



Trace Gas Data Access, Tools, and Analysis

Pawan Gupta and Melanie Follette-Cook

Satellite Remote Sensing of Air Quality, 18-19 November 2018



Learning Objectives

By the end of this training, you will be:

- able to navigate the NASA air quality website, which currently features OMI NO₂
- capable of looking up a NASA air quality forecast for your area
- familiar with OMI Level 3 NO₂ and SO₂ data products and the online visualization and access tool, Giovanni
- able to download Level 2 and 3 data using Earthdata



Goddard's Air Quality Website

OMI NO₂: <https://airquality.gsfc.nasa.gov>

- Download pre-made plots of OMI NO₂ (OMNO2d v3) for over 300 world cities
- Download OMI NO₂ data (ASCII, Excel – not yet, but soon) for ~300 world cities



The screenshot shows the NASA Air Quality website interface. At the top, there is a navigation bar with links for AURA, EOS Project, and OZONE HOLE WATCH. The main header features the NASA logo and the text "Air Quality Observations from Space". Below this is a search bar and a menu with options like NO₂, Ozone, PM_{2.5}, AQ Forecast, AQ Impacts, News, Resources, and AQ Managers. The main content area includes a welcome message and a section titled "Before and After: World Nitrogen Dioxide Levels, 2005-2016". This section contains a world map with a slider to compare data from 2005 and 2016. The map shows a significant increase in NO₂ levels, particularly in East Asia and Europe. To the right of the map, there are two promotional boxes: one for ARSET (Applied Remote Sensing Training Program) and one for HAQAST (Health and Air Quality Applications Training).

ARSET

APPLIED REMOTE SENSING TRAINING PROGRAM
TRAIN - EMPOWER - ADVANCE

NASA Applied Remote Sensing Training (ARSET) - The ARSET program offers free webinars and in-person trainings on the use of NASA satellite data for Health and Air Quality Applications.

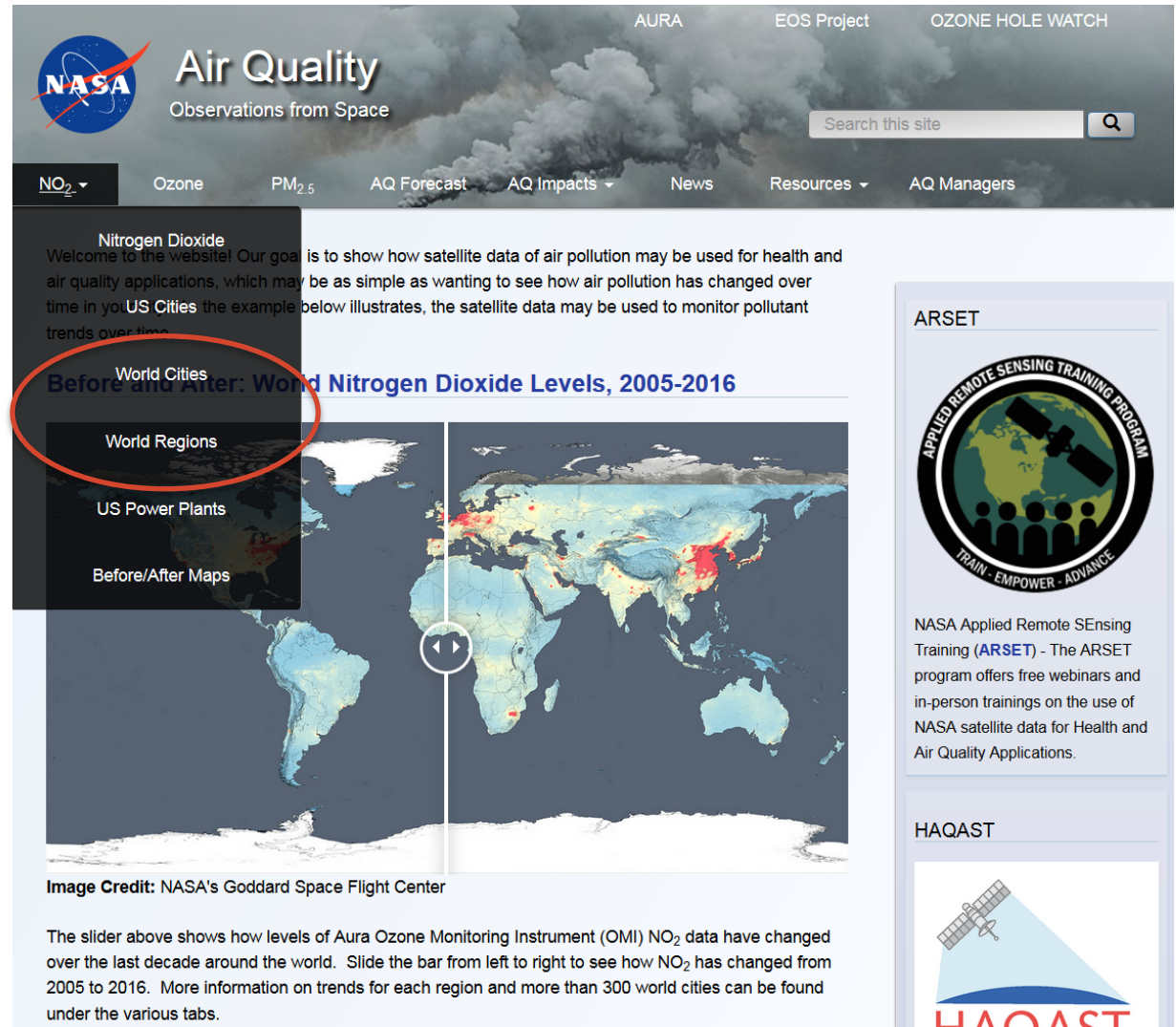
HAQAST

HAQAST



OMI NO₂

- There are several ways to get OMI NO₂ trend data for a city or region
 - Demo: via “World Cities”
 - Exercise: via “World Regions”



The screenshot shows the NASA Air Quality website interface. At the top, there is a navigation bar with links for AURA, EOS Project, and OZONE HOLE WATCH. The main header features the NASA logo and the text "Air Quality Observations from Space". A search bar is located on the right. Below the header, a menu bar includes "NO₂", "Ozone", "PM_{2.5}", "AQ Forecast", "AQ Impacts", "News", "Resources", and "AQ Managers". A dropdown menu is open under "NO₂", listing "World Cities", "World Regions", "US Power Plants", and "Before/After Maps". The "World Regions" option is circled in red. The main content area displays a world map titled "Before and After: World Nitrogen Dioxide Levels, 2005-2016". The map shows a color scale from blue (low) to red (high) for NO₂ levels. Below the map, there is a text box with the following content:

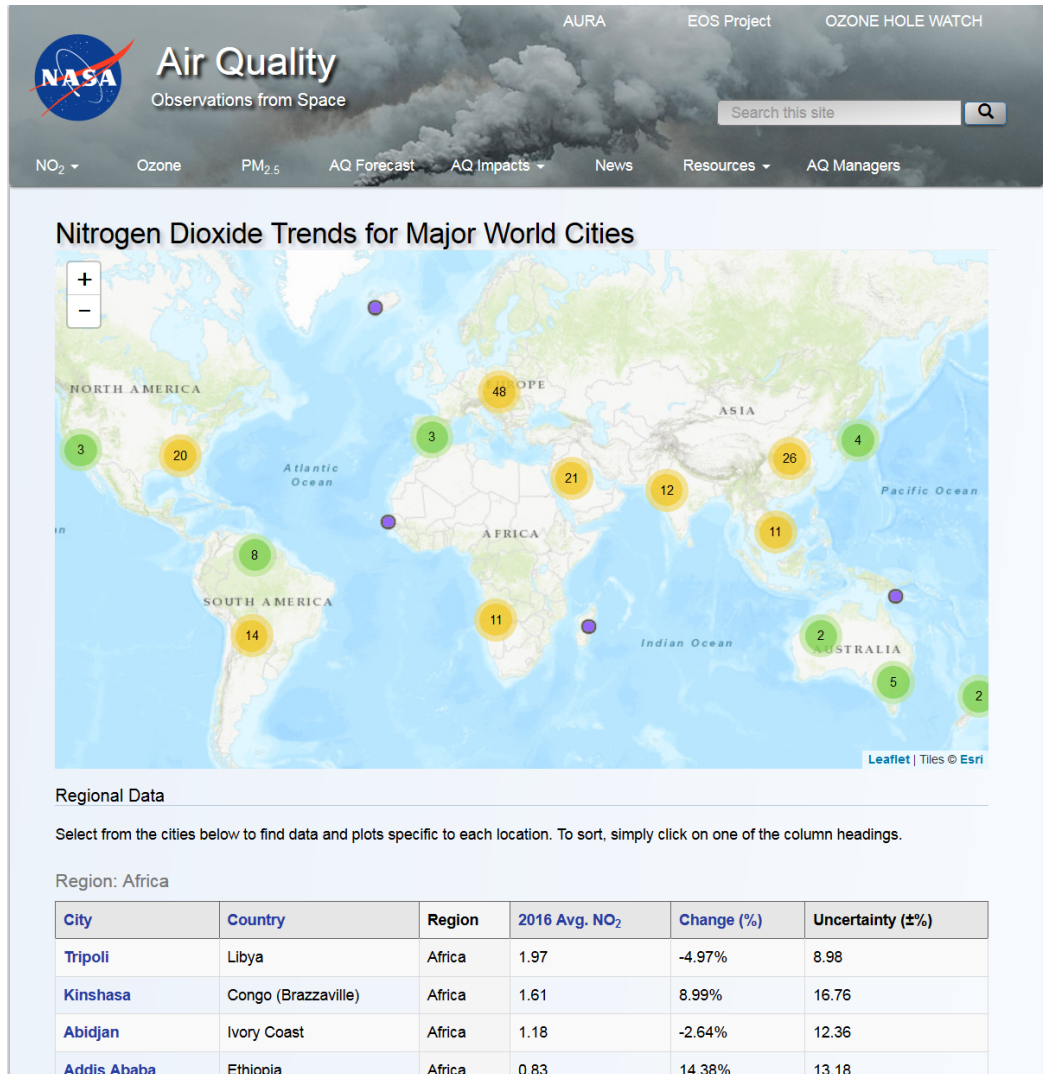
Image Credit: NASA's Goddard Space Flight Center

The slider above shows how levels of Aura Ozone Monitoring Instrument (OMI) NO₂ data have changed over the last decade around the world. Slide the bar from left to right to see how NO₂ has changed from 2005 to 2016. More information on trends for each region and more than 300 world cities can be found under the various tabs.

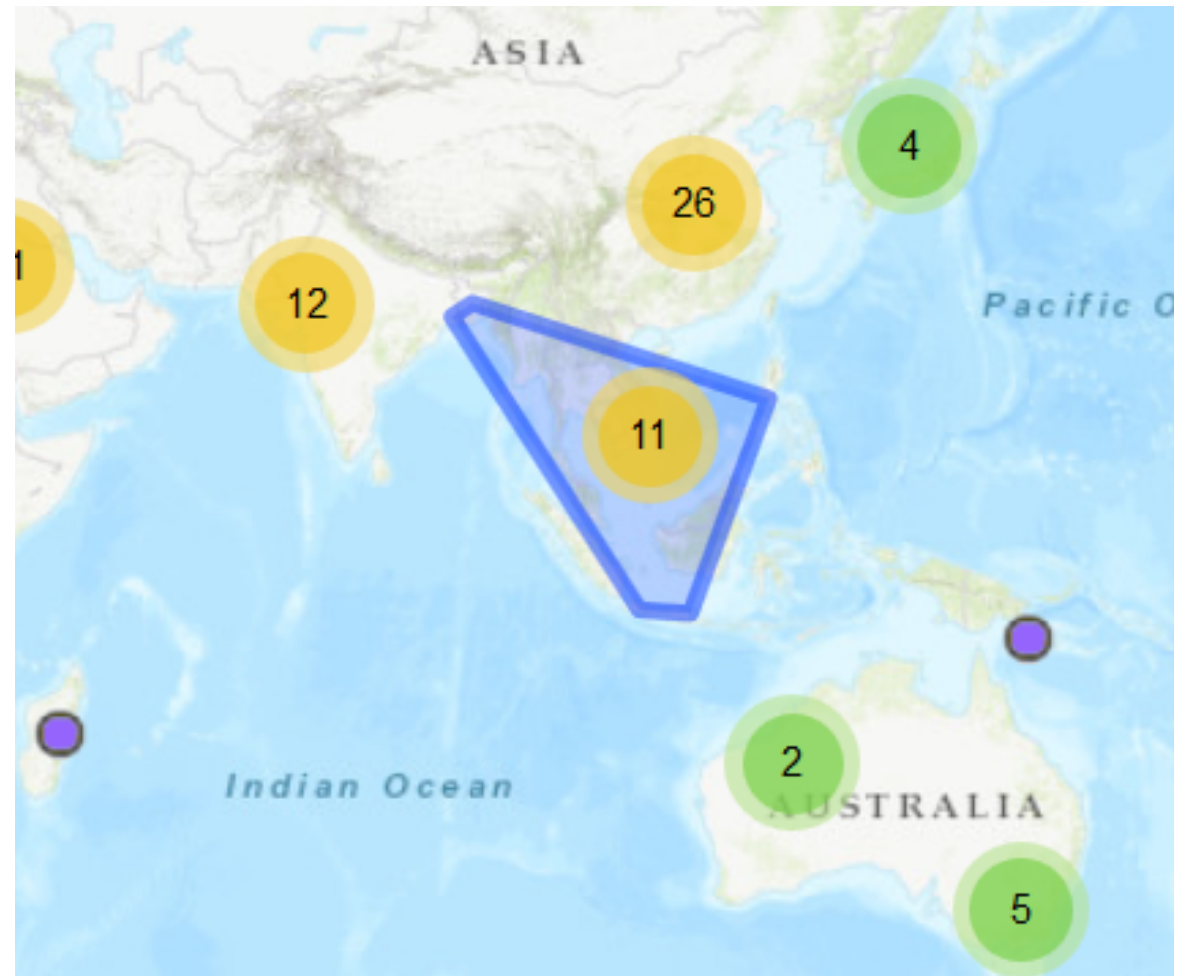
On the right side of the page, there are two promotional boxes. The top one is for ARSET (Applied Remote Sensing Training Program), featuring a circular logo with a satellite and the text "APPLIED REMOTE SENSING TRAINING PROGRAM" and "TRAIN - EMPOWER - ADVANCE". Below the logo, it states: "NASA Applied Remote Sensing Training (ARSET) - The ARSET program offers free webinars and in-person trainings on the use of NASA satellite data for Health and Air Quality Applications." The bottom box is for HAQAST, featuring a logo with a satellite and the text "HAQAST".



