

National Aeronautics and  
Space Administration



# EXPLORE EARTH

**Science Directorate**

**Atmospheric Science Data Center (ASDC)**

**Hazem Mahmoud, Ph.D.**

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ASDC Science Lead

4/24/2024

A vibrant space-themed background featuring a large blue circle on the right side. Inside the circle, the text 'EXPLORE EARTH' is written in a light blue, sans-serif font. The background shows a bright sun in the lower left, a large blue planet (Earth) at the bottom, and several other planets (Mars, Saturn, and the Moon) in the upper left. The sky is filled with stars and a blue nebula.

# EXPLORE EARTH

## Agenda

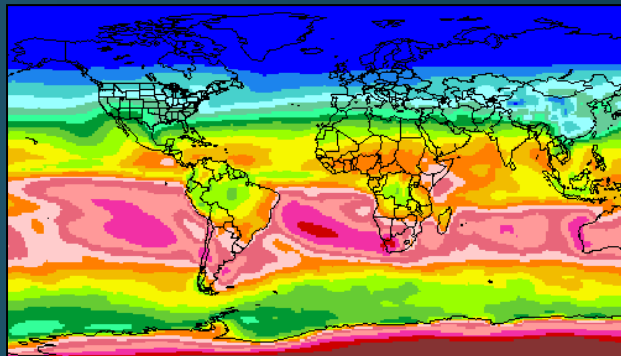
**ASDC Overview**

**Health and Air Quality Tools and Services**

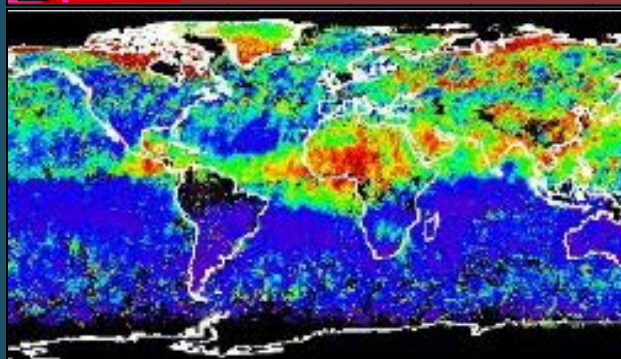
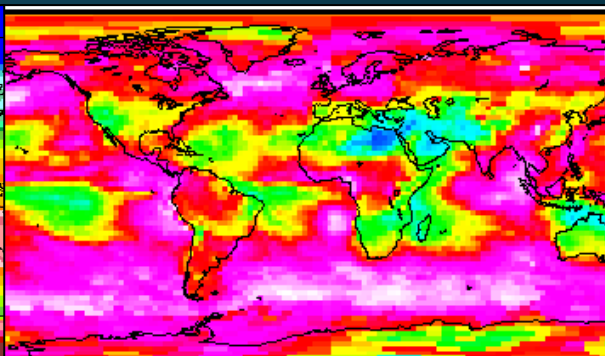
**User Support and Outreach**

# ASDC at a Glance

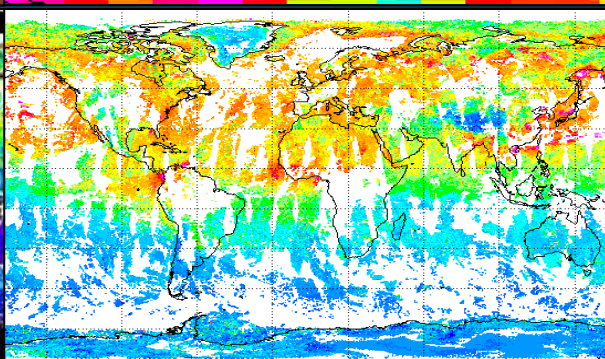
RADIATION BUDGET



CLOUDS



AEROSOLS



TROPOSPHERIC COMPOSITION

- ✓ 44+ Science projects
  - MISR ◦ MOPITT ◦ MAIA ◦ TEMPO ◦ CERES
  - TEMPO & CALIPSO → RSIG (EPA)
  - Airborne field campaigns (KORUS AQ, DISCOVER AQ, FIREX AQ)
- ✓ 1100+ unique science products
- ✓ Data usage (2022)
  - 3.5 Petabytes ◦ 160,000 users
  - 158 countries
- ✓ Data archive (2022)
  - 6.5 Petabytes ◦ 168 million files (5,500 TB) on high-speed disks
- ✓ Data in cloud (ongoing)
  - Data and services in the cloud
  - Scalable infrastructure

## Primary Functions of ASDC

**Ingest** receive data from data provider

**Archive** preservation & provenance

**Distribute** tools and services

**Process** create higher level products

**Outreach & Support** research community

A vibrant space-themed background featuring a large blue and green nebula, a bright yellow sun, and several celestial bodies including Saturn, Mars, and the Moon. The scene is framed by curved blue and yellow lines.

# ASDC Suborbital Updates

STAQS (TEMPO validation)

SCOAPE-II (second deployment to SCOAPE)

PACE-PAX (PACE validation)

ASIA-AQ

AERONET

Pandora

The background of the slide is a cosmic scene featuring a blue nebula in the upper right and an orange nebula in the lower left, with numerous stars scattered throughout. A dark blue horizontal band is positioned across the middle of the image, containing the title text.

# Health and Air Quality Tools and Services

# Earthdata Search

- Search and Order
  - On Premise
  - Amazon Web Services
- Subsetting & Aggregation
- Browse Imagery
- File Conversions
- Application Programming Interface (API) Access

**Historical Urban Population: 3700 BC - AD 2000**

1 Granule 1700-01-01 to 2000-12-31

The Historical Urban Population, 3700 BC - AD 2000, originally developed by the Yale School of Forestry & Environmental Studies, is the first spatially explicit...

