Air Pollution Forecasts using the NASA GEOS Model: A unified Tool from Local to Global Scales

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NASA GMAO global meteorology and chemistry products

GEOS

OMPS (O₃)

NASA/NOAA

www.nasa.gov
NASA’s composition forecast (GEOS-CF)

- Ozone (O$_3$)
- Nitrogen Dioxide (NO$_2$)
- Fine Particulate Matter (PM$_{2.5}$)

Research product
GEOS-Chem is a state-of-the-science chemistry transport model

Tropospheric and Stratospheric full chemistry

- 250 reactive species, 725 reactions
- 100+ user/developer groups worldwide
- Updated version is released about every year
Daily composition forecast

GEOS NWP

GEOS - CF
One 5-day forecast per day

GEOS - Chem
Daily composition forecast

GEOS NWP

GEOS - CF

One 5-day forecast per day

- 1-day “replay analysis”
- 5-day forecast

GEOS - Chem
Daily composition forecast

**GEOS - CF**

One **5-day forecast** per day
- 1-day analysis
- 5-day forecast
- c360 (0.25°, ~25x25 km²) resolution, 72 model layers
Daily composition forecast

GEOS - CF

One 5-day forecast per day
- 1-day analysis
- 5-day forecast
- c360 (0.25°, ~25x25 km²) resolution, 72 model layers
- O₃, NOₓ, VOCs, PM ...
Daily composition forecast

GEOS - CF

One 5-day forecast per day
- 1-day analysis
- 5-day forecast
- c360 (0.25°, ~25x25 km²)
- 15 minute “surface”
- 1-hour average and instantaneous 2D & 3D
Daily composition forecast

One **5-day forecast** per day
- 1-day analysis
- 5-day forecast
- c360 (0.25°, ~25x25 km²)

- 1 January 2018 - NRT
Chemistry is not cheap!

Run on NASA’s Center for Climate Simulation supercomputer

- using the computing power equivalent to 3500 personal computers.
High-Resolution Global Simulation

25 km x 25 km (16 miles)

- **Highest** horizontal resolution of a global atmospheric composition forecast
- **10 x higher** than conventional global atmospheric chemistry simulations.
Where to find GEOS-CF

Output available at fluid.nccs.nasa.gov/cf
Model forecast $O_3$

https://fluid.nccs.nasa.gov/cf
GMAO GEOS CF Datagrams

O3 at Los Angeles (34.00, -118.20)

Model forecast

O_3 at LA

Vertical O_3

Surface O_3

Meteorology
Thank you!

2017-10-01 00:30 UTC

https://fluid.nccs.nasa.gov/cf