OMI NO₂: Demo via “World Cities”



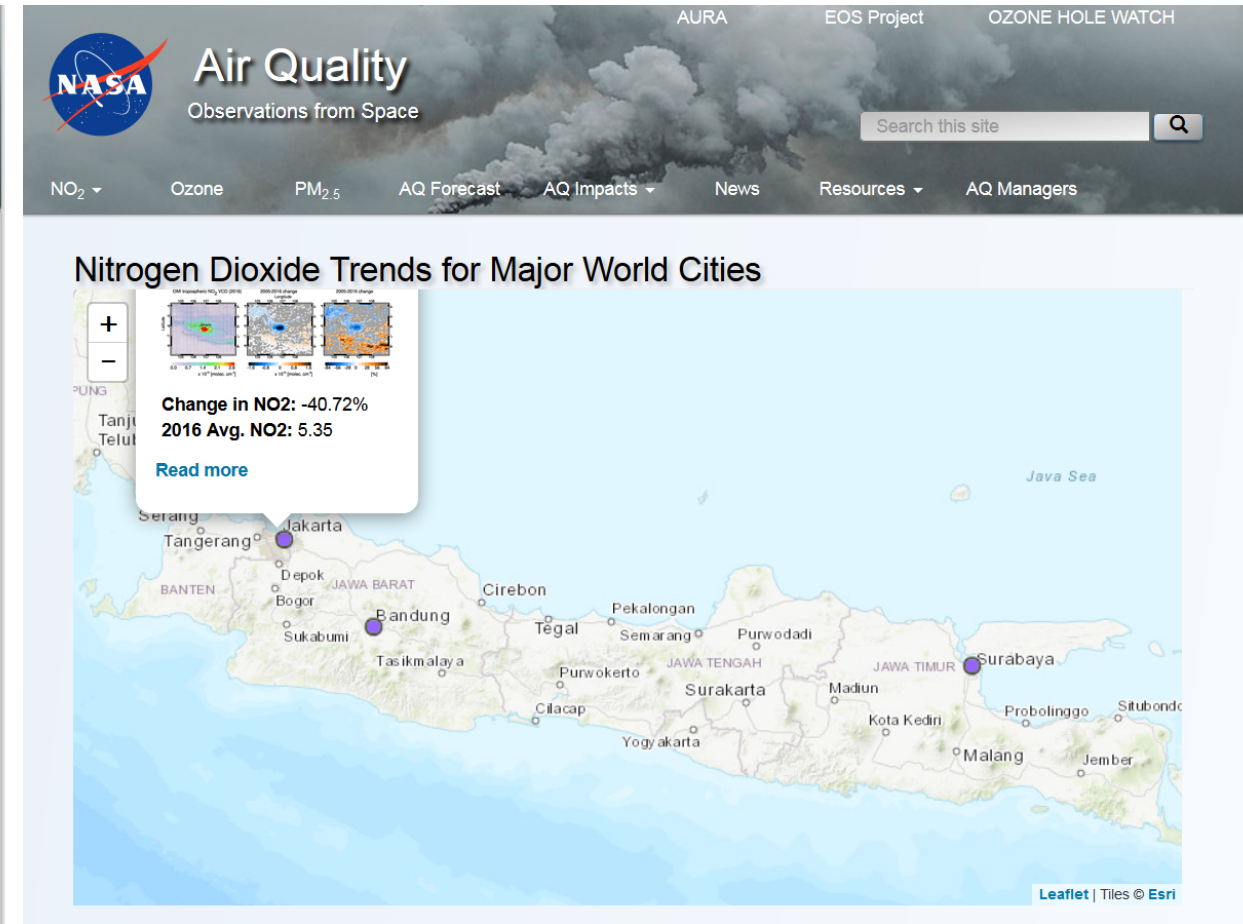
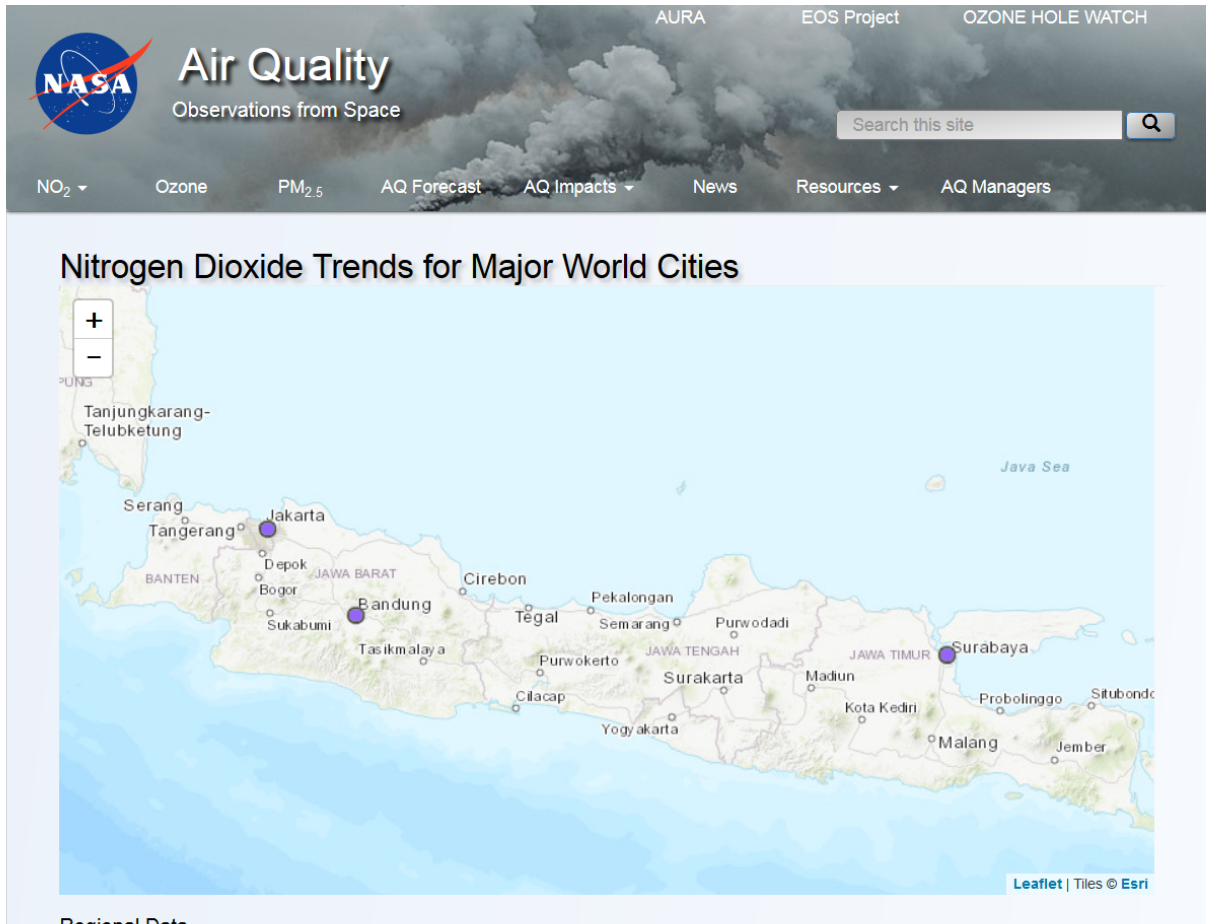
Click on the Southeast Asia region



OMI NO₂: Demo via “World Cities”

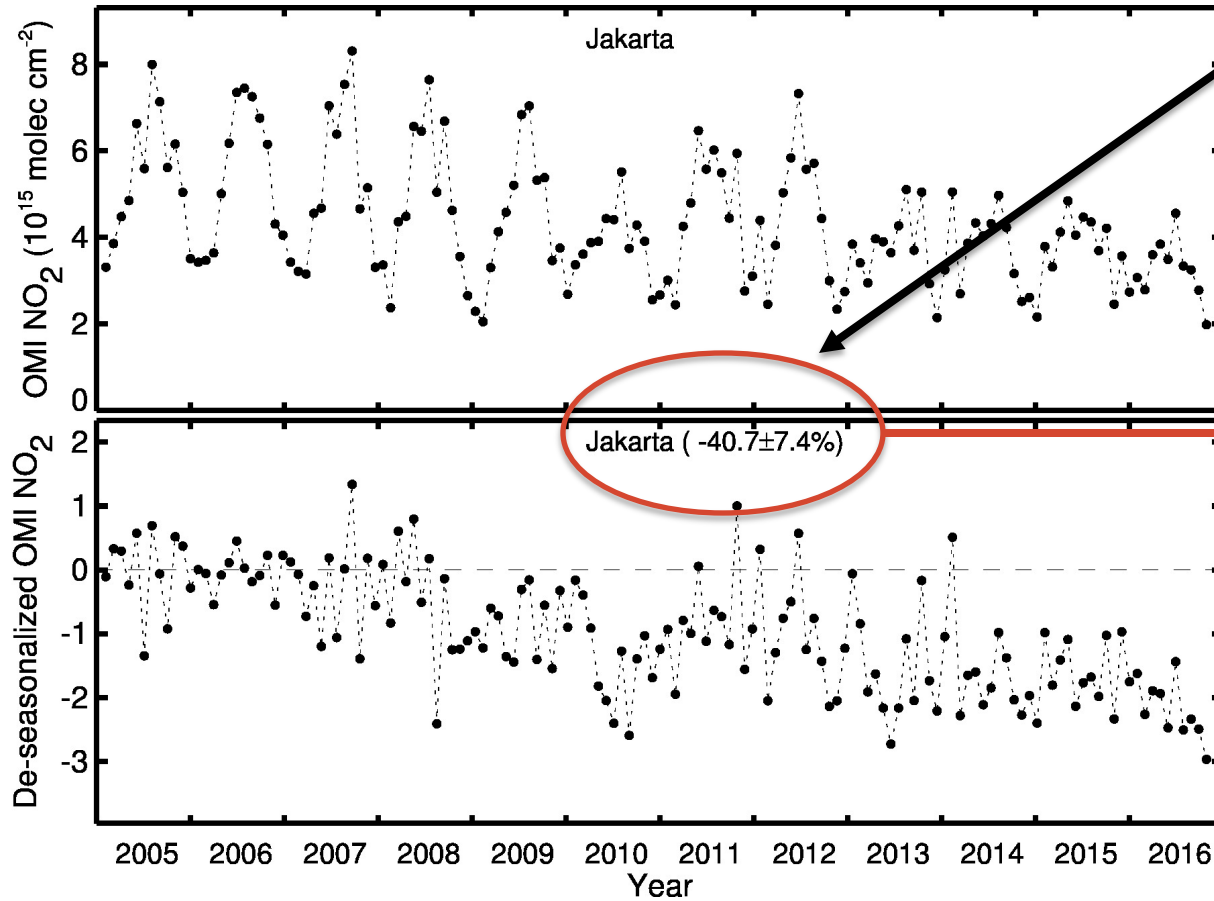
Keep clicking until you reach Java

Click on “Jakarta” & “Read More”

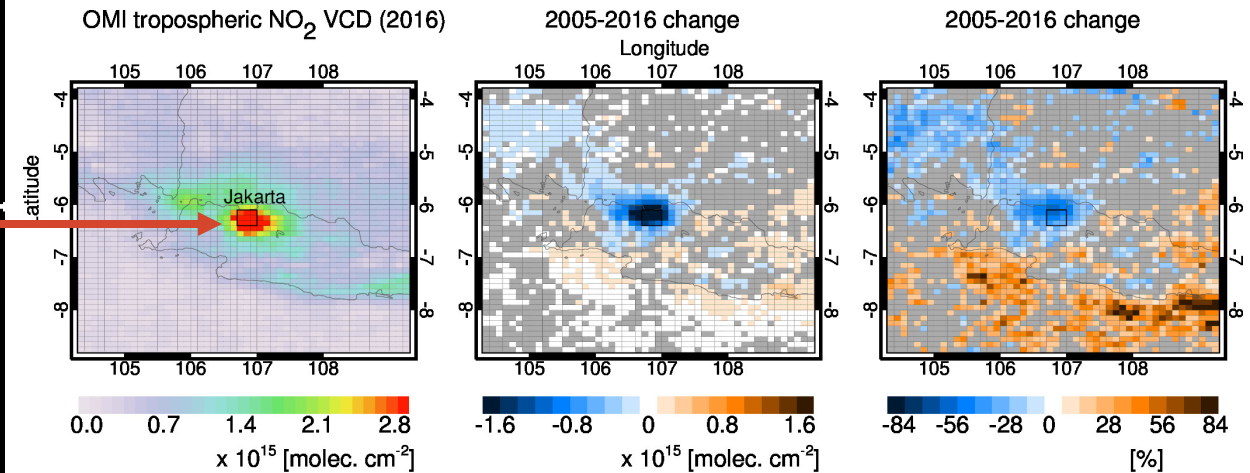


OMI NO₂: Demo via “World Cities”

Jakarta



Percent trend from 2005 to 2016 for the area inside the box



OMI NO₂: Demo via “World Cities”

- Why did OMI NO₂ levels decrease in Jakarta?
- What are the trends in OMI NO₂ in Bandung and Surabaya?

OMI NO₂: Exercise: via “World Regions”

- What is the trend in OMI NO₂ for your favorite city?
- Compare the trend in your favorite city to the trend in Ho Chi Minh City, Vietnam





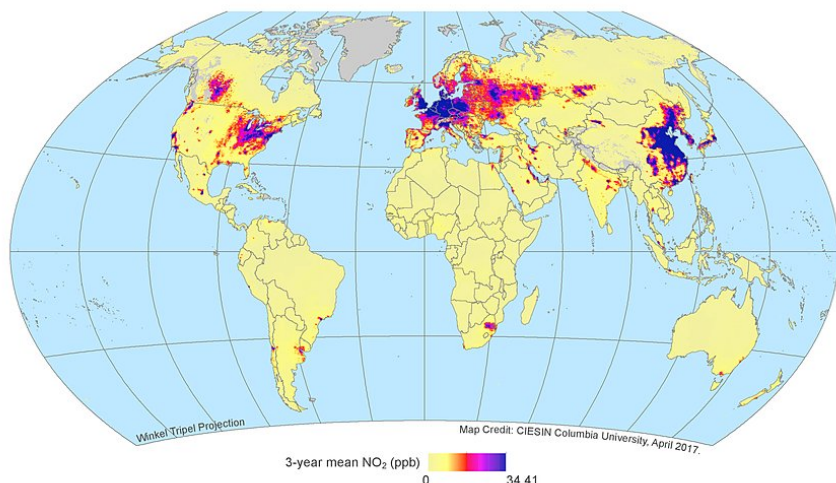
Annual Mean Surface NO₂ Estimates

GOME, SCIAMACHY, GOME-2 Annual Mean Surface NO₂

<http://sedac.ciesin.columbia.edu/>

- Download data and pre-made images of surface NO₂ inferred from satellite observations

Global 3-Year Running Mean Ground-Level Nitrogen Dioxide (NO₂) Grids from GOME, SCIAMACHY and GOME-2, 2010-2012
Satellite-Derived Environmental Indicators



The Global 3-Year Running Mean Ground-Level Nitrogen Dioxide (NO₂) Grids from GOME, SCIAMACHY and GOME-2 are part of the Satellite-Derived Environmental Indicators collection. This data set represents a series of three-year running mean grids (1996-2012) of ground level Nitrogen Dioxide that are derived from Global Ozone Monitoring Experiment (GOME), Scanning Imaging Absorption Spectrometer for Atmospheric Chartography (SCIAMACHY) and Global Ozone Monitoring Experiment-2 (GOME-2) satellite retrievals. This map displays 3-year mean satellite-derived NO₂ concentrations measured in parts per billion (ppb) at a spatial resolution of 6 arc-minutes (0.1 degree or approximately 10 km at the equator) for the years 2010 to 2012.

Center for International Earth Science Information Network
EARTH INSTITUTE | COLUMBIA UNIVERSITY

Data Source: Geddes, J.A., R.V. Martin, B.L. Boys, and A. van Donkelaar. 2017. Global 3-Year Running Mean Ground-Level Nitrogen Dioxide (NO₂) Grids from GOME, SCIAMACHY and GOME-2. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). <https://doi.org/10.7927/H4JW8BTT>.

© 2017. The Trustees of Columbia University in the City of New York.



This document is licensed under a Creative Commons Attribution 4.0 International License. <https://creativecommons.org/licenses/by/4.0/>

SOCIOECONOMIC DATA AND APPLICATIONS CENTER (SEDAC)
A Data Center in NASA's Earth Observing System Data and Information System (EOSDIS) — Hosted by CIESIN at Columbia University

Search SEDAC... Data [Q] [User Icon]

DATA | MAPS | THEMES | RESOURCES | SOCIAL MEDIA | ABOUT | HELP

DATA SETS
DATA COLLECTIONS
FEATURED DATA USES
DATA CITATIONS
CITATIONS DATABASE

In the Spotlight
Map Gallery

India Winter Cropped Area, 2016
A new map collection featuring annual winter cropped area for India (2001-2016).

Gridded Population of the World (GPW), v4
India Data Collection
Population Dynamics

Featured Data Sets
Global Man-made Impervious Surface (GMIS) Dataset From Landsat, v1 (2010)
Global High Resolution Urban Data from Landsat
Overview Download Documents (2) Maps
To provide high spatial resolution estimates of global man-made imperviousness for the target year 2010, derived from global 30m Landsat satellite data and a companion dataset to the Global Human Built-up And Settlement Extent

Global Human Built-up And Settlement Extent (HBASE) Dataset From Landsat, v1 (2010)
Global High Resolution Urban Data from Landsat
Overview Download Documents (2) Maps
To provide high spatial resolution estimates of global urban extent derived from global 30m Landsat satellite data for the target year 2010 and a companion dataset to the Global Man-made Impervious Surface

News
Population Data, Hazard Exposure, and Sustainable Repositories Addressed in Three DC Area Talks
New Report Ranks Nations' Environmental Performance, Reveals Trends
CIESIN Staff Honored for Ten Years of Service
Earth Science Data Experts Hold Joint Meetings in Maryland



GOME, SCIAMACHY, GOME-2 Annual Mean Surface NO₂

<http://sedac.ciesin.columbia.edu/>

- Download data of surface NO₂ inferred from satellite observations from 1996 to 2012
 - Download GeoTIFF files
 - Download ASCII and HDF files from http://fizz.phys.dal.ca/~atmos/martin/?page_id=232



SOCIOECONOMIC DATA AND APPLICATIONS CENTER (SEDAC)
A Data Center in NASA's Earth Observing System Data and Information System (EOSDIS) — Hosted by CIESIN at Columbia University

Search SEDAC... Data [Search] [User] [Help]

DATA MAPS THEMES RESOURCES SOCIAL MEDIA ABOUT HELP

Satellite-Derived Environmental Indicators

Follow Us: [Twitter] [Facebook] [YouTube] [LinkedIn] | Share: [Twitter] [Facebook]

Collection Overview

Data Sets (7)

- Global 3-Year Running Mean Ground-Level NO₂ Grids from GOME, SCIAMACHY and GOME-2, v1 (1996-2012)

Show All...

Map Gallery (48)

Map Services (11)

Citations

Global 3-Year Running Mean Ground-Level NO₂ Grids from GOME, SCIAMACHY and GOME-2, v1 (1996-2012)

Set Overview **Data Download** Maps Map Services Documentation Metadata

Purpose:
To provide a continuous surface of NO₂ concentrations for health and environmental research.