GEOSSE • CIESIN\_SEDAC\_USPAT\_HUP v1.00 - SEDAC

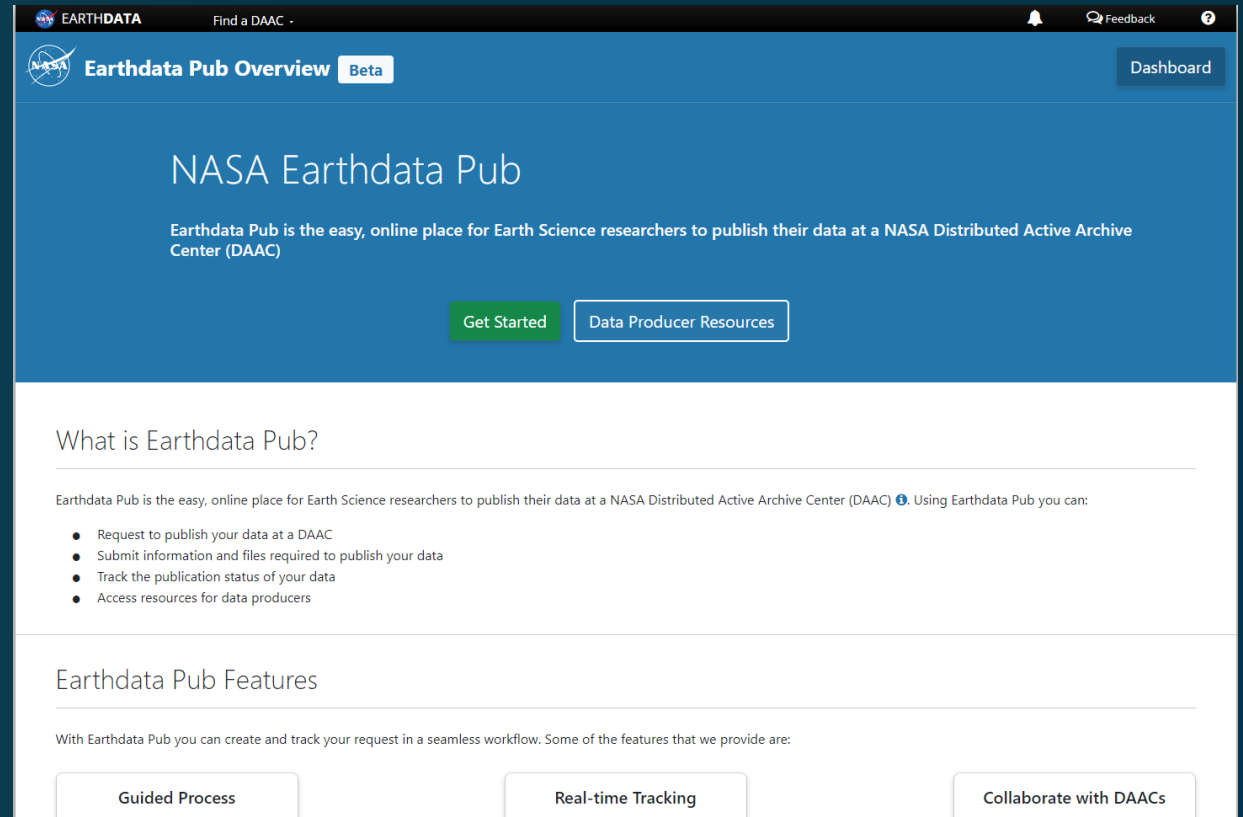


The screenshot displays the Earthdata Search interface. On the left, there is a sidebar with filters for Temporal, Day/Night, and Data Access. The main content area shows search results for 'TEMPO NO2 tropospheric column PROXY', listing granules with their IDs, start/end dates, and download links. On the right, a world map is shown with a blue circle highlighting a location in the North Atlantic Ocean, with coordinates 2014-04-30 22:12:00 and 2014-04-30 22:17:56.

<https://search.earthdata.nasa.gov>

# Earthdata Pub

- Request to publish your data at a DAAC
- Submit information and files required to publish your data
- Track the publication status of your data
- Access resources for data producers



EARTHDATA Find a DAAC - Feedback

NASA Earthdata Pub Overview Beta Dashboard

## NASA Earthdata Pub

Earthdata Pub is the easy, online place for Earth Science researchers to publish their data at a NASA Distributed Active Archive Center (DAAC)

[Get Started](#) [Data Producer Resources](#)

### What is Earthdata Pub?

Earthdata Pub is the easy, online place for Earth Science researchers to publish their data at a NASA Distributed Active Archive Center (DAAC). Using Earthdata Pub you can:

- Request to publish your data at a DAAC
- Submit information and files required to publish your data
- Track the publication status of your data
- Access resources for data producers

