 2000 -	4	NetCDF
Christoph Keller	Global and Regional Daily Air Quality Forecasts (NO, O3, PM2.5) (in progress)	NO2, O3, PM2.5	Point data 3 hourly		4	ASCII

HAQAST Projects and Products – Archived at SEDAC

PIs	Project Title	Pollutant	Resolution	Coverage	Processing Level	Data Format
Martin Wolf	Country Trends in Major Air Pollutants	PM2.5, O3, NOx, SO2, CO, VOCs	country	Global 2003.01-2018.12	4	tabular
Qian Di	Daily and Annual NO2 Concentrations for the Contiguous United States (1-km Grids)	NO2	~ 1x1 km^2 daily, annual	CONUS 2000.01-2016.12	4	XML, HTML, Text
Weebeg Requia	Daily 8-Hour Maximum and Annual O3 Concentrations for the Contiguous United States (1-km Grids)	O3	~ 1x1 km^2 daily, annual	CONUS 2000.01-2016.12	4	GeoTIFF, RDS
Qian Di	Daily and Annual PM2.5 Concentrations for the Contiguous United States (1-km Grids)	PM2.5	~ 1x1 km^2 daily, annual	CONUS 2000.01-2016.12	4	GeoTIFF, RDS
Yaguang Wei	Daily and Annual PM2.5, O3, and NO2 Concentrations at ZIP Codes for the Contiguous US	PM2.5, O3, NO2	ZIP-code daily, annual	CONUS 2000.01-2016.12	4	tabular

Data Services at GES DISC

Subsetting Data

-- for downloading only interesting data

Level 2 Swath Data

Level 3 and 4 Grid Data

- How to Subset Level-2 Data
- How to use the Level 3 and 4 Subsetter and Regridder
- Data Processing Levels

GIS Tutorial and Web Maps

IMERG Precipitation

HAQES PM2.5 (coming soon)

- How to Import Gridded (and Non-Gridded) NetCDF Data into QGIS
- How to Import Gridded Data in NetCDF into ArcGIS
- How to Import Satellite Swath Data in NetCDF into ArcGIS
- How to Define and Visualize Time Dimension in ArcGIS Pro
- How to configure a Web map in the ArcGIS Enterprise Web Map Viewer
- How to open an ASCII file join with shapefile geospatial data in ArcGIS Pro and QGIS (in progress)

GES DISC Data in Cloud

Cloud migration status:

- Data location: [AWS us-west-2 region](#)
- As of Oct 15, 2023, ~33% (593 out of 1773) of data collections at GES DISC have been migrated to Cloud
- Direct S3 access of data is available
- FAQ and data How-to tutorials are available online
- Earthdata Cloud Playground (Early 2024)- an ongoing efforts for users to get familiar with the cloud computing environment
- Cloud data services are coming soon (Note: some cloud services may look different compared to current on-premises services)

Downloading data in the cloud remains free of cost to users

Visualization - Giovanni

Figure: The image shows the total surface mass concentration of PM2.5 derived from MERRA-2 for June 7, 2023, at 12:00Z, generated from Giovanni (click the [link](#) to plot this image). Time series of the area mean over New York state for a) the total surface PM2.5 (TOTSMASS25), b) surface organic carbon (OCSSMASS) (click [link](#) to plot time series). Read more Newsletter: [MERRA-2 hourly PM2.5 data have been added to Giovanni](#)

Sharing a data list - My Dashboard

The 'My Dashboard' service enables compiling a list of selected variables from multiple data collections and create a JSON file or a shareable URL with other scientists. Read more: [How to Compile Your Own Variable List from Multiple GES DISC's Products using My Dashboard](#)

Example: A list consists of data in the Table below <https://disc.gsfc.nasa.gov/datalist/620d4fda1a9c28001acb2ea7>

Collection Name	Variables
M2T1NMXFLX.5.12.4	DUOMASS25 = dust surface mass concentration - PM 2.5
DUOMASS25	dust column mass density - PM 2.5
SSP_L2_AER_AI_HR_1	aerosol_index_354_388 = Aerosol index from 388 and 354 nm)

Note: Earthdata Login is required before using 'My Dashboard'

Online Resources

- Help Desk (gsfc-dl-help-disc@mail.nasa.gov)
- Earthdata [Forum](#)
- Data [How-tos](#) and [FAQs](#)
- [Data-in-action](#): stories about data usage
- [Jupyter Notebooks at NASA Github page](#)
- [Publications](#): list articles that cite the data by utilizing the data DOI, which links the data used in the publication and vice versa

More Air Quality Data at GES DISC

Satellite Observation	Variables	Spatial Information	Temporal Information
TROPESS/Cris-JPSS1	CO, CH4, NH3, O3	14 km x 14 km global	2021.04 - present
	CO, CH4, NH3, O3	14 km x 14 km Mega cities	2016.01 – 2021.05
TROPOMI/Sentinel-5P	NO2, CO, O3, HCHO, AOD, SO2, CH4	5.5 km x 7 km global	2018.05 - present
OMI/Aura	NO2, SO2, HCHO, AOD, O3, BrO, OCIO	13 km x 24 km global	2004.10 - present
OMPS/Suomi-NPP	NO2, SO2, O3	50kmx50km global	2012.01 - present
GOME/ERS-2	NO2	40 km x 320 km global	1996.01 - 2003.06
MLS/Aura	BrO, ClO, CH3Cl, CH3CN, CH3OH, CO, H2O, HCl, HCN, HNO3, HO2, HOCl, N2O, O3, OH, and SO2	165 km x 3 km global	2004.08 - present
AIRS/Aqua	CO	50km x 50km global	2002.08 - present
Multi-satellites	SO2	Volcano events	1978.10 - 2022.05
Model/Analysis	Variables	Spatial Information	Temporal Information
MERRA-2 reanalysis	PM2.5, CO, SO2, O3, AOD	0.5°x0.625° global	hourly, monthly 1980.05 - present

Useful Meteorology Data at GES DISC

Satellite Observation	Platform/ Sensor	Data Collections	Description
Surface temperature	AIRS/Aqua	AIRS3STD_v7.0	Level 3 daily global gridded, 1x1 degree (2002.08- present)
		AIRS2RET_v7.0	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 - 2019.12)
	GPM	GPM_3IMERGDF_v07	Level 3 daily global gridded, 0.1x0.1 degree (2000.06 – present)
Relative Humidity	AIRS/Aqua	AIRS3STD_v7.0	Level 3 daily global gridded, 1x1 degree (2002.08- present)
Soil moisture	AMSR-2	LPRM_AMSR2_DS_A_SO ILM3_v001 LPRM_AMSR2_DS_D_S OILM3_v001	Level 3 daily global 0.1x0.1 degree (2012.07 – present)
Model/Analysis	Measurements	Data Collections	Description
MERRA-2 Reanalysis	Wind speed, humidity, temperature, precipitation, Soil moisture	M2T1NMXFLX_5.12.4 M2TMNXFLX_5.12.4	Global hourly and monthly gridded 0.5x0.625 degree (1980.01-present)
		M2T1NLXND_5.12.4 M2TMNLXND_5.12.4	Global hourly and monthly gridded 0.5x0.625 degree (1980.01-present)
GLDAS NLDAS Assimilation	Wind speed, humidity, temperature, precipitation, Soil moisture	GLDAS_NOAH025_3H_V2.1 NLDAS_NOAH0125_3H_V2.1	Global 3-hourly and monthly gridded 0.25x0.25 degree (2000.01-present) NLDAS : 0.125x0.125 degree over North American