Abstract:
The Global 3-Year Running Mean Ground-Level Nitrogen Dioxide (NO₂) Grids from GOME, SCIAMACHY and GOME-2 represent a series of three-year running mean grids (1996-2012) of ground level NO₂ that were derived from Global Ozone Monitoring Experiment (GOME), Scanning Imaging Absorption SpectroMeter for Atmospheric CHartographY (SCIAMACHY) and Global Ozone Monitoring Experiment-2 (GOME-2) satellite retrievals. For each satellite-derived NO₂ source, the relationship between satellite observations of tropospheric NO₂ column densities and the NO₂ concentrations at ground level relevant to human exposure is simulated, using the Goddard Earth Observing System chemical transport model (GEOS-Chem) to produce a mean NO₂ concentration raster grid. The grid cell resolution is six arc-minutes (0.1 degree, or approximately 10 km at the equator) covering the global land surface.

Recommended Citation(s)*:
Geddes, J.A., R.V. Martin, B.L. Boys, and A. van Donkelaar. 2017. Global 3-Year Running Mean Ground-Level Nitrogen Dioxide (NO₂) Grids from GOME, SCIAMACHY and GOME-2. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). <https://doi.org/10.7927/H4JW8BTT>. Accessed DAY MONTH YEAR.

ENW (EndNote & RefWorks)†
RIS (Others)

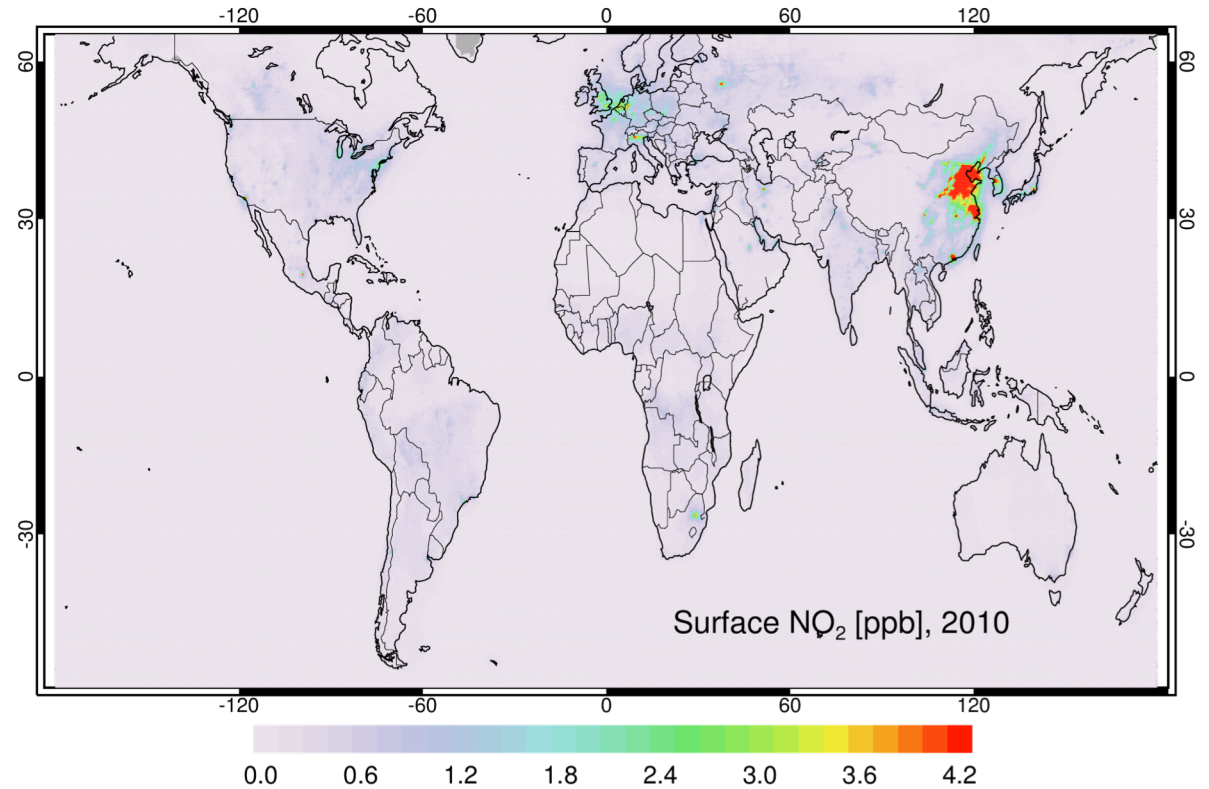
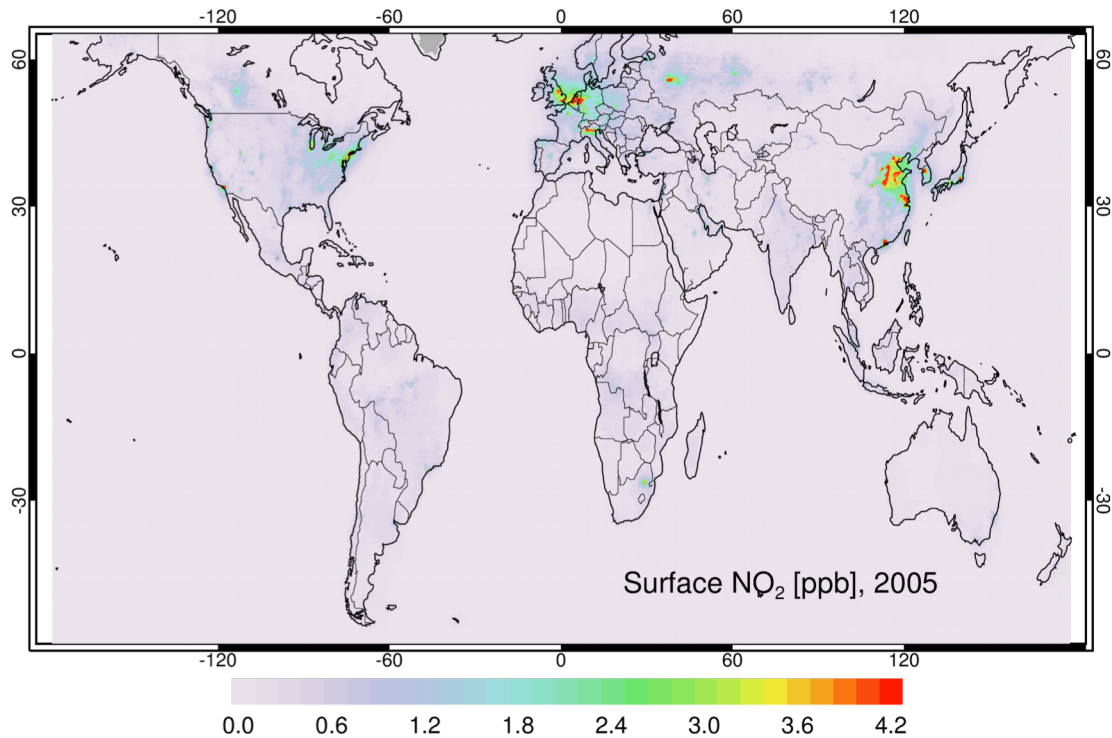
Ground-Level NO₂ from GOME, SCIAMACHY and GOME-2, 1996-1998

1 of 2



OMI Annual Mean Surface NO₂

<http://sedac.ciesin.columbia.edu/>



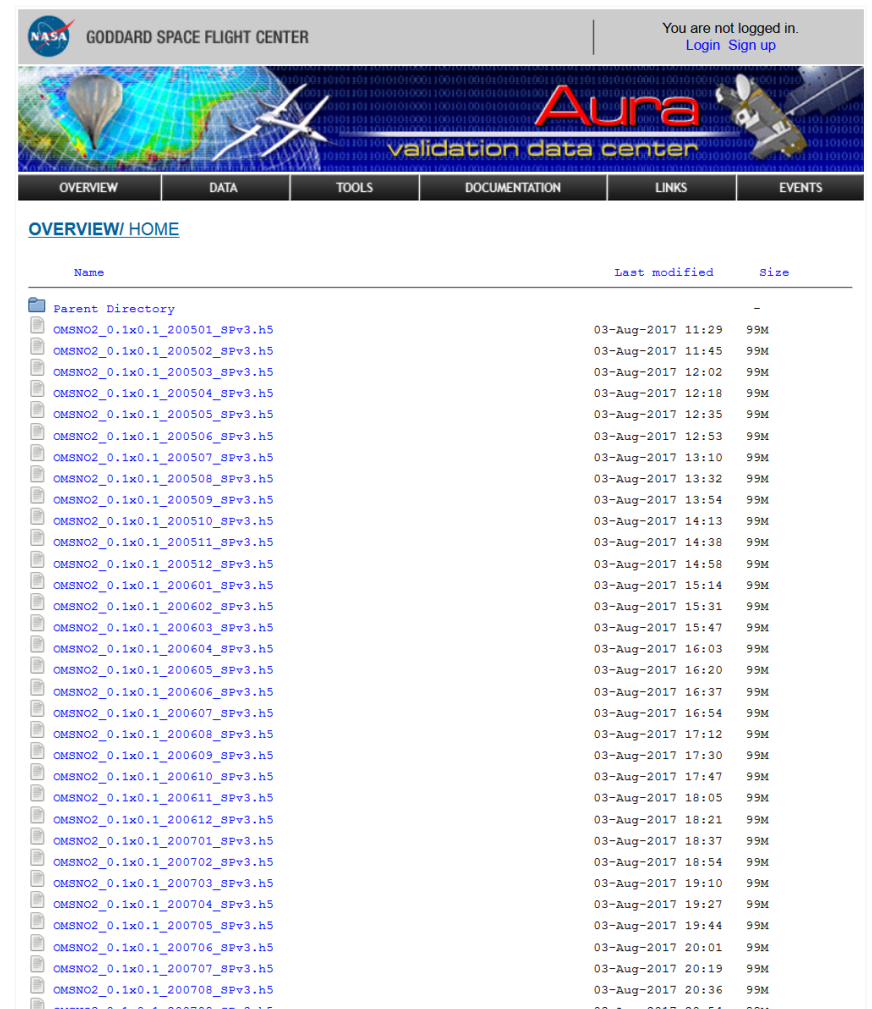
Lok Lamsal (NASA)



OMI Monthly Mean Surface NO₂ Data

https://avdc.gsfc.nasa.gov/pub/data/satellite/Aura/OMI/V03/L4/OMI_Surface_NO2/Monthly/

- Download monthly mean surface estimates of NO₂ from OMI data (2005-2016)
- File formats are “.h5” so some software (e.g., Python, Matlab) may be necessary to read the files
- Within 5 years or so, hopefully one continuous NO₂ record (1996-present) will become available



The screenshot shows the NASA AVDC website interface. At the top, it says "GODDARD SPACE FLIGHT CENTER" and "You are not logged in. Login Sign up". Below this is a banner for "Aura validation data center" with a satellite image. A navigation menu includes "OVERVIEW", "DATA", "TOOLS", "DOCUMENTATION", "LINKS", and "EVENTS". The main content area is titled "OVERVIEW / HOME" and displays a directory listing of files. The listing has columns for "Name", "Last modified", and "Size".

Name	Last modified	Size
Parent Directory	-	-
OMSN02_0.1x0.1_200501_SPv3.h5	03-Aug-2017 11:29	99M
OMSN02_0.1x0.1_200502_SPv3.h5	03-Aug-2017 11:45	99M
OMSN02_0.1x0.1_200503_SPv3.h5	03-Aug-2017 12:02	99M
OMSN02_0.1x0.1_200504_SPv3.h5	03-Aug-2017 12:18	99M
OMSN02_0.1x0.1_200505_SPv3.h5	03-Aug-2017 12:35	99M
OMSN02_0.1x0.1_200506_SPv3.h5	03-Aug-2017 12:53	99M
OMSN02_0.1x0.1_200507_SPv3.h5	03-Aug-2017 13:10	99M
OMSN02_0.1x0.1_200508_SPv3.h5	03-Aug-2017 13:32	99M
OMSN02_0.1x0.1_200509_SPv3.h5	03-Aug-2017 13:54	99M
OMSN02_0.1x0.1_200510_SPv3.h5	03-Aug-2017 14:13	99M
OMSN02_0.1x0.1_200511_SPv3.h5	03-Aug-2017 14:38	99M
OMSN02_0.1x0.1_200512_SPv3.h5	03-Aug-2017 14:58	99M
OMSN02_0.1x0.1_200601_SPv3.h5	03-Aug-2017 15:14	99M
OMSN02_0.1x0.1_200602_SPv3.h5	03-Aug-2017 15:31	99M
OMSN02_0.1x0.1_200603_SPv3.h5	03-Aug-2017 15:47	99M
OMSN02_0.1x0.1_200604_SPv3.h5	03-Aug-2017 16:03	99M
OMSN02_0.1x0.1_200605_SPv3.h5	03-Aug-2017 16:20	99M
OMSN02_0.1x0.1_200606_SPv3.h5	03-Aug-2017 16:37	99M
OMSN02_0.1x0.1_200607_SPv3.h5	03-Aug-2017 16:54	99M
OMSN02_0.1x0.1_200608_SPv3.h5	03-Aug-2017 17:12	99M
OMSN02_0.1x0.1_200609_SPv3.h5	03-Aug-2017 17:30	99M
OMSN02_0.1x0.1_200610_SPv3.h5	03-Aug-2017 17:47	99M
OMSN02_0.1x0.1_200611_SPv3.h5	03-Aug-2017 18:05	99M
OMSN02_0.1x0.1_200612_SPv3.h5	03-Aug-2017 18:21	99M
OMSN02_0.1x0.1_200701_SPv3.h5	03-Aug-2017 18:37	99M
OMSN02_0.1x0.1_200702_SPv3.h5	03-Aug-2017 18:54	99M
OMSN02_0.1x0.1_200703_SPv3.h5	03-Aug-2017 19:10	99M
OMSN02_0.1x0.1_200704_SPv3.h5	03-Aug-2017 19:27	99M
OMSN02_0.1x0.1_200705_SPv3.h5	03-Aug-2017 19:44	99M
OMSN02_0.1x0.1_200706_SPv3.h5	03-Aug-2017 20:01	99M
OMSN02_0.1x0.1_200707_SPv3.h5	03-Aug-2017 20:19	99M
OMSN02_0.1x0.1_200708_SPv3.h5	03-Aug-2017 20:36	99M
OMSN02_0.1x0.1_200709_SPv3.h5	03-Aug-2017 20:54	99M





NASA Atmospheric Composition Forecasts

NASA Forecasts: <https://fluid.nccs.nasa.gov/weather/>

- NASA's global weather and atmospheric composition forecasts
 - Currently, the forecast system does include aerosols and CO, but not other trace gases like ozone and NO₂

The screenshot shows the NASA GMAO website interface. At the top, the NASA logo is on the left, and the text "Global Modeling and Assimilation Office" and "GMAO" are on the right. Below this is a navigation bar with links for "Weather", "Seasonal", "Reanalysis", and "Mission Support". The main content area is titled "Weather Analyses and Forecasts" and contains four panels: "Datagrams", "WxMaps", "Chem Maps", and "Observing System Statistics". A sidebar on the left contains a "Navigation" menu with links to "Datagrams", "WxMaps", "Chem Maps", "Observing System Stats", "Radiances Monitoring", "Observation Impacts", and "WMS Viewer: GEOS Aerosols". Below this is a "Data Access" section with links for "HTTPS", "OPeNDAP", and "FTP (No Password)", each with sub-links for "Assimilation" and "Forecast". The "Datagrams" panel shows a vertical cross-section of atmospheric variables like Cloud (%), Relative Humidity (%), Wind Speed (m/s), SLP (hPa), and Snow (kg). The "WxMaps" panel shows a map of the United States with 3-hour accumulated precipitation, SLP, and 1000-500mb thickness. The "Chem Maps" panel shows a map of the United States with Dust Aerosol Optical Thickness. The "Observing System Statistics" panel shows a vertical cross-section of METOP-A AMSUA TB Observations in Kelvin.



NASA Atmospheric Composition Forecasts: Datagrams

METEOGRAMS

Relative Humidity

AEROGRAMS

Organic Carbon

Black Carbon

All (OC + BC + SU)

Sea Salt

Dust

Sulfate

CO

NATIONAL

Select a Station

WORLD

Select a Station

AERONET

Select a Station

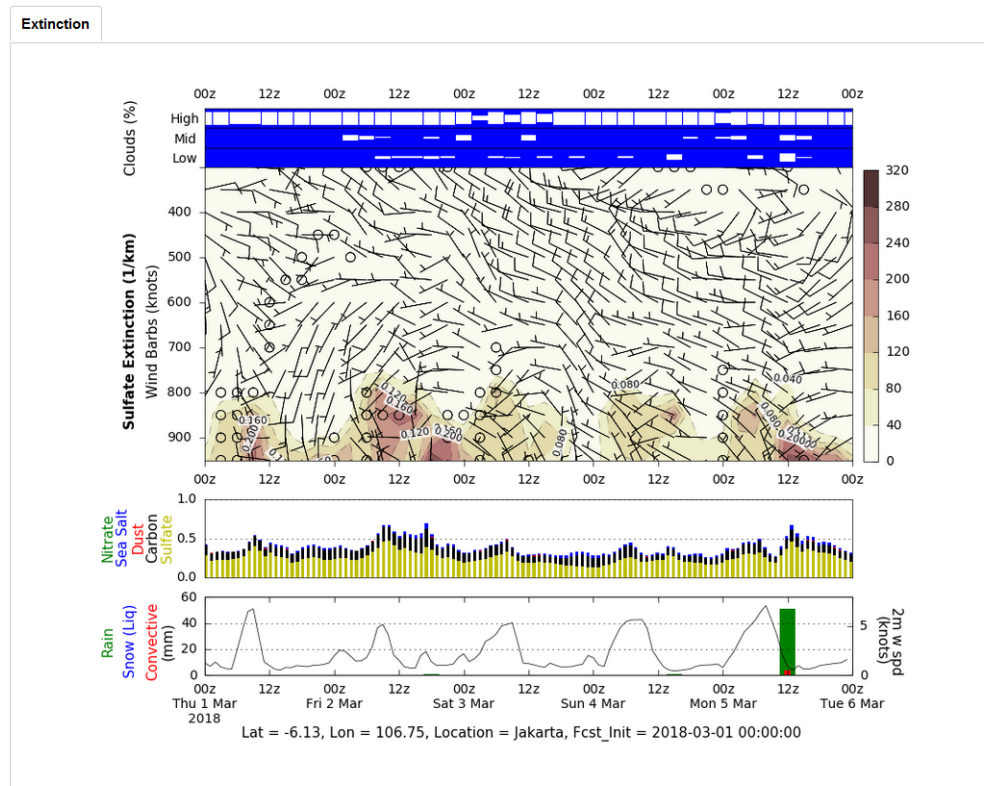
MEGACITIES

Jakarta

ACTIVE CAMPAIGNS

GMAO GEOS FP Aerograms

Jakarta (-6.13, 106.75)



NASA Atmospheric Composition Forecasts: Datagrams

VARIABLES

Total AOT

REGIONS

Atlantic	Australia
Global	Mid Atlantic
North America	N Polar
Pacific	Seven Seas
S Polar	

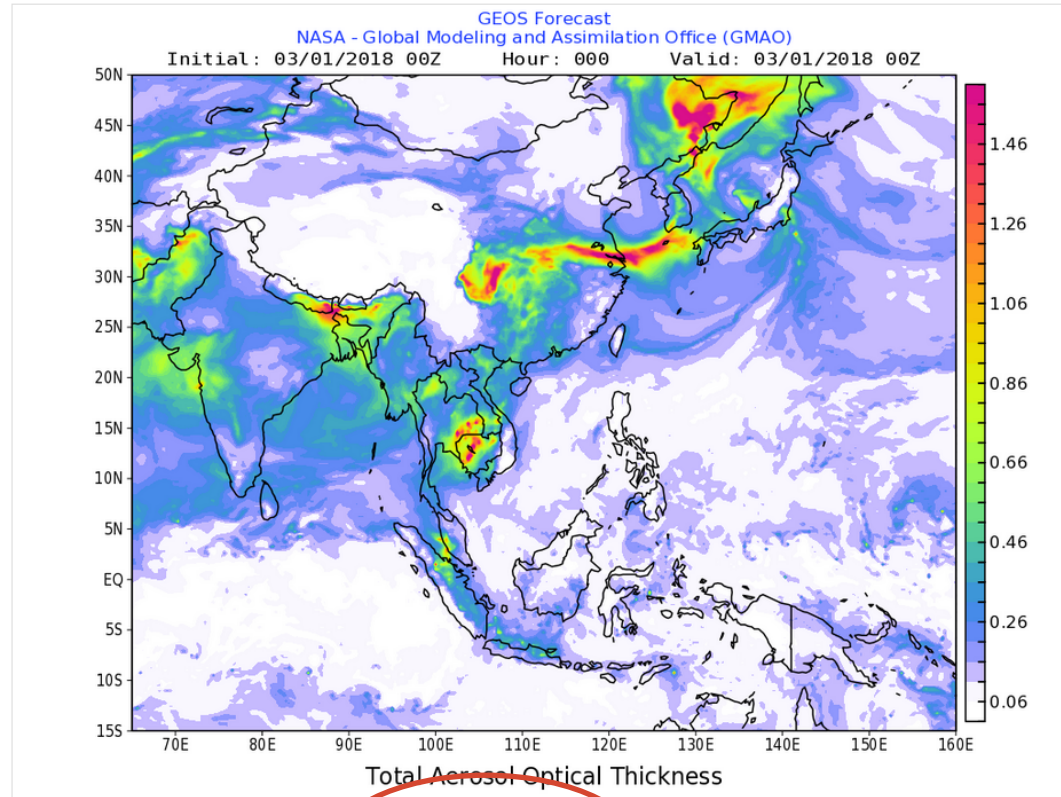
FORECAST INITIAL TIME

01Mar2018 00z

FORECAST LEAD HOUR

000 01Mar2018 00z

Atmospheric Composition (2D) Maps



ANIMATE DOWNLOAD MOVIE



NASA Atmospheric Composition Forecasts: Datagrams

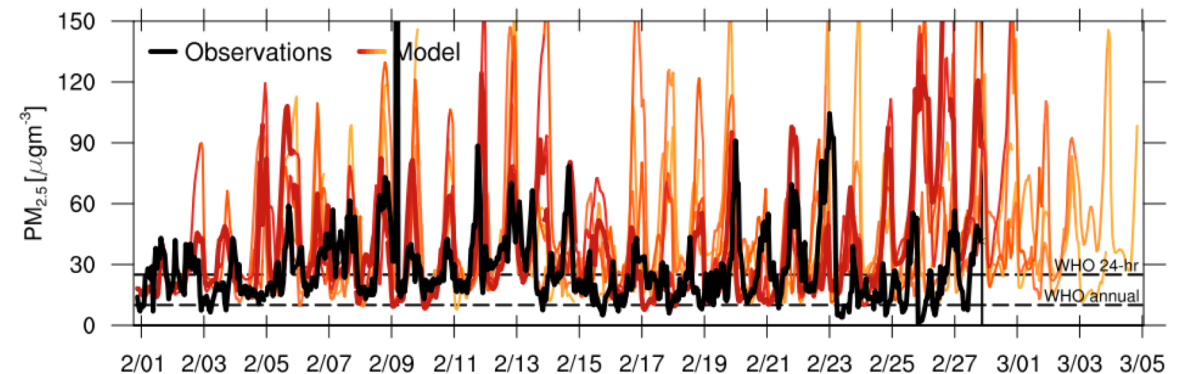
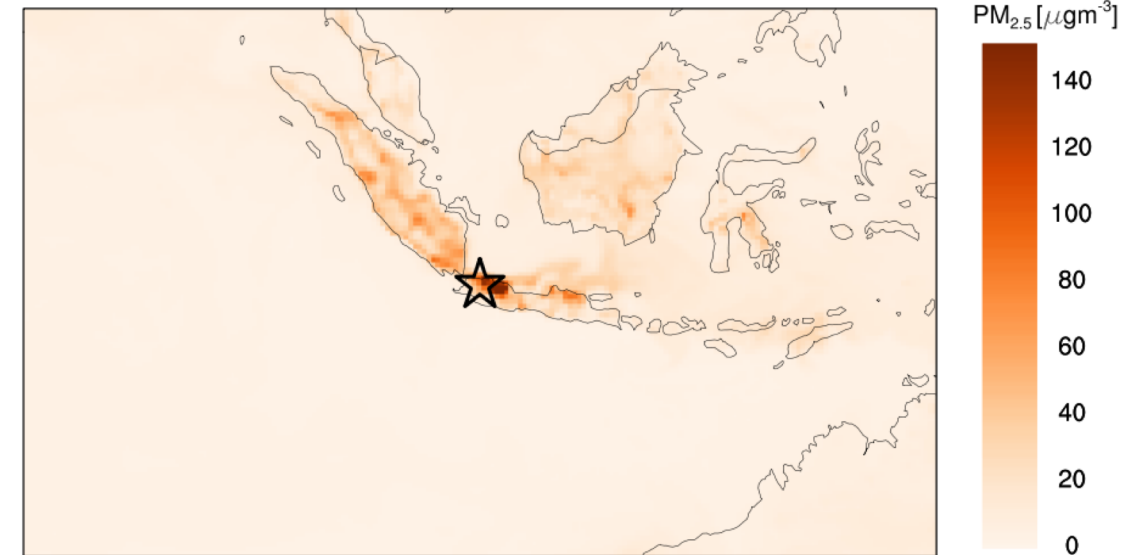
- Compare the forecast for the chemical composition of aerosols in Surabaya to that in Bangkok (Bangkok)
- What is the forecast for CO in Surabaya at the surface and 600 mb?



NASA's Upcoming **Air Quality** Forecasts

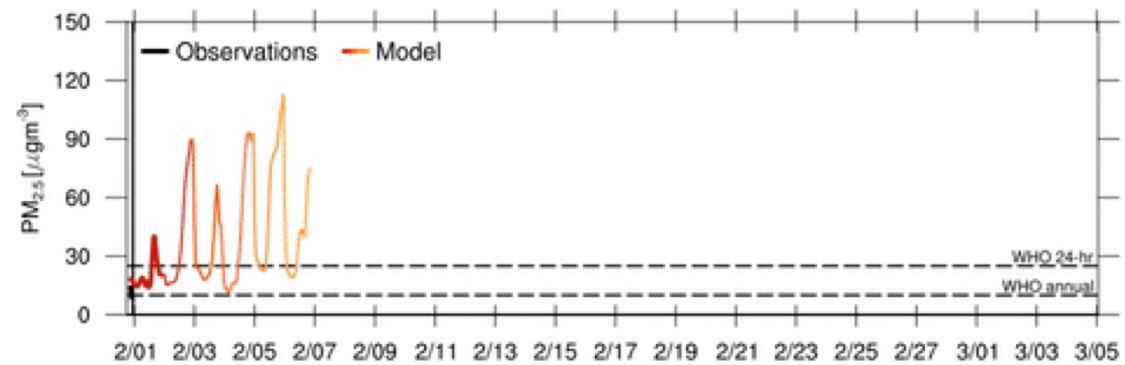
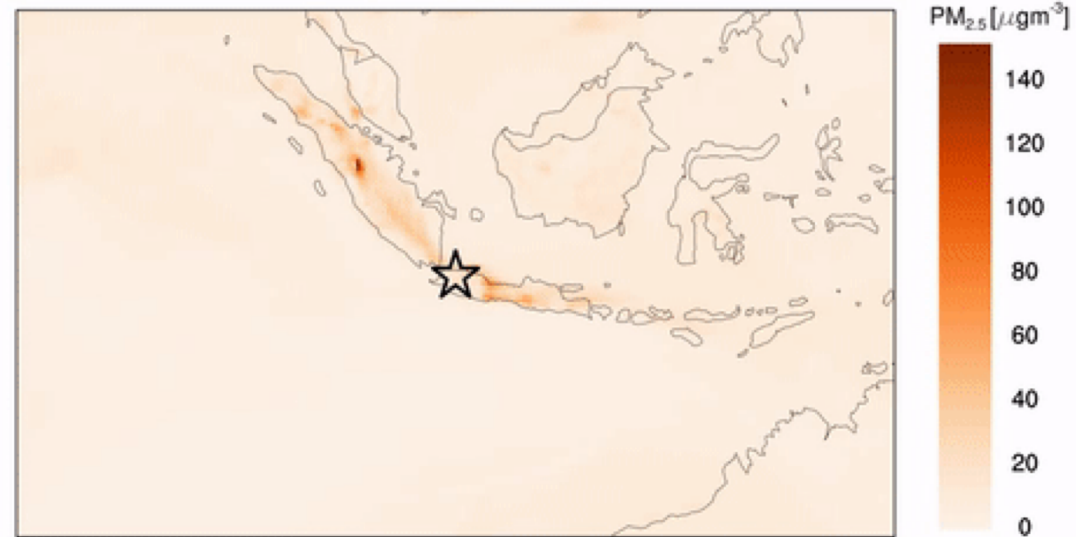
- NASA's global weather and atmospheric composition forecasts
 - Currently, the forecast system does include aerosols and CO, but not other trace gases like ozone and NO₂
 - At some point in 2018, surface particulate matter, ozone, NO₂, and other trace gases will be added to the system

Jakarta, Indonesia, 2018-02-27 23:45 UTC



NASA's Upcoming **Air Quality** Forecasts

Jakarta, Indonesia, 2018-02-01 01:15 UTC

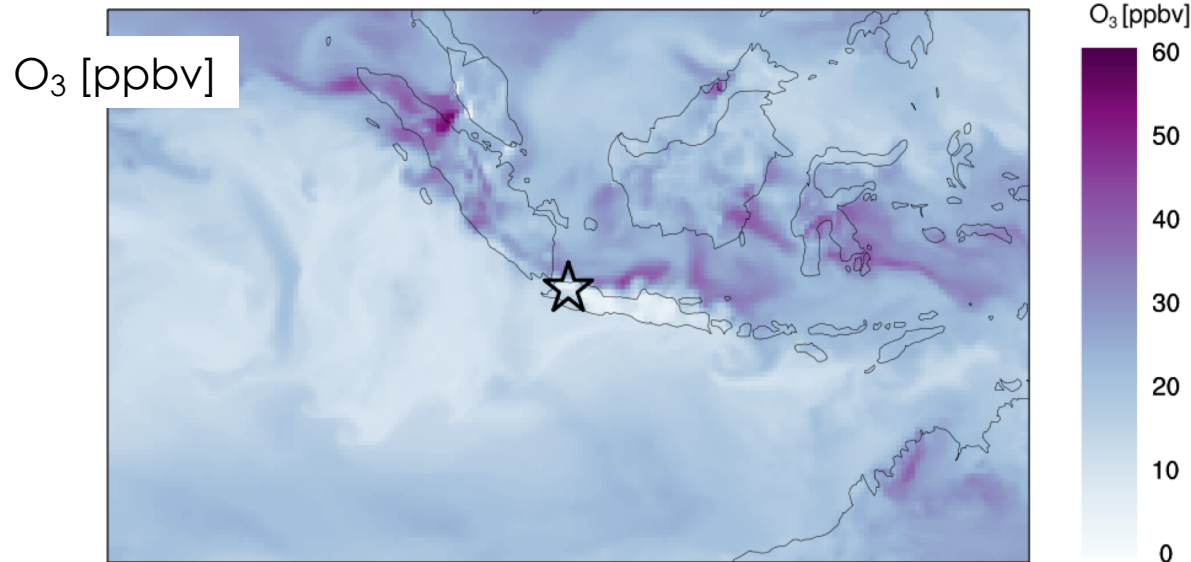


Christoph Keller, NASA GMAO

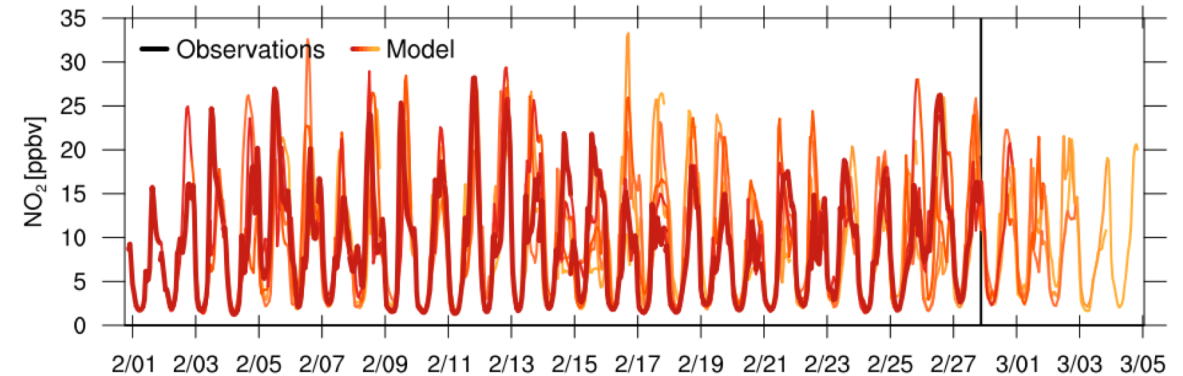
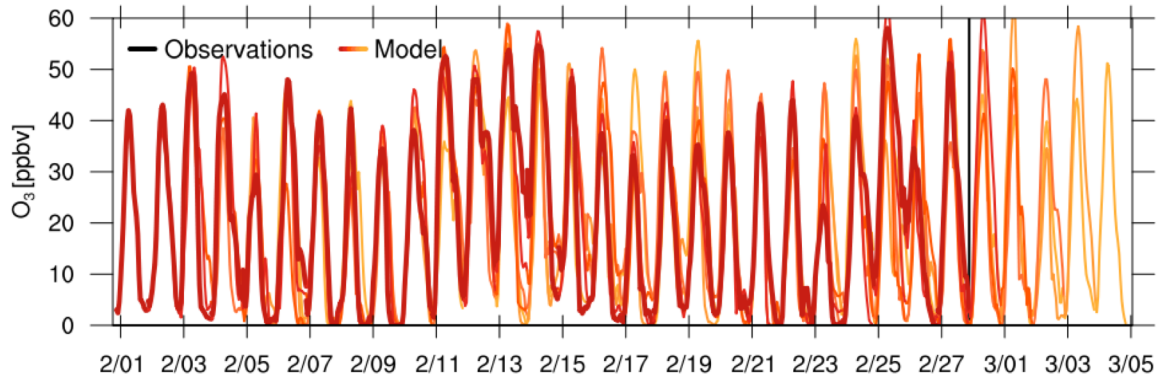