### Earthdata Pub Features

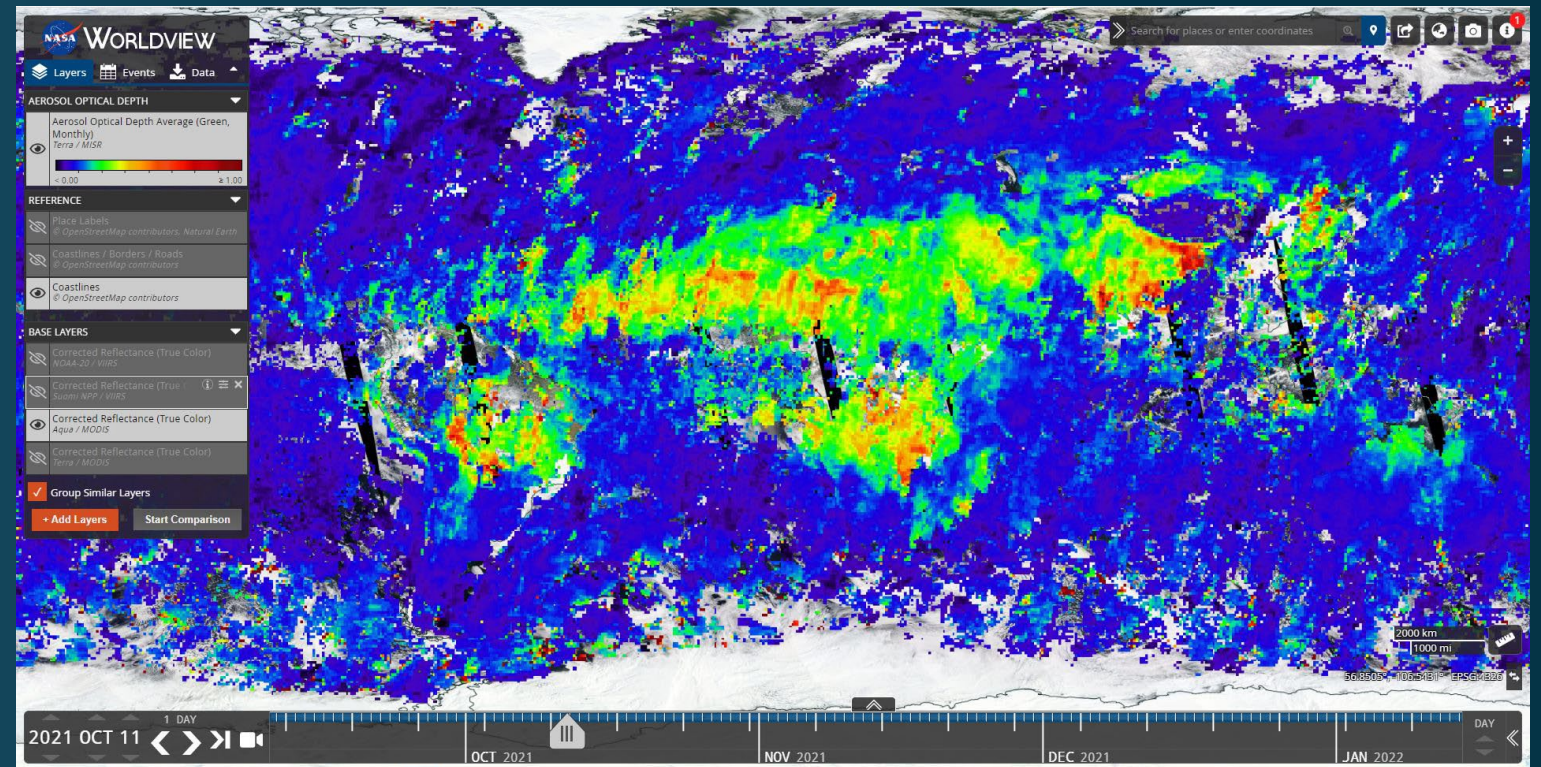
With Earthdata Pub you can create and track your request in a seamless workflow. Some of the features that we provide are:

[Guided Process](#) [Real-time Tracking](#) [Collaborate with DAACs](#)

<https://pub.earthdata.nasa.gov/>

# Worldview / Global Imagery Browse Service (GIBS)

- Browse Imagery
- Animations
- Event Information
- GIBS API



<https://worldview.nasa.gov>



# OPeNDAP

- API Access
- Subsetting & Aggregation
- File Conversions

Welcome to the new  
OPeNDAP Data Access Form  
[The old form can be found here.](#)

dataset: CERES\_EBAF\_Edition4.1\_200003-202111.nc

Actions: [Get as ASCII](#) [Get as Coverage/JSON](#) [Get as NetCDF 3](#) [Get as NetCDF 4](#) [Binary \(DAP\) Object](#) [Show Help](#)

Data URL:

Global Attributes:  NC\_GLOBAL

Variables:

- lon[ lon= 0 ..359] (Grid of Float32 values)  
 attributes
- lat[ lat= 0 ..179] (Grid of Float32 values)  
 attributes
- ctime[ ctime= 0 ..11] (Grid of Float32 values)  
 attributes
- climatology\_bounds[ ctime= 0 ..11] [ sec= 0 ..1] (Grid of Float32 values)  
 attributes
- time[ time= 0 ..260] (Grid of Float32 values)  
 attributes
- toa\_sw\_all\_mon[ time= 0 ..260] [ lat= 0 ..179] [ lon= 0 ..359] (Grid of Float32 values)  
 attributes
- toa\_lw\_all\_mon[ time= 0 ..260] [ lat= 0 ..179] [ lon= 0 ..359] (Grid of Float32 values)  
 attributes
- toa\_net\_all\_mon[ time= 0 ..260] [ lat= 0 ..179] [ lon= 0 ..359] (Grid of Float32 values)  
 attributes
- toa\_sw\_clr\_c\_mon[ time= 0 ..260] [ lat= 0 ..179] [ lon= 0 ..359] (Grid of Float32 values)  
 attributes
- toa\_lw\_clr\_c\_mon[ time= 0 ..260] [ lat= 0 ..179] [ lon= 0 ..359] (Grid of Float32 values)  
 attributes
- toa\_net\_clr\_c\_mon[ time= 0 ..260] [ lat= 0 ..179] [ lon= 0 ..359] (Grid of Float32 values)  
 attributes

<https://opendap.earthdata.nasa.gov>

# ArcGIS Enterprise in the Earthdata Cloud

- Geospatial Services
- Maps
- StoryMaps
- Applications

Studying the 2019-2020 Australian Bushfires Using NASA Data

Introduction 1) Conditions for Fire Activit... 2) An Unprecedented Fire Seaso... 3) Atmospheric Composition 4) Particulate Matter & Pu... Exploring NASA's Data

### MISR Plume Height

The geographic region where the plume height data is aggregated.

We can tell the height of a cloud or smoke plume above Earth's surface by viewing it from space at different angles. A plume located high above the surface will appear to move considerably relative to the underlying surface when viewed at different angles, whereas a plume closer to the surface will appear to shift less.

The Multi-angle Imaging SpectroRadiometer (MISR) instrument aboard the NASA Terra satellite

Exaggerated (20x) Plume Height on 12/16/19 Active Aerosol Plume (AAP) project, V. Flower, R. Kahn, K. Junghenn-Noyes

Waiting for services7.arcgis.com... Jarmin, FAO, NOAA, USGS | Source: USGS, NGA, NASA, OGIAR, GEBCO, N. Robinson, NCEAS, NLS, OS, NMA, Geodatasy/reisen and the GIS User Community | Active Aerosol Plume (AAP) Project, V. Flower, R. Kahn, ... Powered by Esri

<https://gis.earthdata.nasa.gov>

# Giovanni

- Time Series
- Time Averaged Maps
- Comparisons
- Vertical Cross Sections

The screenshot shows the Giovanni Data Selection interface. The top navigation bar includes the GIOVANNI logo, the tagline "The Bridge Between Data and Science v 4.38", and links for Feedback, Help, and Log out (mstisdal). The main interface is divided into several sections:

