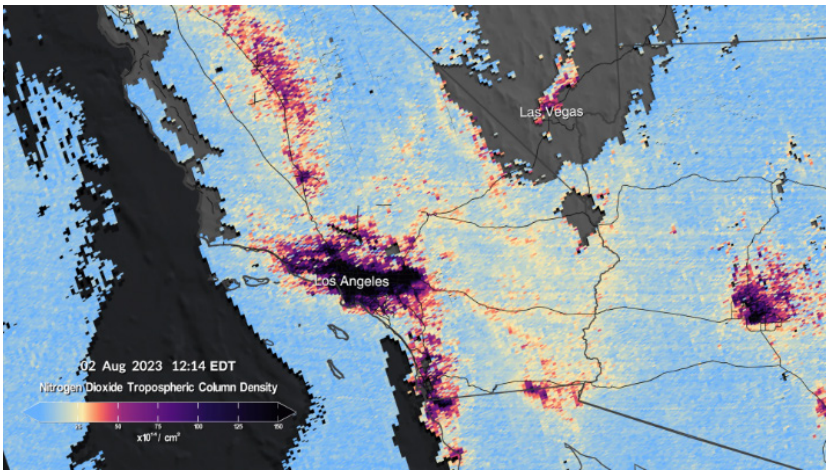
National Aeronautics and Space Administration

# TEMPO/GOES Near Real-Time Products

## Satellite Needs Working Group - Solution Fact Sheet

The Tropospheric Emissions: Monitoring of Pollution (TEMPO) mission is a collaborative effort between NASA and the Smithsonian Astrophysical Observatory (SAO) to provide high spatial and temporal resolution measurements of tropospheric air pollution over North America. TEMPO is a UV-Vis spectrometer that operates in geostationary orbit, enabling it to capture a more comprehensive view of tropospheric composition than currently available from similar instruments operating in polar low Earth orbit. To complement the standard TEMPO products, NASA's Satellite Needs Working Group (SNWG) Implementation TEam (NSITE) representatives at SAO produce a set of near real-time (NRT) products with < 3 hour latency for nitrogen dioxide ($NO_2$), formaldehyde (HCHO), sulfur dioxide ($SO_2$), clouds (using $O_2$-$O_2$ absorption), and a Level 1B product that NOAA will use along with Geostationary Operational Environmental Satellite – R Series (GOES-R) measurements to generate NRT aerosol products. These products will be available to the public for use in air quality monitoring and forecasting.




***Nitrogen dioxide gas concentrations created from TEMPO measurements show the extent of air pollution in the Los Angeles and Las Vegas areas on August 2, 2023. TEMPO can detect pollution that is typically hidden in reflected sunlight.***

Credit: Kel Elkins, Trent Schindler, and Cindy Starr of NASA's Science Visualization Studio

## Scientific & Societal Benefit

- **Provide NRT measurements of tropospheric constituents ($NO_2$, HCHO, clouds, aerosols) over North America every 3 hours**
- **Obtain hourly observations of small-scale emission sources and pollution gradients at suburban levels (e.g. industrial activities, vehicular exhaust)**
- **Capture rapidly-developing episodic events like wildfires and dust storms**
- **Provide expedited pollution products to advance air quality monitoring/forecasting, pollution transport modeling, weather and climate analysis, and population exposure assessments**

## NASA's SNWG Implementation TEam (NSITE)

# TEMPO/GOES Near Real-Time Products

| Data Characteristics | | | | |
|---|---|---|---|---|
| **Products** | $NO_2$ (Nitrogen dioxide) | HCHO (Formaldehyde) | $O_2$-$O_2$ (Cloud) | Aerosol |
| **Platform** | Intelsat 40e (IS-40e) | | | |
| **Sensor Type** | Ultraviolet-Visible Spectrometer | | | |
| **Processing Level** | 1, 2, 3 | | | |
| **Temporal Coverage** | Based on TEMPO availability (April 7, 2023 = IS-40e launch date) | | | |
| **Temporal Frequency** | Hourly | | | |
| **Latency** | 3 hours | | | |
| **Spatial Coverage** | North America | | | |
| **Spatial Resolution** | 2.0 × 4.75 $km^2$ | | | |
| **Data Format** | NetCDF4/HDF5 | | | |

## *How do I access this data?*

TEMPO NRT data is available through NASA's ESDIS archive.

**NASA's ESDIS Archive**

## *Where can I find more information?*

More information on TEMPO NRT products is available on this solution's webpage. More information on the TEMPO mission is provided on the TEMPO website.

**TEMPO NRT Webpage**

**TEMPO Website**

Background Image Credit: Joseph V. Ardizzone, NASA's Global Modeling and Assimilation Office

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