NASA's Upcoming **Air Quality** Forecasts

Jakarta, Indonesia, 2018-02-27 23:45 UTC



Jakarta, Indonesia, 2018-02-27 23:45 UTC





Giovanni -
The Bridge Between Data and Science
an Online Visualization and Analysis Tool

Visit <https://urs.earthdata.nasa.gov/users/new>



EARTHDATA LOGIN

Register for an Earthdata Login Profile

Profile Information

Username: •

Password: •

Password Confirmation: •

• Required field

Username must:

- Be a Minimum of 4 characters
- Be a Maximum of 30 characters
- Use letters, numbers, periods and underscores
- Not contain any blank spaces
- Not begin, end or contain two consecutive special characters(. _)

Password must contain:

- Minimum of 8 characters
- One Uppercase letter
- One Lowercase letter
- One Number



Time Averaged Maps: Step 1

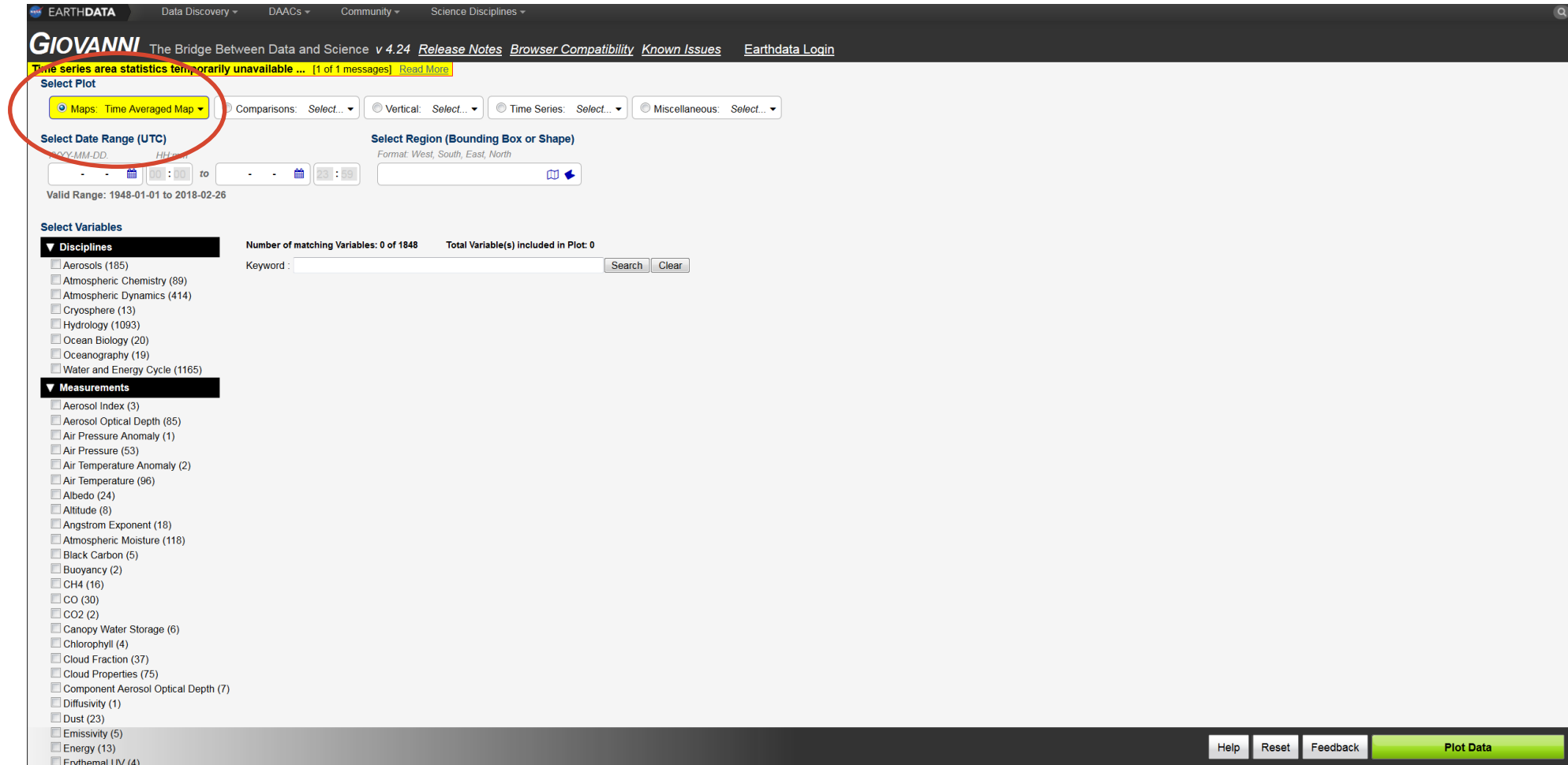
- Go to the Giovanni website: <http://giovanni.gsfc.nasa.gov/giovanni/>

The screenshot shows the GIOVANNI website interface. At the top, there is a navigation bar with 'EARTHDATA' and several menu items: 'Data Discovery', 'DAACs', 'Community', and 'Science Disciplines'. Below this is the 'GIOVANNI' logo and the tagline 'The Bridge Between Data and Science v 4.24'. There are links for 'Release Notes', 'Browser Compatibility', 'Known Issues', and 'Earthdata Login'. A yellow banner indicates 'Time series area statistics temporarily unavailable ... [1 of 1 messages] Read More'. The main content area is titled 'Select Plot' and features several radio button options: 'Maps: Time Averaged Map' (selected), 'Comparisons: Select...', 'Vertical: Select...', 'Time Series: Select...', and 'Miscellaneous: Select...'. Below this is the 'Select Date Range (UTC)' section with input fields for 'YYYY-MM-DD' and 'HH:mm', and a 'Valid Range: 1948-01-01 to 2018-02-26' label. To the right is the 'Select Region (Bounding Box or Shape)' section with a text input field and a 'Format: West, South, East, North' label. The 'Select Variables' section is divided into two categories: 'Disciplines' and 'Measurements'. The 'Disciplines' list includes: Aerosols (185), Atmospheric Chemistry (89), Atmospheric Dynamics (414), Cryosphere (13), Hydrology (1093), Ocean Biology (20), Oceanography (19), and Water and Energy Cycle (1165). The 'Measurements' list includes: Aerosol Index (3), Aerosol Optical Depth (85), Air Pressure Anomaly (1), Air Pressure (53), Air Temperature Anomaly (2), Air Temperature (96), Albedo (24), Altitude (8), Angstrom Exponent (18), Atmospheric Moisture (118), Black Carbon (5), Buoyancy (2), CH4 (16), CO (30), CO2 (2), Canopy Water Storage (6), Chlorophyll (4), Cloud Fraction (37), Cloud Properties (75), Component Aerosol Optical Depth (7), Diffusivity (1), Dust (23), Emissivity (5), Energy (13), and Erythral UV (4). A search bar with 'Search' and 'Clear' buttons is located below the 'Disciplines' list. At the bottom right, there are buttons for 'Help', 'Reset', 'Feedback', and a prominent green 'Plot Data' button.



Time Averaged Maps: Step 2

- Under **Select Plot**, go to **Maps** and select **Time Averaged Map**



The screenshot shows the GIOVANNI web interface. At the top, there is a navigation bar with 'EARTHDATA', 'Data Discovery', 'DAACs', 'Community', and 'Science Disciplines'. Below this is the GIOVANNI logo and the tagline 'The Bridge Between Data and Science v 4.24'. A notification banner indicates that 'Time series area statistics temporarily unavailable'. The 'Select Plot' section is highlighted with a red circle, and the 'Maps: Time Averaged Map' option is selected. Other options include 'Comparisons', 'Vertical', 'Time Series', and 'Miscellaneous'. Below this is the 'Select Date Range (UTC)' section with a date picker and a 'Valid Range' of 1948-01-01 to 2018-02-26. The 'Select Region (Bounding Box or Shape)' section is also visible. The 'Select Variables' section shows a list of disciplines and measurements, with 'Number of matching Variables: 0 of 1848' and 'Total Variable(s) included in Plot: 0'. A search bar is present. At the bottom right, there are buttons for 'Help', 'Reset', 'Feedback', and 'Plot Data'.



Time Averaged Maps: Step 2

- Under **Measurement**, select **NO₂** and **SO₂**

The screenshot shows the GIOVANNI web interface. At the top, there are navigation links for 'Data Discovery', 'DAACs', 'Community', and 'Science Disciplines'. The main header includes the GIOVANNI logo and version information. Below the header, there are several sections for configuring a plot:

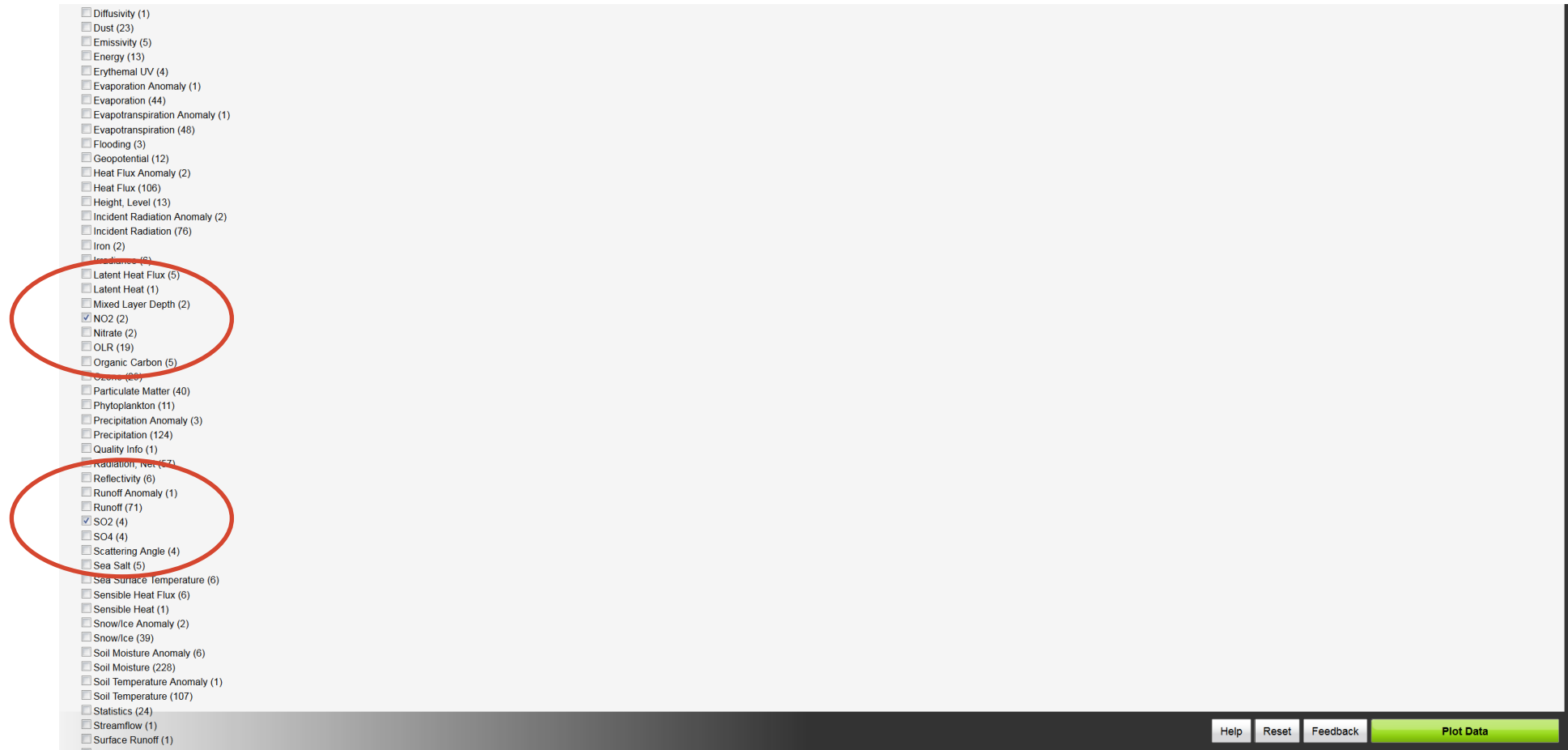
- Select Plot:** Includes radio buttons for 'Maps: Time Averaged Map', 'Comparisons', 'Vertical', 'Time Series', and 'Miscellaneous'.
- Select Date Range (UTC):** Includes input fields for start and end dates and times, with a 'Valid Range: 1948-01-01 to 2018-02-26' note.
- Select Region (Bounding Box or Shape):** Includes a text input field for region coordinates.
- Select Variables:** This section is divided into two columns:
 - Disciplines (185):** A list of categories such as 'Aerosols (185)', 'Atmospheric Chemistry (89)', 'Atmospheric Dynamics (414)', 'Cryosphere (13)', 'Hydrology (1093)', 'Ocean Biology (20)', 'Oceanography (19)', and 'Water and Energy Cycle (1165)'. The 'Measurements' category is circled in red.
 - Measurements:** A list of specific variables such as 'Aerosol Index (3)', 'Aerosol Optical Depth (85)', 'Air Pressure Anomaly (1)', 'Air Pressure (53)', 'Air Temperature Anomaly (2)', 'Air Temperature (96)', 'Albedo (24)', 'Altitude (8)', 'Angstrom Exponent (18)', 'Atmospheric Moisture (118)', 'Black Carbon (5)', 'Buoyancy (2)', 'CH4 (16)', 'CO (30)', 'CO2 (2)', 'Canopy Water Storage (6)', 'Chlorophyll (4)', 'Cloud Fraction (37)', 'Cloud Properties (75)', 'Component Aerosol Optical Depth (7)', 'Diffusivity (1)', 'Dust (23)', 'Emissivity (5)', 'Energy (13)', and 'Erythral UV (4)'. A red arrow points down from the text 'Scroll down' to this section.

At the bottom right of the interface, there are buttons for 'Help', 'Reset', 'Feedback', and a prominent green 'Plot Data' button.



Time Averaged Maps: Step 2

- Under **Measurement**, select **NO₂** and **SO₂**



Time Averaged Maps: Step 3

- Select the following two variables:
 - NO₂ Tropospheric Column (30% Cloud Screened) (OMNO2d_v003)
 - SO₂ Column Amount (Planetary Boundary Layer) OMSO2e_v003 (OMSO2e_v003)

The screenshot shows the GIOVANNI web interface. At the top, there are navigation links for 'Data Discovery', 'DAACs', 'Community', and 'Science Disciplines'. The main header includes the GIOVANNI logo and the tagline 'The Bridge Between Data and Science v 4.24'. Below the header, there are several tabs: 'Time series area statistics temporarily unavailable ... (1 of 1 messages) Read More', 'Select Plot', and 'Select Region (Bounding Box or Shape)'. The 'Select Plot' tab is active, showing a dropdown menu with 'Maps: Time Averaged Map' selected. Below this, there are fields for 'Select Date Range (UTC)' and 'Select Region (Bounding Box or Shape)'. The 'Select Variables' section is expanded, showing a list of variables under 'Disciplines' and 'Measurements'. The 'Measurements' list includes 'NO2 Total Column (30% Cloud Screened) (OMNO2d_v003)', 'NO2 Tropospheric Column (30% Cloud Screened) (OMNO2d_v003)', 'SO2 Column Amount (Planetary Boundary Layer) OMSO2e_v003 (OMSO2e_v003)', 'SO2 Column Mass Density (ENSEMBLE) (M21NXXAER v5.12.4)', 'SO2 Surface Mass Concentration (ENSEMBLE) (M21NXXAER v5.12.4)', and 'SO2 Column Mass Density (ENSEMBLE), time average (M21NXXAER v5.12.4)'. The 'NO2 Tropospheric Column (30% Cloud Screened) (OMNO2d_v003)' and 'SO2 Column Amount (Planetary Boundary Layer) OMSO2e_v003 (OMSO2e_v003)' variables are selected. A table below the list shows the details for these variables, including Source, Temp. Res., Spat. Res., Begin Date, End Date, and Units.

Variable	Source	Temp. Res.	Spat. Res.	Begin Date	End Date	Units
<input type="checkbox"/> NO2 Total Column (30% Cloud Screened) (OMNO2d_v003)	OMI	Daily	0.25 °	2004-10-01	2018-02-24	1/cm2
<input checked="" type="checkbox"/> NO2 Tropospheric Column (30% Cloud Screened) (OMNO2d_v003)	OMI	Daily	0.25 °	2004-10-01	2018-02-24	1/cm2
<input checked="" type="checkbox"/> SO2 Column Amount (Planetary Boundary Layer) OMSO2e_v003 (OMSO2e_v003)	OMI	Daily	0.25 °	2004-10-01	2018-02-23	DU
<input type="checkbox"/> SO2 Column Mass Density (ENSEMBLE) (M21NXXAER v5.12.4)	MERRA-2 Model	Monthly	0.5 x 0.625 °	1980-01-01	2018-01-31	kg m-2
<input type="checkbox"/> SO2 Surface Mass Concentration (ENSEMBLE) (M21NXXAER v5.12.4)	MERRA-2 Model	Monthly	0.5 x 0.625 °	1980-01-01	2018-01-31	kg m-3
<input type="checkbox"/> SO2 Column Mass Density (ENSEMBLE), time average (M21NXXAER v5.12.4)	MERRA-2 Model	Hourly	0.5 x 0.625 °	1980-01-01	2018-01-31	kg m-2



Time Averaged Maps: Step 4

- Set the date range as **June 1, 2005** to **June 30, 2005**

GIOVANNI The Bridge Between Data and Science v 4.24 [Release Notes](#) [Browser Compatibility](#) [Known Issues](#)

Time series area statistics temporarily unavailable ... [1 of 1 messages] [Read More](#)

Select Plot

Maps: Time Averaged Map Comparisons: Select... Vertical: Select... Time Series: Select... Miscellaneous: S

Select Date Range (UTC)

YYYY-MM-DD HH:mm

2005 -06 -01 00:00 to 2005 -06 -30 23:59

Valid Range: 2004-10-01 to 2018-02-2

Select Region (Bounding Box or Shape)

Format: West, South, East, North

6 of 1848 Total Variable(s) included in Plot: 2

Select Variables

▼ Disciplines

- Atmospheric Chemistry (6)

▼ Measurements

- Aerosol Index (3)
- Aerosol Optical Depth (85)
- Air Pressure Anomaly (1)
- Air Pressure (53)
- Air Temperature Anomaly (2)
- Air Temperature (96)
- Albedo (24)
- Altitude (8)
- Angstrom Exponent (18)
- Atmospheric Moisture (118)
- Black Carbon (5)
- Buoyancy (2)
- CH4 (16)
- CO (20)

30% Cloud Screened (OMNO2d v003)

Column (30% Cloud Screened) (OMNO2d v003)

nt (Planetary Boundary Layer) OMSO2e v003 (OMSO2e v003)

Density (ENSEMBLE) (M2TMNXAER v5.12.4)

SO2 Surface Mass Concentration (ENSEMBLE) (M2TMNXAER v5.12.4)

SO2 Column Mass Density (ENSEMBLE), time average (M2T1NXAER v5.12.4)



Time Averaged Maps: Step 5

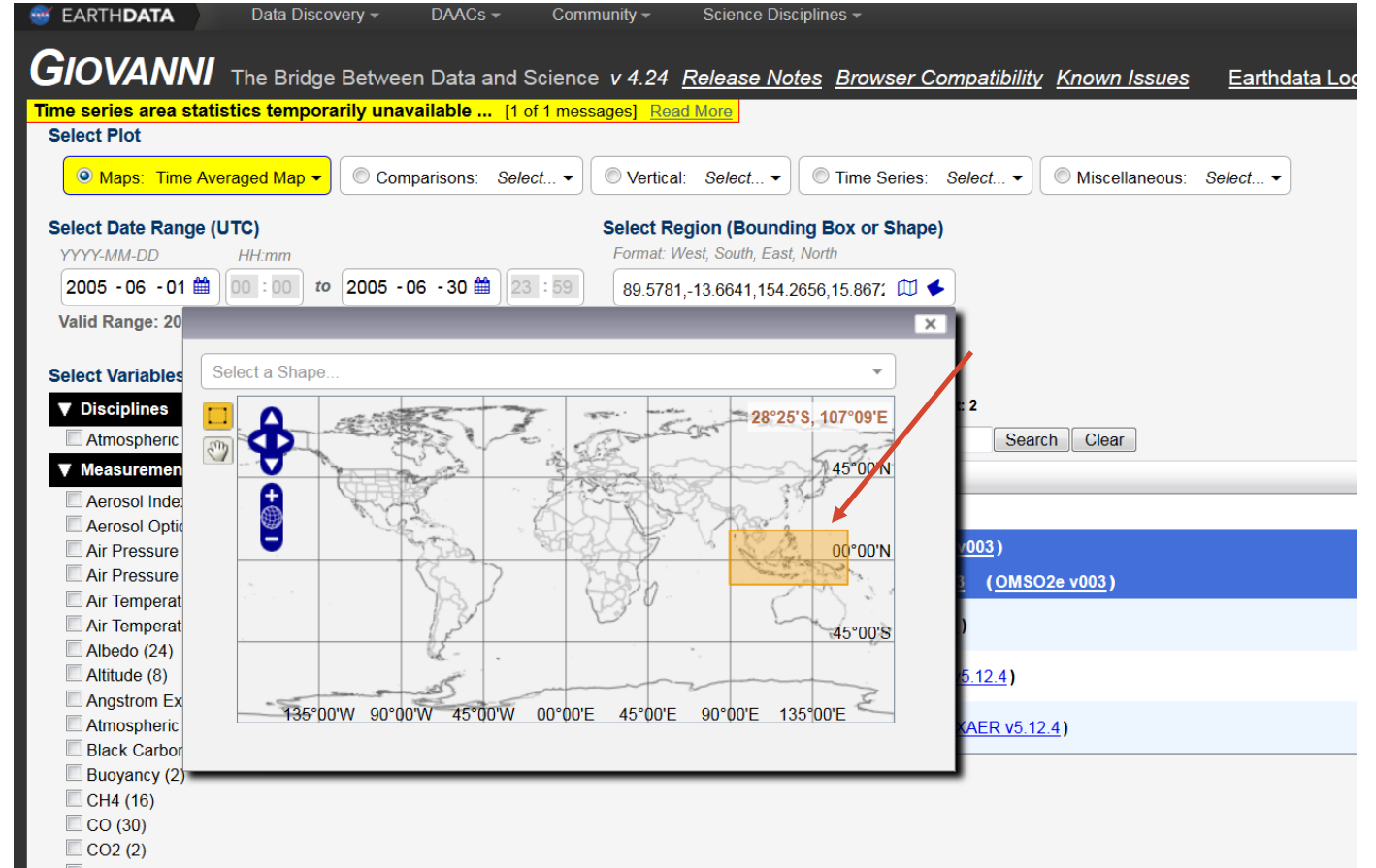
- Select your region either by typing in coordinates, or by clicking **Show Map** and drawing a box (about 10 x 10 degrees) around your area of interest

The screenshot displays the GIOVANNI web interface. At the top, the header includes 'EARTHDATA', 'Data Discovery', 'DAACs', 'Community', and 'Science Disciplines'. The main title is 'GIOVANNI The Bridge Between Data and Science v 4.24'. Below the header, there is a yellow notification bar: 'Time series area statistics temporarily unavailable ... [1 of 1 messages] Read More'. The 'Select Plot' section has 'Maps: Time Averaged Map' selected. The 'Select Date Range (UTC)' section shows the date range '2005 -06 -01 00:00 to 2005 -06 -30 23:59'. The 'Select Region (Bounding Box or Shape)' section has a red arrow pointing to the 'Show Map' button. A modal window titled 'Select a Shape...' is open, showing a world map with a blue box drawn over the North Atlantic region. The map includes latitude and longitude coordinates. The background interface shows the 'Select Variables' section with a list of variables under 'Disciplines' and 'Measurements'.



Time Averaged Maps: Step 5

- Select your region either by typing in coordinates, or by clicking **Show Map** and drawing a box (about 10 x 10 degrees) around your area of interest
- If you pick too large of an area or time period, it will take a long time for your image to be created
- Click on **Plot Data** (green button) in lower right-hand corner

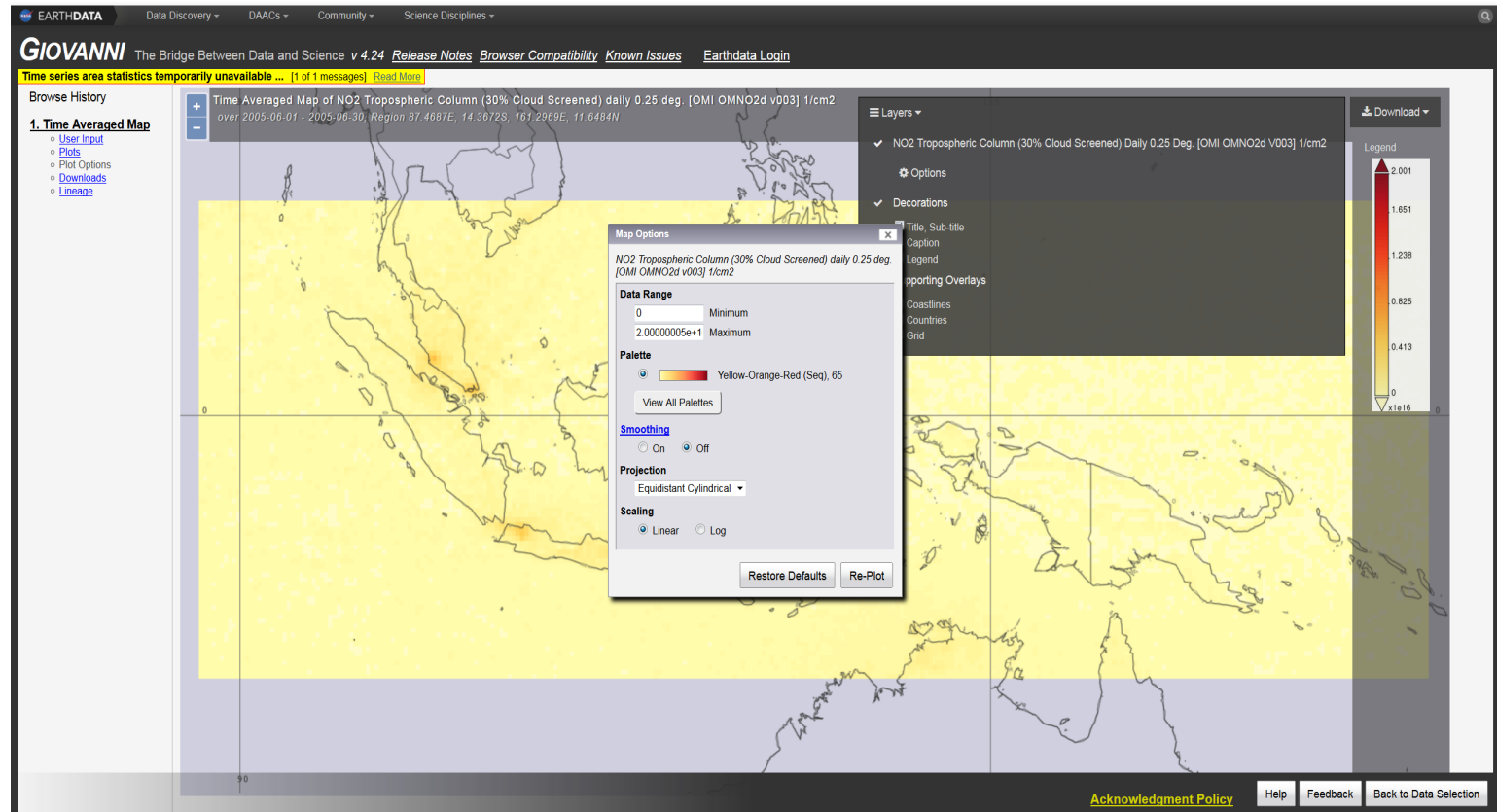


The screenshot shows the GIOVANNI web interface. The main navigation bar includes "EARTHDATA", "Data Discovery", "DAACs", "Community", and "Science Disciplines". The page title is "GIOVANNI The Bridge Between Data and Science v 4.24". A yellow banner at the top indicates "Time series area statistics temporarily unavailable ... [1 of 1 messages] Read More". The "Select Plot" section has "Maps: Time Averaged Map" selected. The "Select Date Range (UTC)" section shows a date range from "2005 -06 -01 00:00" to "2005 -06 -30 23:59". The "Select Region (Bounding Box or Shape)" section shows a bounding box of "89.5781,-13.6641,154.2656,15.867". A "Select Variables" panel on the left lists various atmospheric and measurement variables. A map window is open, showing a world map with a yellow bounding box around a region in the Indian Ocean. A red arrow points to the "Plot Data" button in the bottom right corner of the map window.



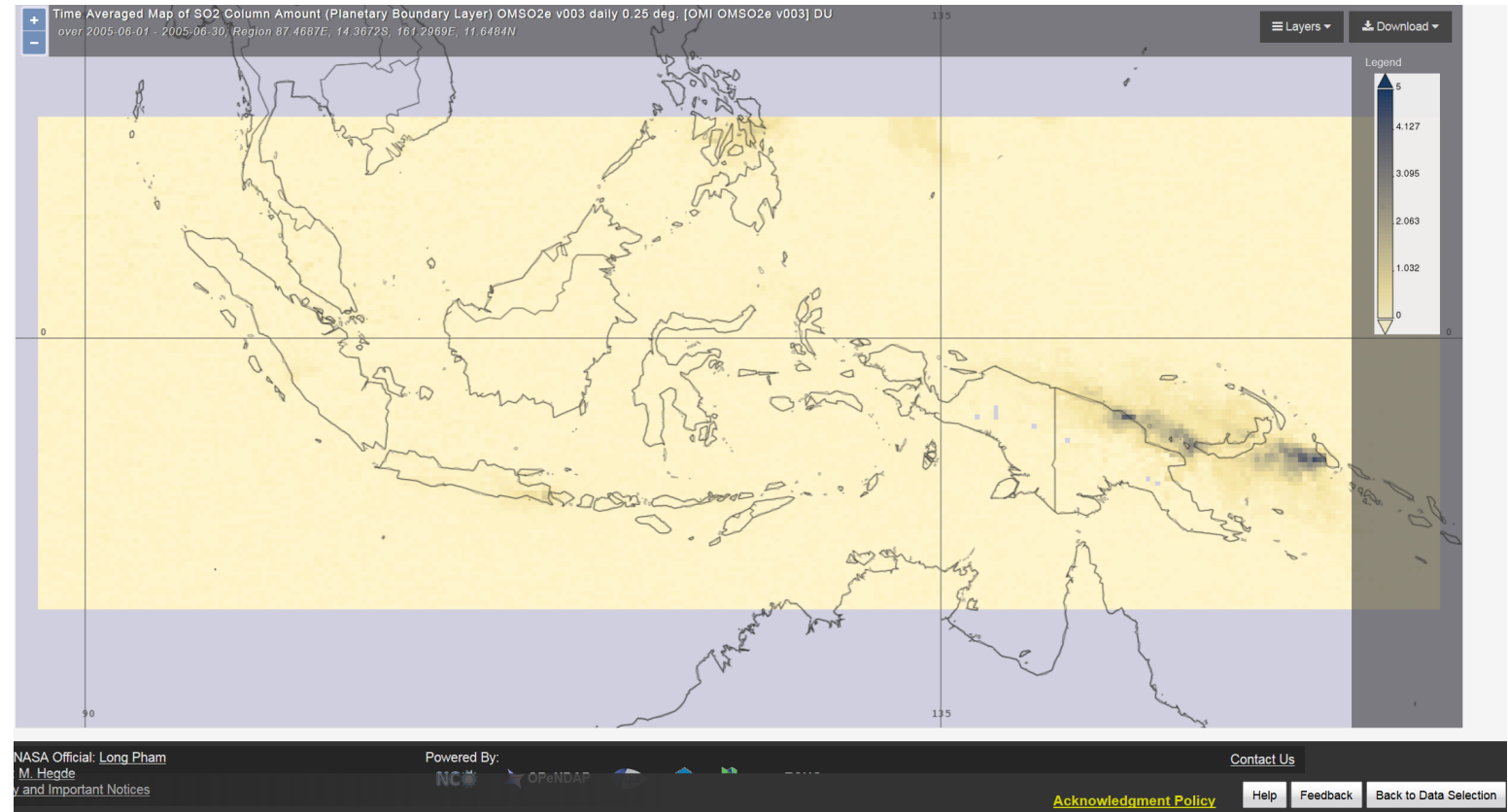
Time Averaged Maps: Step 6: SO₂

- Scroll down to view the various maps. You can change the color scale, max, and min under the **Options** button on the top right of each map. You can download each image (either as .png or a GeoTIFF) under the **Download** button