- Select Plot:** A dropdown menu set to "Time Averaged Map".
- Select Date Range (UTC):** Input fields for start and end dates and times, currently showing "00 : 00" to "23 : 59". A "Valid Range: 2000-04-01 to 2022-05-01" is displayed below, along with a note "Please specify a start date."
- Select Region (Bounding Box or Shape):** Input fields for latitude and longitude, currently showing "-180, -90, 180, 90".
- Select Variables:** A sidebar menu with categories: Observations (9), Disciplines (Atmospheric Chemistry (9)), Measurements, and Platform / Instrument (AIRS (68), GEOS-CHEM (2), MERRA-2 Model (138), MODIS-Aqua (3), MODIS-Terra (2), MOPITT (9), OMI (7), TOMS EP (1), TOMS Meteor-3 (1), TOMS Nimbus-7 (1)).
- Search Results:** A table listing variables with columns for Variable, Units, Source, Temp. Res., Spat. Res., Begin Date, End Date, and Vert. Slice. The table shows 9 matching variables, with "Multispectral CO Mixing Ratio Profile (Daytime/Descending) (MOP03JM v008)" selected.

Variable	Units	Source	Temp. Res.	Spat. Res.	Begin Date	End Date	Vert. Slice
<input type="checkbox"/> Thermal-Only CO Mixing Ratio Profile (Daytime/Descending) (MOP03TM v008)	ppbv	MOPITT	Monthly	1.0 °	2000-04-01	2022-05-01	500 hPa
<input type="checkbox"/> Thermal-Only CO Mixing Ratio Profile (Nighttime/Ascending) (MOP03TM v008)	ppbv	MOPITT	Monthly	1.0 °	2000-04-01	2022-05-01	500 hPa
<input type="checkbox"/> Thermal-Only CO Surface Mixing Ratio (Daytime/Descending) (MOP03TM v008)	ppbv	MOPITT	Monthly	1.0 °	2000-04-01	2022-05-01	-
<input type="checkbox"/> Thermal-Only CO Surface Mixing Ratio (Nighttime/Ascending) (MOP03TM v008)	ppbv	MOPITT	Monthly	1.0 °	2000-04-01	2022-05-01	-
<input type="checkbox"/> Thermal-Only CO Total Column (Daytime/Descending) (MOP03TM v008)	mol/cm <sup>2</sup>	MOPITT	Monthly	1.0 °	2000-04-01	2022-05-01	-
<input type="checkbox"/> Thermal-Only CO Total Column (Nighttime/Ascending) (MOP03TM v008)	mol/cm <sup>2</sup>	MOPITT	Monthly	1.0 °	2000-04-01	2022-05-01	-
<input checked="" type="checkbox"/> Multispectral CO Mixing Ratio Profile (Daytime/Descending) (MOP03JM v008)	ppbv	MOPITT	Monthly	1.0 °	2000-04-01	2022-05-01	500 hPa
<input type="checkbox"/> Multispectral CO Surface Mixing Ratio (Daytime/Descending) (MOP03JM v008)	ppbv	MOPITT	Monthly	1.0 °	2000-04-01	2022-05-01	-
<input type="checkbox"/> Multispectral CO Total Column (Daytime/Descending) (MOP03JM v008)	mol/cm <sup>2</sup>	MOPITT	Monthly	1.0 °	2000-04-01	2022-05-01	-

At the bottom of the interface, there is a footer with NASA logo, "Responsible NASA Official: Angela Li", "Web Curator: M. Heslop", "Privacy", "Powered By", and "Contact Us" links. On the right side of the footer, there are "Reset" and "Plot Data" buttons.

<https://giovanni.earthdata.nasa.gov>

# Sub-Orbital Order Tool (SOOT)

- Search and Access Sub-Orbital Data
- Merge to Common Time Scale

## Sub-Orbital Order Tool (SOOT) Power User Interface

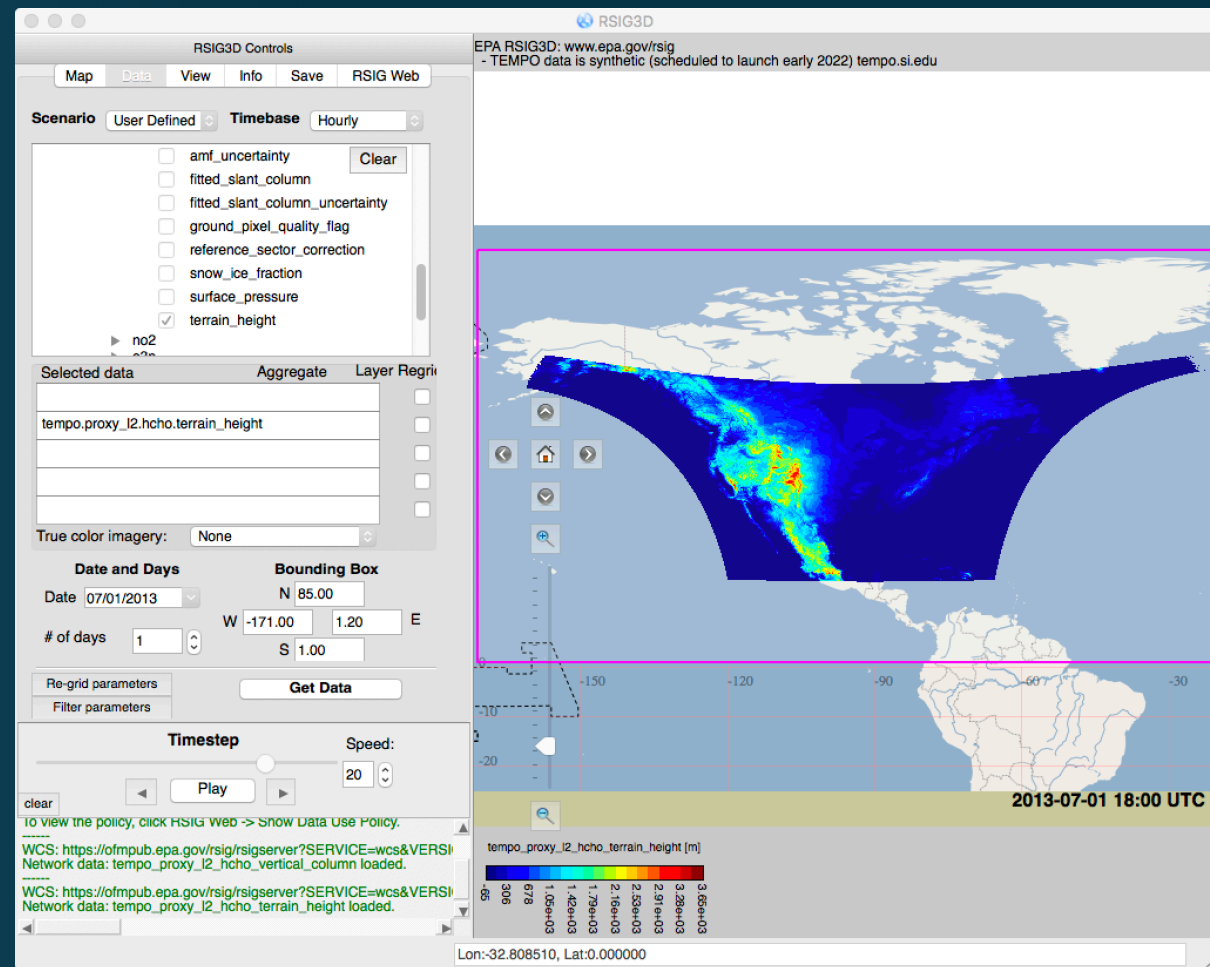
Welcome to the [Sub-Orbital Order Tool \(SOOT\)](#) which is designed to promote suborbital research and analysis. Here you can discover and access the airborne and field campaign data archived at the Atmospheric Science Data Center (ASDC). The SOOT Power User Interface is intended for experienced airborne data users and airborne science teams.

Select a campaign and deployment: 

 <b>ACEPOL</b> Support Documentation 2017	 <b>ACTIVATE</b> Support Documentation 2020 2021 2022	 <b>Aeolus Cal/Val</b> Support Documentation 2019
 <b>AJAX</b> Support Documentation 2011 2012 2013 2014 2015 2016 2017 2018	 <b>ARISE</b> Support Documentation 2014	 <b>CAMP2EX</b> 2018 2019
 <b>DCOTSS</b> 2021	 <b>FIREX-AQ</b> 2019	 <b>LISTOS</b> Support Documentation 2017 2018 2019
 <b>LMOS 2017</b> Support Documentation 2017	 <b>NAAMES</b> Support Documentation 2015 2016 2017 2018	 <b>ORACLES</b> 2016 2017 2018

# EPA Remote Sensing Information Gateway (RSIG)

- Visualization (2D/3D) & Animations
- Subsetting to CMAQ Modeling Grids
- File Conversions
- API Access



# Earthdata Website

- Data Tools
- Data Recipes
- Data Pathfinders
- Webinars and Tutorials

**EARTHDATA**  
OPEN ACCESS FOR OPEN SCIENCE

Data Topics Learn Engage About

Your Gateway to NASA Earth Observation Data

The Earth Science Data Systems (ESDS) Program provides full and open access to NASA's collection of Earth science data for understanding and protecting our home planet. Begin your Earthdata exploration by clicking on any of the discipline icons above.

Get Started Find Data Use Data

**Data Pathfinders**

New to using NASA Earth science data? Our Data Pathfinders will help you chart a path through the process of selecting data products and learning how to use them. Click the arrows on either side of the box to find your topic-specific starting point.

View All >

**Agriculture & Water**

**Resource Spotlight**

Find data, articles, webinars and other resources on relevant topics in one place on these spotlight pages.

**Agriculture**  
NASA data provide vital

**Open Science**  
Open Science empowers an

**Environmental Justice**  
Combine Earth science with

<https://www.earthdata.nasa.gov/>

The background of the slide is a cosmic scene. The top half features a dark blue and black space filled with numerous small, bright stars and a prominent, glowing blue nebula on the right side. The bottom half transitions into a warm orange and yellow glow, also filled with stars and a faint, glowing greenish-yellow nebula. A dark blue horizontal band runs across the middle of the slide, containing the title text.

# User Support and Outreach

# Earthdata Forum

- View Existing Questions/Answers
- Ask New Questions to Subject Matter Experts
- Science and Technical Support

The screenshot displays the Earthdata Forum website. At the top, there is a navigation bar with the Earthdata logo and a search bar. Below the navigation bar, there is a header section with the text "Welcome to the Earthdata Forum! Here, the scientific user community and subject matter experts from NASA Distributed Active Archive Centers (DAACs), and other contributors, discuss research needs, data, and data applications." The main content area is divided into two columns. The left column contains a "FILTER RESULTS" section with various filter options such as "FILTER BY BEST ANSWER", "FILTER BY TEXT", "SELECTED TAG MATCH", "FILTER BY DISCIPLINE", "FILTER BY DAAC", "FILTER BY PROJECTS", "FILTER BY SERVICES/USAGE", "FILTER BY DATES", and "FILTER BY AUTHOR". The right column contains an "ANNOUNCEMENTS" section with several items, including "FLASHFlux Data", "UPDATE: Terra data and imagery outage starting October 10th 2022", "GCMD Keywords Version 14.5 Released", "Disaster Assessment Using Synthetic Aperture Radar: Open, Online NASA ARSET Training Invitation", and "Best Practices For Using Machine Learning Keywords in Collection and Service Records in the CMR". Below the announcements is a "QUESTIONS AND COMMENTS" section with a table of questions and answers.

