National Aeronautics and Space Administration

ATMOSPHERIC SCIENCE DATA CENTER

1235 Preparing for TEMPO: A Review of Planned Metadata, Data Structure, and Distribution by NASA's Atmospheric Science Data Center

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Introduction

The Atmospheric Science Data Center (ASDC) is in the Science Directorate located at the NASA Langley Research Center (LaRC), in Hampton, Virginia. The ASDC is one of NASA's Distributed Active Archive Centers (DAAC) and supports over 60 projects and provides access to more than 1,000 archived collections. These datasets were created from satellite measurements, field experiments, and modeled data products. ASDC projects focus on the following Earth science disciplines: Radiation Budget, Clouds, Aerosols, and Tropospheric Composition.

The ASDC is the official Distributed Active Archive Center (DAAC) of record for the upcoming Tropospheric Emissions: Monitoring of Pollution (TEMPO) instrument.. The instrument will share a ride on a commercial satellite as a hosted payload and will be launched to an orbit about 22,000 miles above Earth's equator. The investigation will, for the first time, use a space-based instrument to make accurate observations of tropospheric pollution concentrations of ozone, nitrogen dioxide, formaldehyde, and aerosols with high resolution and frequency over the U.S, Canada, and Mexico.

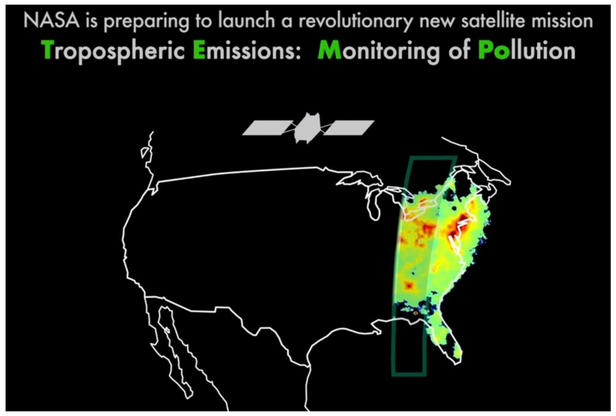
The ASDC

Ingest and archive entire missions' worth of data and derivative products
ASDC has two ingest and archive systems that push and pull data from respective science data providers.

Customization and delivery of data products
The DAAC provides users access to terabytes of orderable data for satellite missions and field campaigns alike. Select datasets can be subset temporally, spatially, and by parameter.

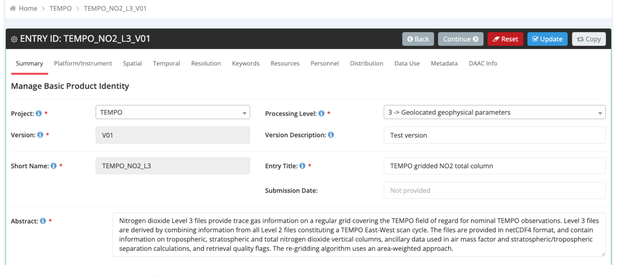
Easy access tools to discover new or pertinent datasets
The DAAC is part of the larger Earth Science Data and Information System (ESDIS) system that utilizes a central search-capable site that allows users of all skills and backgrounds to obtain data.

Imaging services to view specialized products and parameters
The ASDC provides Global Imagery Browse Services (GIBS) processing support used by the NASA Worldview and the Earthdata Search web applications.



Data & Metadata

DATA TYPE	COLLECTION DESCRIPTION
TEMPO_DRK_L1	Level 1 calibrated CCD dark current
TEMPO_IRR_L1	Level 1 calibrated irradiance
TEMPO_IRRR_L1	Level 1 CCD irradiance frames (reference)
TEMPO_RAD_L1	Level 1 calibrated geo-located radiance
TEMPO_CLDO4_L2	Level 2 derived geophysical product for cloud pressure and fraction
TEMPO_HCHO_L2	Level 2 derived geophysical product for formaldehyde
TEMPO_NO2_L2	Level 2 derived geophysical product for nitrogen dioxide
TEMPO_O3TOT_L2	Level 2 derived geophysical product for total ozone
TEMPO_O3PROF_L2	Level 2 derived geophysical product for ozone vertical profile
TEMPO_CLDO4_L3	Level 3 gridded derived geophysical product for cloud pressure and fraction
TEMPO_HCHO_L3	Level 3 gridded geophysical product for formaldehyde
TEMPO_NO2_L3	Level 3 gridded geophysical product for nitrogen dioxide
TEMPO_O3TOT_L3	Level 3 gridded geophysical product for total ozone
TEMPO_O3PROF_L3	Level 3 gridded geophysical product for ozone vertical profile