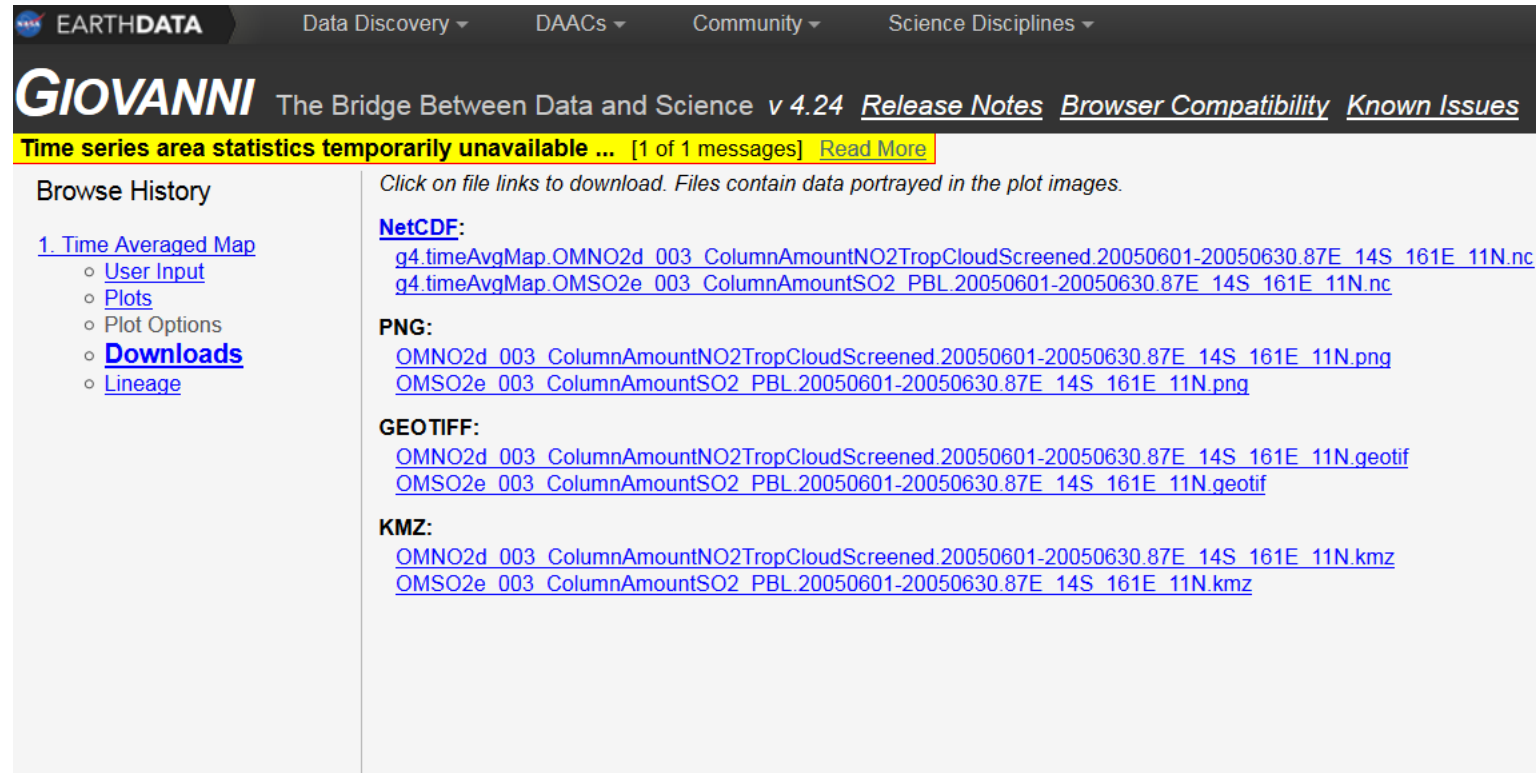
Time Averaged Maps: Step 6: SO₂

- Scroll down to view the various maps. You can change the color scale, max, and min under the **Options** button on the top right of each map. You can download each image (either as .png or a GeoTIFF) under the button



Time Averaged Maps: Step 7

- In the panel on the left, under **Time Averaged Map**, click the **Downloads** link
- Here you can download the maps in .png or GeoTIFF formats, or the data in NetCDF format



The screenshot shows the GIOVANNI web interface. At the top, there is a navigation bar with "EARTHDATA" and several dropdown menus: "Data Discovery", "DAACs", "Community", and "Science Disciplines". Below this is the "GIOVANNI" logo and the tagline "The Bridge Between Data and Science v 4.24". There are links for "Release Notes", "Browser Compatibility", and "Known Issues". A yellow banner at the top of the main content area reads "Time series area statistics temporarily unavailable ..." with a "Read More" link. On the left side, there is a "Browse History" section with a list of items: "1. Time Averaged Map", "User Input", "Plots", "Plot Options", "Downloads" (highlighted in blue), and "Lineage". The main content area on the right contains a message: "Click on file links to download. Files contain data portrayed in the plot images." Below this, there are three sections: "NetCDF:" with two links, "PNG:" with two links, and "GEOTIFF:" with two links. At the bottom of the screenshot, there is a "KMZ:" section with two links.



Time Averaged Maps: Step 8

- Click the **Back to Data Selection** button in the lower right and keep all parameters the same, except change the range to **November 1, 2017** to **November 30, 2017** and plot the map again
- Now you have two maps of NO₂ and SO₂ for two time periods to compare



Time Averaged Maps – Questions

- What are two differences in the NO₂ and SO₂ maps generated for the two time periods?
- Did you observe any increasing or decreasing trends in NO₂ or SO₂ over your area of interest?





Earthdata: Download Level 2 and 3 Data

Step 1b: Add NASA GESDISC to your Applications

- Login to Earthdata (<https://urs.earthdata.nasa.gov>)
- Click on **Applications**, then **Authorized Apps**
- If NASA GESDISC DATA ARCHIVE isn't in your Approved Applications then click on **Approve More Applications**
- Look for NASA GESDISC DATA ARCHIVE in the list or search
- Add NASA GESDISC DATA ARCHIVE to your applications

You should see NASA GESDISC DATA ARCHIVE in list of approved applications

EARTHDATA LOGIN My Profile Sign Out

Bryan Duncan

Profile Home Edit Profile Change Password Applications My Groups

Approved Applications

Applications that use your Earthdata Login profile for authentication.

Earthdata Feedback Module	?
Earthdata Code Collaborative	?
Earthdata Website	?
SEDAC Website	✎ +
Metadata Management Tool	?
NASA GESDISC DATA ARCHIVE	✎ +
GESDISC	✎ +

APPROVE MORE APPLICATIONS



Step 1a: Visit <https://urs.earthdata.nasa.gov/users/new>



EARTHDATA LOGIN

Register for an Earthdata Login Profile

Profile Information

Username: •

Password: •

Password Confirmation: •

• Required field

Username must:

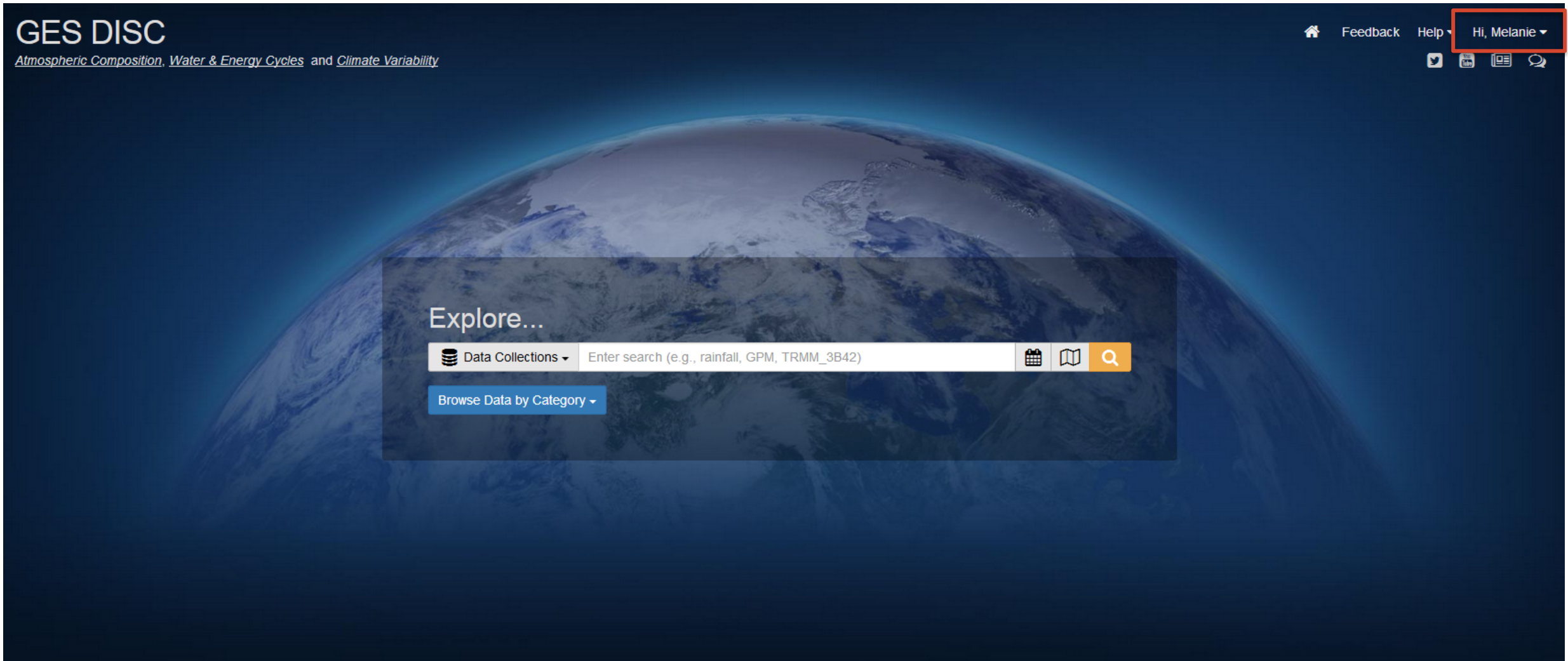
- Be a Minimum of 4 characters
- Be a Maximum of 30 characters
- Use letters, numbers, periods and underscores
- Not contain any blank spaces
- Not begin, end or contain two consecutive special characters(. _)

Password must contain:

- Minimum of 8 characters
- One Uppercase letter
- One Lowercase letter
- One Number



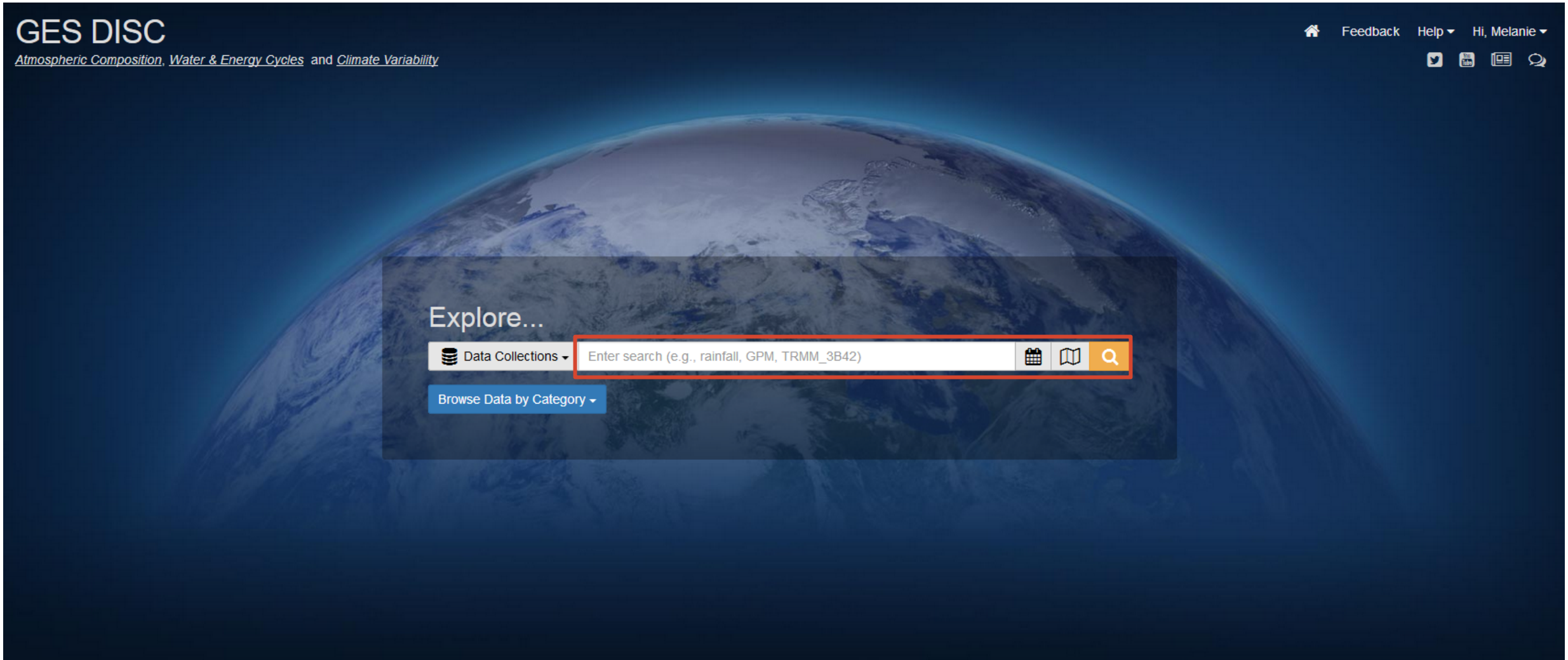
Step 2: Login at <https://disc.gsfc.nasa.gov/>



The screenshot shows the NASA GES DISC website interface. The background is a satellite view of Earth. In the top left corner, the text "GES DISC" is displayed, with the subtitle "Atmospheric Composition, Water & Energy Cycles and Climate Variability" below it. In the top right corner, there is a navigation bar with a home icon, "Feedback", "Help", and a user profile dropdown menu that says "Hi, Melanie" and is highlighted with a red box. Below the navigation bar are social media icons for Twitter, YouTube, and Facebook. In the center of the page, there is a semi-transparent "Explore..." panel. This panel contains a "Data Collections" dropdown menu, a search input field with the placeholder text "Enter search (e.g., rainfall, GPM, TRMM_3B42)", and a "Browse Data by Category" dropdown menu. To the right of the search field are icons for a calendar, a book, and a magnifying glass.






Step 3: Enter Search Keywords (e.g. OMNO2 or OMSO2)




The screenshot shows the GES DISC website interface. At the top left, the text "GES DISC" is displayed in a large, white font, with the subtitle "Atmospheric Composition, Water & Energy Cycles and Climate Variability" below it. In the top right corner, there are navigation links for "Feedback", "Help", and "Hi, Melanie", along with social media icons for Twitter, YouTube, and a chat bubble. The main content area features a dark blue background with a satellite view of Earth. A central "Explore..." panel is highlighted with a red border. This panel contains a "Data Collections" dropdown menu, a search input field with the placeholder text "Enter search (e.g., rainfall, GPM, TRMM_3B42)", and a "Browse Data by Category" button. The search input field is currently empty and is the focus of the step.



Step 4: Make a Product Selection




GES DISC Data Collections OMSO2    Feedback Help Hi, Melanie

Atmospheric Composition, Water & Energy Cycles and Climate Variability

 **Data Collections** Showing 1 - 3 of 3 datasets associated with OMSO2

Refine By

- Subject** Sort ▾
 Atmospheric Chemistry (3)
- Measurement** Sort ▾
 Sulfur Dioxide (3)
- Source** Sort ▾
 Aura OMI (3)
- Processing Level** Sort ▾
 2 (2)
 3 (1)
- Project** Sort ▾
 ATDD (1)
 Aura (2)
- Temporal Resolution** Sort ▾
 98 minutes (1)
 98.8 minutes (1)
 1 day (1)
- Spatial Resolution** Sort ▾
 13 km x 24 km (2)
 0.25 ° x 0.25 ° (1)

Image	Dataset	Source	Temporal Resolution	Spatial Resolution	Process Level	Begin Date	End Date
 Hover	OMI/Aura Level 2 Sulphur Dioxide (SO2) Trace Gas Column Data 1-Orbit subset Swath along CloudSat track 1-Orbit Swath 13x24 km (OMSO2_CPR.003) - Atmospheric Chemistry Get Data	Aura OMI	98.8 minutes	13 km x 24 km	2	2006-06-01	2018-01-17
 Hover	OMI/Aura Sulphur Dioxide (SO2) Total Column 1-orbit L2 Swath 13x24 km V003 (OMSO2.003) - Atmospheric Chemistry Subset / Get Data	Aura OMI	98 minutes	13 km x 24 km	2	2004-10-01	2018-01-17
 Hover	OMI/Aura Sulfur Dioxide (SO2) Total Column L3 1 day Best Pixel in 0.25 degree x 0.25 degree V3 (OMSO2e.003) - Atmospheric Chemistry Subset / Get Data	Aura OMI	1 day	0.25 ° x 0.25 °	3	2004-10-01	2018-01-17



Step 5: Choose Data Access (we will use Earthdata)

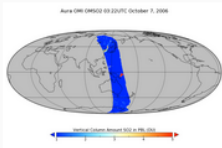
GES DISC Data Collections OMSO2

Atmospheric Composition, Water & Energy Cycles and Climate Variability

Feedback Help Hi, Melanie

Go to Search Results

OMSO2: OMI/Aura Sulphur Dioxide (SO2) Total Column 1-orbit L2 Swath 13x24 km V003



The Aura Ozone Monitoring Instrument (OMI) Sulphur Dioxide Product 'OMSO2' Version 3 is now available to the public from the NASA Goddard Earth Sciences Data and Information Services Center (GES DISC). The OMSO2 product contains three values of SO2 Vertical column corresponding to three a-priori vertical profiles used in the retrieval algorithm. It also contains quality flags, geolocation and other ancillary information. The lead scientist for the OMSO2 product is Nickolay Kroktov. The shortname for this Level-2 OMI total column SO2 product is OMSO2.