	REPLIES	LAST POST
<b>Can I get weather details ?</b> ASDC Atmosphere	1	by ASDC - Ingridis a Tue Jul 26, 2022 9:41 am America/New_York
<b>SAGE III on ISS Version 5.21 Release</b> ASDC Announcements Atmosphere SAGE	0	by ASDC - David W. a Tue Jun 28, 2022 12:01 pm America/New_York
<b>Solar radiation</b> ASDC Atmosphere Data Access ORNL POWER - SSE	4	by ASDC - David W. a Tue May 10, 2022 1:36 pm America/New_York
<b>CALIPSO Data Download Doesn't work</b> ASDC Atmosphere CALIPSO Data Download	1	by ASDC - David W. a Mon Mar 28, 2022 3:01 pm America/New_York
<b>Climate scenarios 2.6, 4.5 and 8.5 downscaled data download</b> ASDC Atmosphere Data Access GES DISC GLDAS/NLDAS MERRA-2 POWER - SSE	3	by ASDC - David W. a Wed Mar 23, 2022 12:25 am America/New_York
<b>ACCESS TO DATA CONTENT</b> ASDC Atmosphere CALIPSO	1	by ASDC - cheyenne.e.land a Wed Mar 16, 2022 9:26 am America/New_York
<b>Release Announcement of New CALIPSO V2.00 Lidar Level 2 Polar Stratospheric Cloud Data Product</b> ASDC Announcements Atmosphere CALIPSO Data Access Data Download Data Search	0	by ASDC - Joseph.F.koch a Tue Mar 08, 2022 12:31 pm America/New_York
<b>Data discrepancy between CERES and ERA5</b> ASDC Atmosphere CERES	2	by ASDC - cheyenne.e.land a Thu Mar 03, 2022 9:04 am America/New_York

<https://forum.earthdata.nasa.gov>





# Example question

Hello – I'm a lung doctor and researcher. I was trying to find out if TEMPO collects particulate matter air pollution (PM2.5) data but couldn't find this on your website. Are you able to answer the question and point me to the right data source. I know the data are new and in beta testing. Many thanks!

Best

Laura

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Laura C. Myers, MD MPH CPPS

Research Scientist I, Division of Research, Kaiser Permanente Northern California

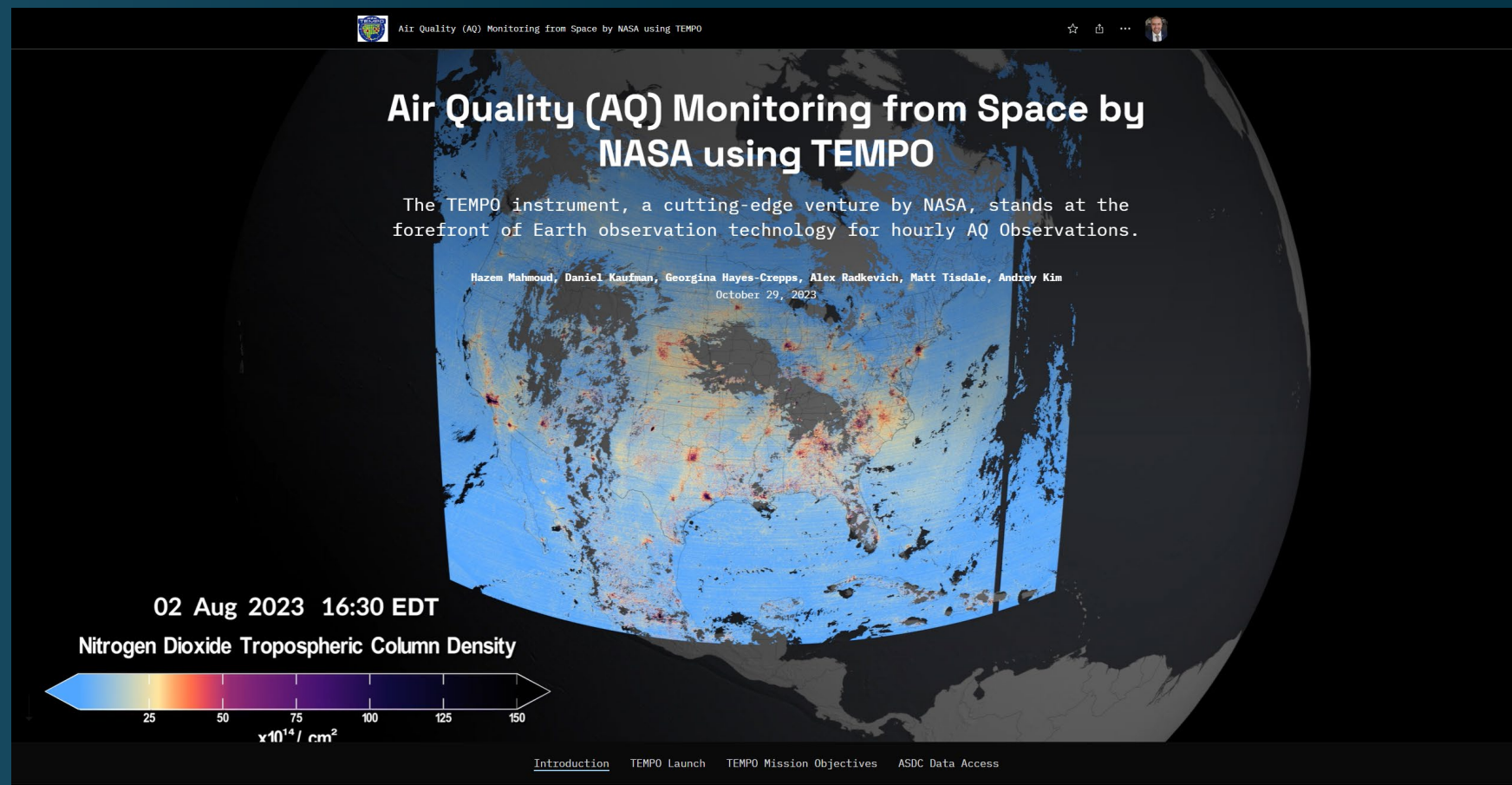
Pulmonary Intensivist, Diablo Service Area

A vibrant space-themed background featuring a large blue nebula, a bright yellow sun, and several celestial bodies including Saturn, Mars, and the Moon. The scene is set against a dark starry sky. A large, semi-transparent blue circle is overlaid on the right side of the image, containing the text.

