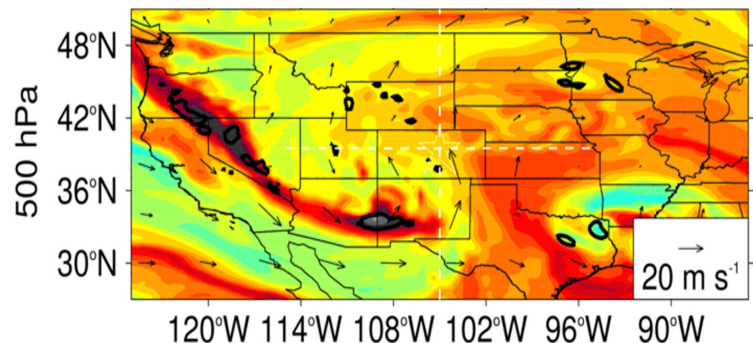


GEOS Composition Reanalysis (GEOS-CR)

Satellite Needs Working Group - Solution Fact Sheet

The Satellite Needs Working Group (SNWG)-2018 biennial assessment identified a need across civilian federal agencies for improved atmospheric composition modeling and forecasting capabilities. To address this need, NASA's SNWG Implementation Team (NSITE) representatives at the Global Modeling and Assimilation Office are conducting a reanalysis for the 2009-2018 period by assimilating remotely-sensed tropospheric and stratospheric constituent data within the Goddard Earth Observing System (GEOS) Constituent Data Assimilation System (CoDAS). The resulting reanalysis product will provide a global, hourly, 3-dimensional characterization of atmospheric composition, using a model system similar to the near real-time GEOS Composition Forecasting (GEOS-CF) system. Reanalysis datasets provide a consistent, long-term look at past conditions, therefore the GEOS Composition Reanalysis (GEOS-CR) solution can be used to better evaluate air quality monitoring data and analyze trends.

Enhanced ozone (dark red) in the mid-troposphere in Pueblo, Colorado, due to a stratospheric intrusion of ozone-rich air on May 11, 2023. While stratospheric ozone offers protection from the sun's harmful UV radiation, ozone is an air pollutant at ground-level. Tracking concentrations of chemical species like ozone allows for improved insight into impacts on health and air quality.



Credit: NASA/GMAO GEOS-CF version 2.

Scientific & Societal Benefit

- Extends the long-term record of selected atmospheric constituents important for air quality and tropospheric chemistry, stratospheric ozone, and greenhouse gases
- By combining information from a wide range of observation instruments, this captures changes and variability in atmospheric composition on decadal scale
- Allows for historical reanalysis of air pollution events, including trends and outlier events, as well as providing reference gridded datasets for training AI-based prediction systems
- Provides data for global prediction of surface air quality in the context of emissions and transport and encourages research studies that address applications to human health and ecosystem monitoring

NASA's SNWG Implementation TEam (NSITE)

GEOS Composition Reanalysis (GEOS-CR)

Data Characteristics									
Platform	Aura		Aqua	GOSAT	ISS	OCO-2	Sentinel-5 Precursor	Suomi NPP, NOAA-20, NOAA-21	Terra
Instruments (as available)	OMI	MLS	AIRS	TANSO-CAI, TANSO-FTS	SAGE III	Spectrometers	TROPOMI	OMPS	MOPITT
Output Variables	Reanalysis of NO ₂ , O ₃ , CH ₄ , CO ₂ , CO, HCl, HNO ₃ , N ₂ O, H ₂ O								
Temporal Coverage	2009 – 2018 (core period); will be extended to an earlier period of 2004-2008 and later period 2019-2024								
Temporal Frequency	Hourly (selected two-dimensional fields), three-hourly (three-dimensional fields)								
Spatial Coverage	Global								
Spatial Resolution	0.25 degree latitude x 0.25 degree longitude (nominally, 25 km x 25 km)								
Vertical Resolution	72 model layers, Earth surface to lower mesosphere (0.01 hPa, nominally 80 km)								
Data Format	NetCDF4 (HDF5 compatible)								

How do I access this data?

GEOS-CR data is not yet available, but it will be publically accessible.

Where can I find more information?

More information on the GEOS-CR solution is available on this solution's webpage.



**GEOS-CR
Webpage**

Background Image Credit: NASA, photo taken of the Ferguson fire near Yosemite National Park by an astronaut on the International Space Station on August 2, 2018.

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