The OMSO2 files are stored in the version 5 EOS Hierarchical Data Format (HDF-EOS5). Each file contains data from the day lit portion of an orbit (~53 minutes). There are approximately 14 orbits per day. The maximum file size for the OMSO2 data product is approximately 21 MB.

Data Access

- Online Archive
- EARTHDATA Search**
- Simple Subset Wizard
- OPENDAP DATA

Product Summary Data Citation Documentation

Shortname: OMSO2
Longname: OMI/Aura Sulphur Dioxide (SO2) Total Column 1-orbit L2 Swath 13x24 km V003
DOI: 10.5067/Aura/OMI/DATA2022
Version: 003
Format: HDF5
Spatial Coverage: -180.0,-90.0,180.0,90.0
Temporal Coverage: 2004-10-01 to present
File Size: 26 MB per file
Data Resolution
Spatial: 13 km x 24 km
Vertical: 80 km
Temporal: 98 minutes



Step 6: Select Product

The screenshot shows the NASA Earthdata Search interface. At the top, the search bar contains 'OMSO2_003'. Below the search bar, a map of the world is displayed, with a white cursor pointing to the North Atlantic Ocean. To the left of the map, a sidebar lists various search filters: Features (Map Imagery, Near Real Time, Subsetting Services), Keywords, Platforms, Instruments, Organizations, Projects, and Processing levels. Below the map, a search results section is visible, showing '2 Matching Collections'. The first result is highlighted with a red box and is titled 'OMI/Aura Sulphur Dioxide (SO2) Total Column 1-orbit L2 Swath 13x24 km V003 (OMSO2) at GES DISC'. This result includes a thumbnail image of a satellite swath, a description of the data, and a 'MAP IMAGERY' tag. The second result is titled 'OMI/Aura Sulphur Dioxide (SO2) Total Column 1-orbit L2 Swath 13x24 km V003 NRT' and includes a 'No image available' placeholder and an 'NRT' tag. The interface also features a 'Show Tour' button, an 'Earthdata Login' button, and a 'Report a metadata problem' link.



Step 7: Select Time

To choose time, click on + or - to change the time resolution (e.g. Click - to change to year, and + to change to day)

Back to Collections

OMI/Aura Sulphur Dioxide (SO₂) Total Column 1-orbit L2 Swath 13x24 km V003 (OMSO2) at GES DISC

Showing 20 of 67736 matching granules Sort by: Start Date, Newest first Granule Search: Search Single or Multiple Granule IDs... Search Time: 0.4s Report a metadata problem

Granule ID	START	END
OMI-Aura_L2-OMSO2_2018m0118t0800-o71867_v003-2018m0118t142500.he5	2018-01-18 08:00:41	2018-01-18 09:39:35
OMI-Aura_L2-OMSO2_2018m0118t0621-o71866_v003-2018m0118t141452.he5	2018-01-18 06:21:48	2018-01-18 08:00:41
OMI-Aura_L2-OMSO2_2018m0118t0442-o71865_v003-2018m0118t123448.he5	2018-01-18 04:42:55	2018-01-18 06:21:48
OMI-Aura_L2-OMSO2_2018m0118t0304-o71864_v003-2018m0118t092759.he5	2018-01-18 03:04:01	2018-01-18 04:42:55
OMI-Aura_L2-OMSO2_2018m0118t0125-o71863_v003-2018m0118t073427.he5	2018-01-18 01:25:08	2018-01-18 03:04:01
OMI-Aura_L2-OMSO2_2018m0117t2346-o71862_v003-2018m0118t055001.he5	2018-01-17 23:46:15	2018-01-18 01:25:08
OMI-Aura_L2-OMSO2_2018m0117t2207-o71861_v003-2018m0118t041541.he5		
OMI-Aura_L2-OMSO2_2018m0117t2028-o71860_v003-2018m0118t041510.he5		
OMI-Aura_L2-OMSO2_2018m0117t1849-o71859_v003-2018m0118t021312.he5		
OMI-Aura_L2-OMSO2_2018m0117t1710-o71858_v003-2018m0117t231809.he5		
OMI-Aura_L2-OMSO2_2018m0117t1531-o71857_v003-2018m0117t211323.he5		
OMI-Aura_L2-OMSO2_2018m0117t1352-o71856_v003-2018m0117t200605.he5		

MONTH: + -

Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan 2018



Step 8: Select Swath

Clicking on a swath will show you its location on the map

Find a DAAC

OMSO2_003

Earthdata Login

2000 km
1000 mi

Back to Collections

OMI/Aura Sulphur Dioxide (SO₂) Total Column 1-orbit L2 Swath 13x24 km V003 (OMSO2) at GES DISC

Showing 15 of 15 matching granules for the selected day. (Show All) Sort by: Start Date, Newest first Granule Search: Search Single or Multiple Granule IDs... Search Time: 0.2s Report a metadata problem

Granule ID	START	END
OMI-Aura_L2-OMSO2_2016m1024t1228-o65302_v003-2016m1024t222720.he5	2016-10-24 12:28:14	2016-10-24 14:07:06
OMI-Aura_L2-OMSO2_2016m1024t1049-o65301_v003-2016m1024t224733.he5	2016-10-24 10:49:21	2016-10-24 12:28:14
OMI-Aura_L2-OMSO2_2016m1024t0910-o65300_v003-2016m1024t174753.he5	2016-10-24 09:10:29	2016-10-24 10:49:21
OMI-Aura_L2-OMSO2_2016m1024t0731-o65299_v003-2016m1024t163627.he5	2016-10-24 07:31:36	2016-10-24 09:10:29
OMI-Aura_L2-OMSO2_2016m1024t0552-o65298_v003-2016m1024t163822.he5	2016-10-24 05:52:43	2016-10-24 07:31:36
OMI-Aura_L2-OMSO2_2016m1024t0413-o65297_v003-2016m1024t114026.he5	2016-10-24 04:13:51	2016-10-24 05:52:43

DAY

OMI/Aura Sulphur Dioxide (SO₂) Total Column 1-orbit L2 Swath 13x24 km V003 (OMSO2) at GES DISC

01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Oct 2016



Step 9: Download a Single Granule by Clicking the Gear Icon

The screenshot shows the Earthdata search interface. At the top, there's a search bar with 'OMSO2_003' and a 'Find a DAAC' dropdown. Below the search bar is a map of the world with green lines indicating the data swath. A tooltip shows two time points: '2016-10-24 09:10:29' and '2016-10-24 10:49:21'. Below the map, there's a 'Download Data' button. The main content area shows a table of 15 granules for the selected day. The table has columns for granule ID, start time, and end time. The third granule is highlighted in blue, and its gear icon is circled in red with a mouse cursor pointing to it. Below the table is a timeline for the day of October 2016, with a green bar indicating the data swath.

OMSI/Aura Sulphur Dioxide (SO₂) Total Column 1-orbit L2 Swath 13x24 km V003 (OMSO2) at GES DISC

Showing 15 of 15 matching granules for the selected day. (Show All) Sort by: Start Date, Newest first Granule Search: Search Single or Multiple Granule IDs... Search Time: 0.2s Report a metadata problem

Granule ID	START	END
OMI-Aura_L2-OMSO2_2016m1024t1228-o65302_v003-2016m1024t222720.he5	2016-10-24 12:28:14	2016-10-24 14:07:06
OMI-Aura_L2-OMSO2_2016m1024t1049-o65301_v003-2016m1024t224733.he5	2016-10-24 10:49:21	2016-10-24 12:28:14
OMI-Aura_L2-OMSO2_2016m1024t0910-o65300_v003-2016m1024t174753.he5	2016-10-24 09:10:29	2016-10-24 10:49:21
OMI-Aura_L2-OMSO2_2016m1024t0731-o65299_v003-2016m1024t163627.he5	2016-10-24 07:31:36	2016-10-24 09:10:29
OMI-Aura_L2-OMSO2_2016m1024t0552-o65298_v003-2016m1024t163822.he5	2016-10-24 05:52:43	2016-10-24 07:31:36
OMI-Aura_L2-OMSO2_2016m1024t0413-o65297_v003-2016m1024t114026.he5	2016-10-24 04:13:51	2016-10-24 05:52:43



Step 10: Choose “Direct Download” and Click “Submit”

Data Access
Review and select service options for your data prior to download

1 OMI/Aura Sulphur Dioxide (SO₂) Total Column 1-orbit L2 Swath 13x24 km V003 (OMSO₂) at GES DISC

Review & Select Service Options

Review

1 Granule
26.2 Megabytes

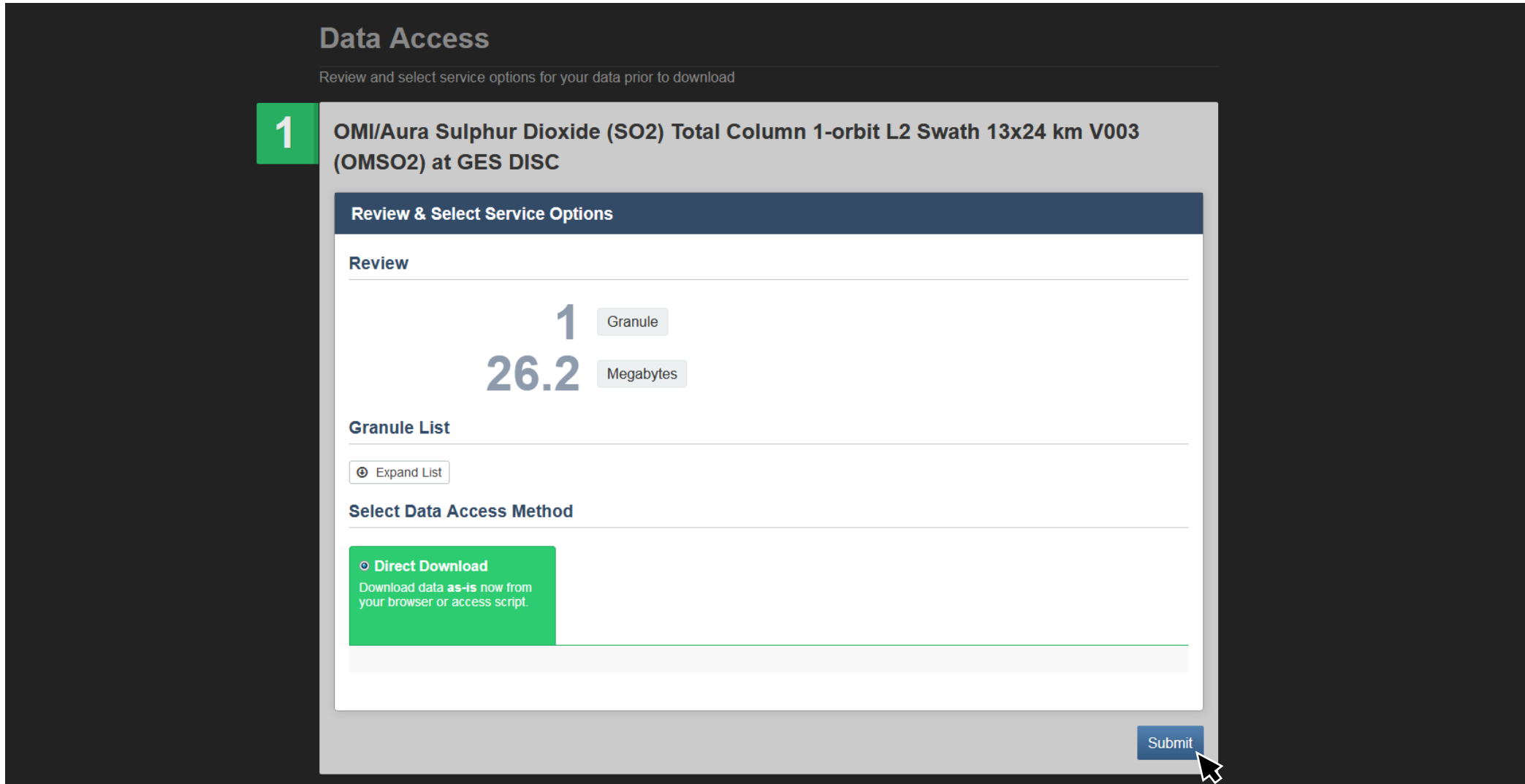
Granule List

Expand List

Select Data Access Method

Direct Download
Download data as-is now from your browser or access script.

Submit



Step 11: Click “View Download Links” to Download

The following collections are available for immediate download

Click the "View Download Links" button to view a page containing links to your data. You may bookmark this page for later access. A browser download manager plugin such as Firefox's [DownThemAll!](#) can assist you in managing a large number of download links.

- **OMI/Aura Sulphur Dioxide (SO₂) Total Column 1-orbit L2 Swath 13x24 km V003 (OMSO2) at GES DISC**

[View Download Links](#) [Download Data Links File](#) [Download Access Script](#)

Additional Resources and Documentation

- **OMI/Aura Sulphur Dioxide (SO₂) Total Column 1-orbit L2 Swath 13x24 km V003 (OMSO2) at GES DISC**

https://aura.gesdisc.eosdis.nasa.gov/opendap/Aura_OMI_Level2/OMSO2_003/contents.html
<https://disc.sci.gsfc.nasa.gov/SSW/#keywords=OMSO2>
<https://aura.gsfc.nasa.gov/>
http://projects.knmi.nl/omi/research/news/newsWrap.php?language=only_enhttps://www.knmi.nl/omitimeFrame=latesthttps://www.knmi.nl/omichoise=page
<https://so2.gsfc.nasa.gov/>

Next Steps

- [Back to Earthdata Search Results](#)
- [Start a New Earthdata Search Session](#)
- [View Your Download Status & History](#)

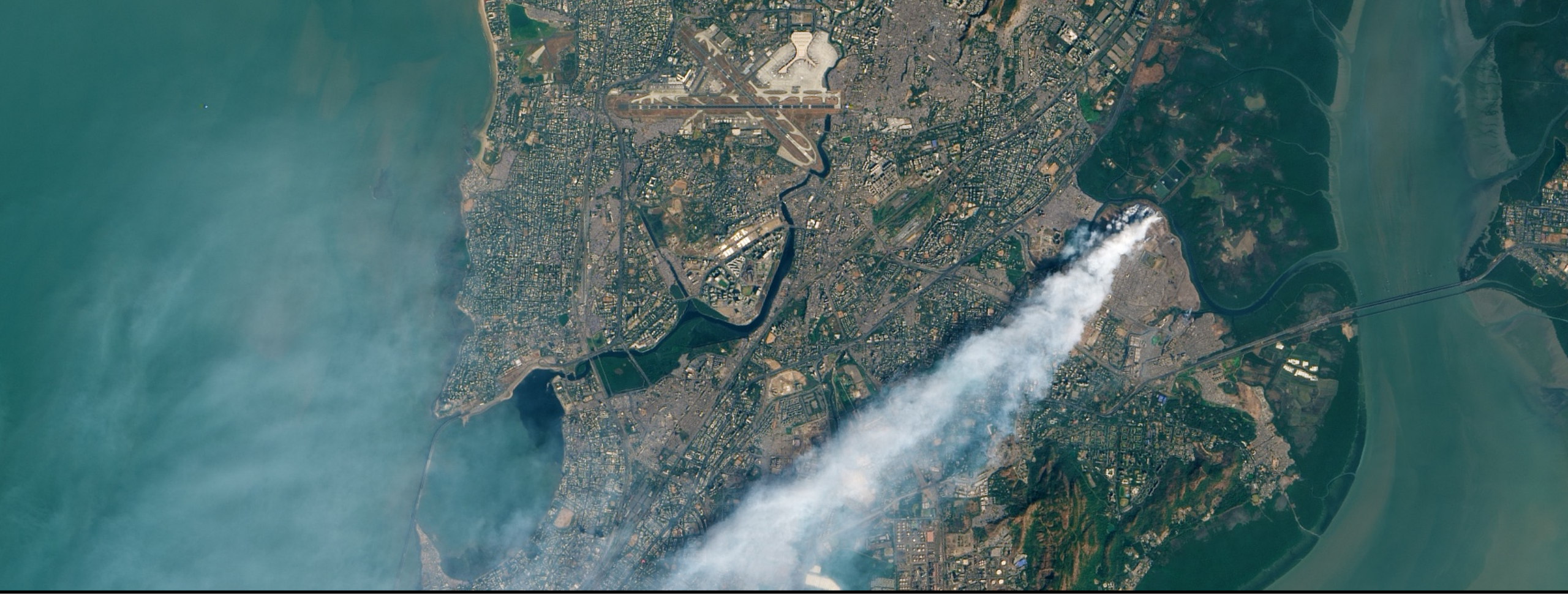


Step 12: Download the Data

- http://aura.gesdisc.eosdis.nasa.gov/data/Aura_OMI_Level2/OMS02.003/2016/298/OMI-Aura_L2-OMS02_2016m1024t0910-o65300_v003-2016m1024t174753.he5

Click on the provided link and save the data in your directory where you will run your python scripts





Questions