# Outreach

- Local in-person Bootcamp with coordination with VA Space Grant.
- Participation and attendance at various science team meetings.
- Openscapes workshops, Tutorials and Cookbooks.
- Airborne and Field Data Workshop.
- HAQAST
- AGU
- EGU
- AMS
- ESIP

# TEMPO Storymap



# TEMPO Storymap metrics

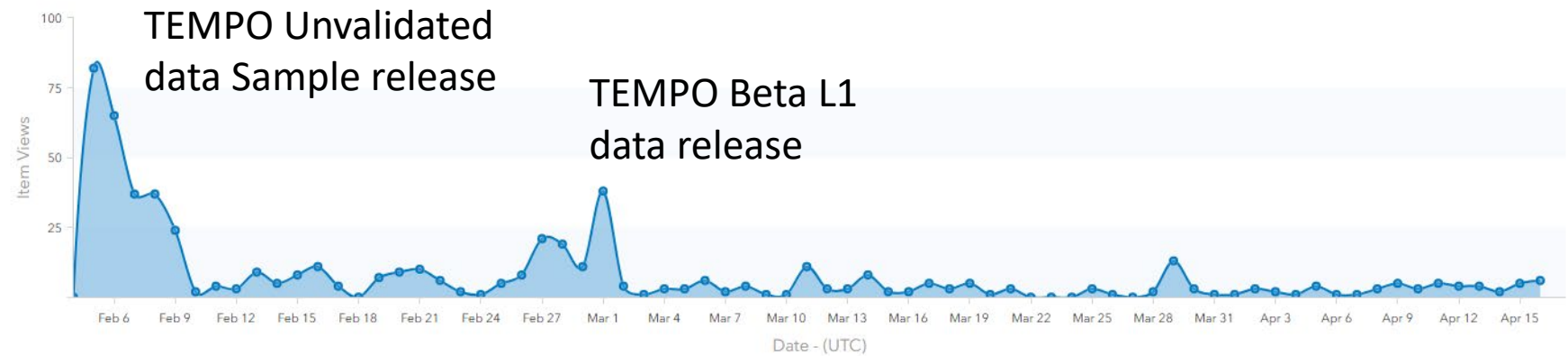
Item Views this Period

572

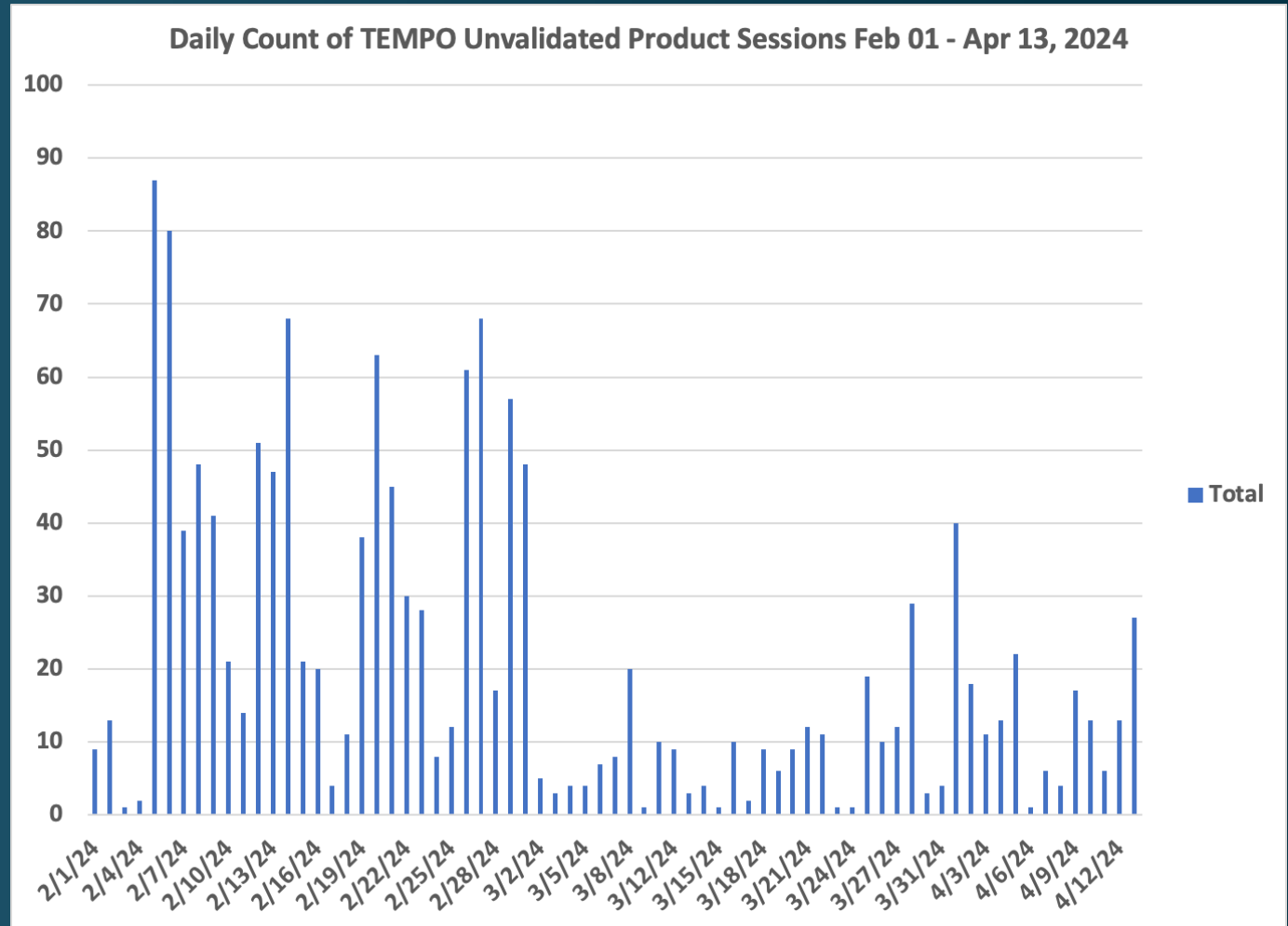
Avg Item Views Per Day

7.84

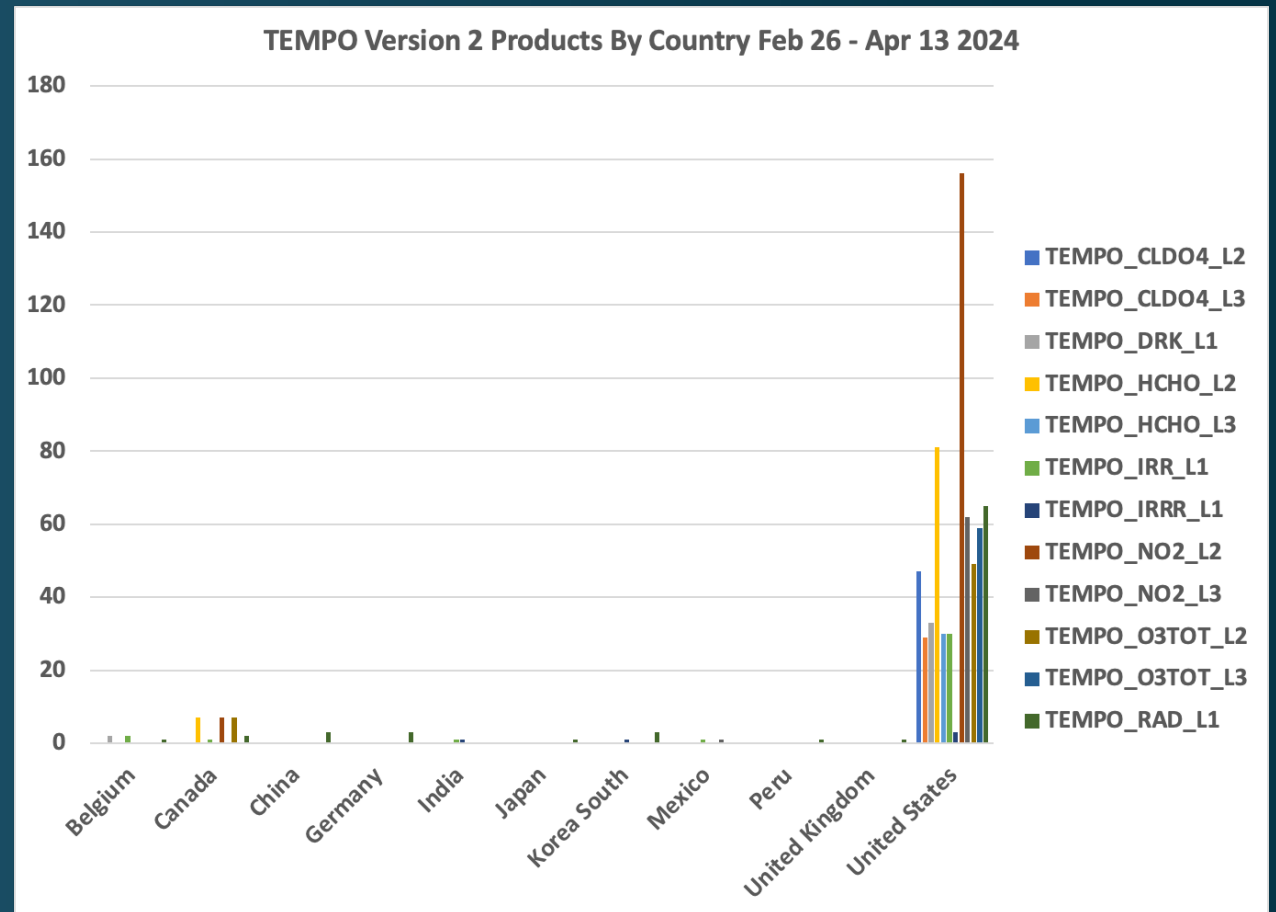
Usage Time Series



# Unvalidated TEMPO data



# TEMPO Products per Country





# EXPLORE EARTH

**Science Directorate**

**Atmospheric Science Data Center (ASDC)**

**Hazem Mahmoud, Ph.D.**

Hazem.Mahmoud@nasa.gov

ASDC Science Lead

4/24/2024

A vibrant space-themed background featuring a large Earth in the lower-left corner, a bright sun, and various celestial bodies including Saturn, Mars, and the Moon. The scene is set against a backdrop of colorful nebulae and stars.

# New Suborbital DAAC Assignments

STAQS (TEMPO validation)

SCOAPE-II (second deployment to SCOAPE)

PACE-PAX

ASIA-AQ

AERONET

Pandora



A vibrant space-themed background featuring a large blue and white Earth in the lower left, a bright yellow sun, and various celestial bodies including a ringed planet, a reddish planet, and a large blue planet. The background is filled with stars and nebulae in shades of blue and green.

# Recent Public Data Releases

SOLVE (legacy mission, 1999-2003)

SONEX (legacy mission, 1997)

POLARIS (legacy mission, 1997)

TOTE-VOTE (legacy mission, 1995-1996)

TRACE-A (part of GTE/TRACE, 1992) – released in the Earthdata Cloud

ACCLIP (2022)

More legacy missions are scheduled to be archived!

A vibrant space-themed background featuring a large blue planet in the foreground, a bright yellow sun, and various other celestial bodies like Saturn and Mars against a starry sky. The scene is framed by curved blue and yellow borders.

# Suborbital Preservation

Completed suborbital preservation activities for NAAMES

Contributed to discussions at ESDSWG suborbital preservation breakout sessions (will continue to participate in any ongoing conversations/work surrounding this topic)

A vibrant space-themed background featuring a large blue sphere (resembling the Moon) in the center, a bright yellow sun in the lower left, and various other celestial bodies like Saturn and Mars. The background is filled with stars and nebulae, all set against a dark blue gradient. A large, semi-transparent blue circle is overlaid on the right side of the image, containing the text.

# Worldview

ASDC Suborbital team has begun the process of adding suborbital datasets to Worldview (per feedback from our User Working Group)

Goal is to help promote suborbital data findability and accessibility

Currently undergoing testing for QA/QC

A vibrant space-themed background featuring a large blue planet in the foreground, a bright yellow sun, and various other celestial bodies like Saturn and Mars against a starry sky. The scene is framed by curved blue and yellow borders.

# Outreach Efforts

3 presentations at the AMS Annual Meeting

Assisted with planning the Second Airborne and Field Data Workshop

Published StoryMaps highlighting AJAX, TOLNet Stratospheric Intrusion Event, and a user guide for AJAX

Participation and attendance at various science team meetings