Sample L3 collection metadata

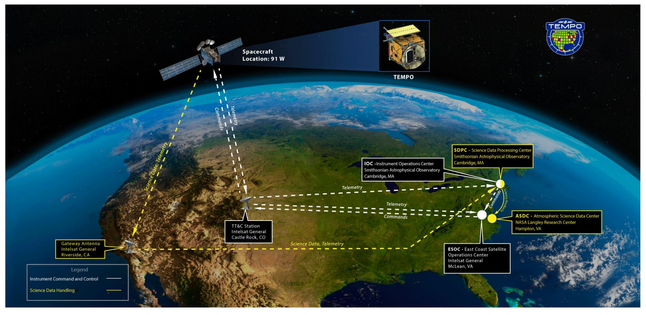
About TEMPO

Tropospheric Emissions: Monitoring of POllution (TEMPO) is a member of a global air quality constellation, along with the European Space Agency's Sentinel-4 & Asia's GEMS satellites. TEMPO will provide hourly measurements of air pollution over North America in geostationary orbit. This is a joint mission between NASA and the Smithsonian Astrophysical Observatory. The mission is designed to address several science questions, including:

- What are the temporal and spatial variations of emissions of gases and aerosols important for air quality and climate?
- How do physical, chemical, and dynamical processes determine tropospheric composition and air quality over scales ranging from urban to continental, diurnally to seasonally?
- How does air pollution drive climate forcing and how does climate change affect air quality on a continental scale?

TEMPO — Tropospheric Emissions: Monitoring of POllution

Smithsonian



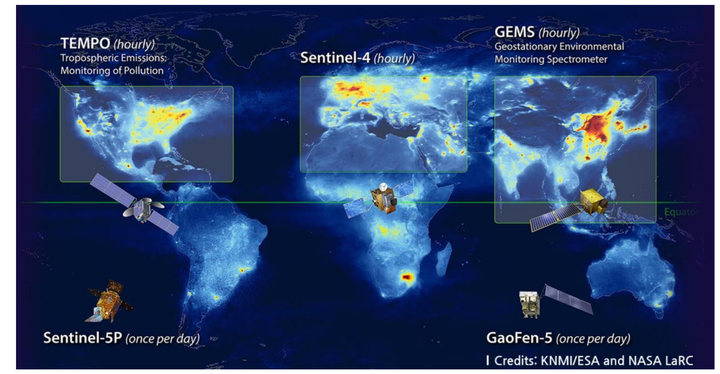
Planned Services

Proposed TEMPO data services include: data visualization, distribution, and subsetting, spatially, temporally, and by variable. Data visualization, distribution, analysis are likely to occur through NASA's Global Imagery Browse Services (GIBS), such as Worldview and Earthdata Search, and other tools.

Early Adopters Program

Are you interested in having your ideas surrounding the TEMPO mission heard? Join our Early Adopters Program! By joining, you'll gain access to proxy data to start understanding and demonstrating the capabilities and application benefits of TEMPO data.

Join our EA Program here:



	TEMPO	SENTINEL-4	GEMS
PRODUCTS	NO_2, O_3, HCHO, cloud products	NO_2, O_3, SO_2, HCHO, AOD, CHOCHO, BrO, cloud top height	O_3, NO_2, SO_2, HCHO, AOD, AI, AEH, CHOCHO, UVI
ORBIT	Geostationary	Geostationary	Geostationary
FIELD OF VIEW	18°N - 64°N, 15°W - 80°W / North America	30°N - 65°N, 30°W - 45°E / Europe-Atlantic	5°S - 45°N, 75°E - 145°E / Asia-Pacific
SPATIAL RESOLUTION	2.1km N/S x 4.5km E/W @ 36.5°N	8km N/S x 8km E/W @ 40°N	3.5km N/S x 8km E/W @ 38°N
SPECTRAL RESOLUTION	0.6 nm	0.5 nm UV-VIS / 0.12 nm NIR	0.6 nm
REVISIT TIME	1 hour	1 hour	1 hour
LAUNCH DATE	Projected March 2023	Projected March 2024	18 February 2020

Societal Impact

Air quality has a direct effect on our health and can cause diseases, based on the length and amount of exposure to potential pollutants. TEMPO will revolutionize air quality forecasts by collecting high-resolution measurements of pollutants. Its measurements address climate forcing by measuring pollution pathways, particularly the details of tropospheric ozone and aerosol production, transport, and relation to sources. This will allow scientists, forecasters, decision-makers, and the public to better monitor air quality in their area and recognize trends.

Learn more about TEMPO here: