



NASA GEOS Composition Forecast system: “GEOS-CF”

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In collaboration with:

NASA GMAO: Christoph Keller, Pamela Wales, Callum Wayman, Lesley Ott, Steven Pawson

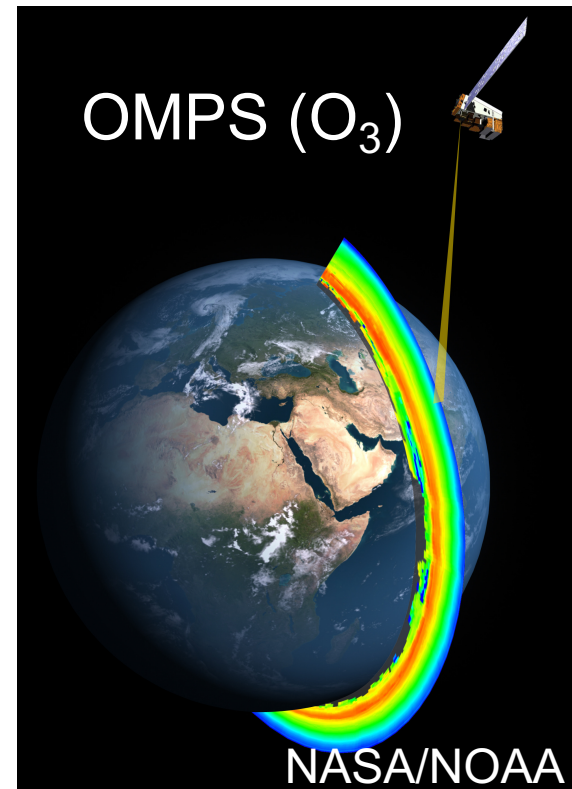
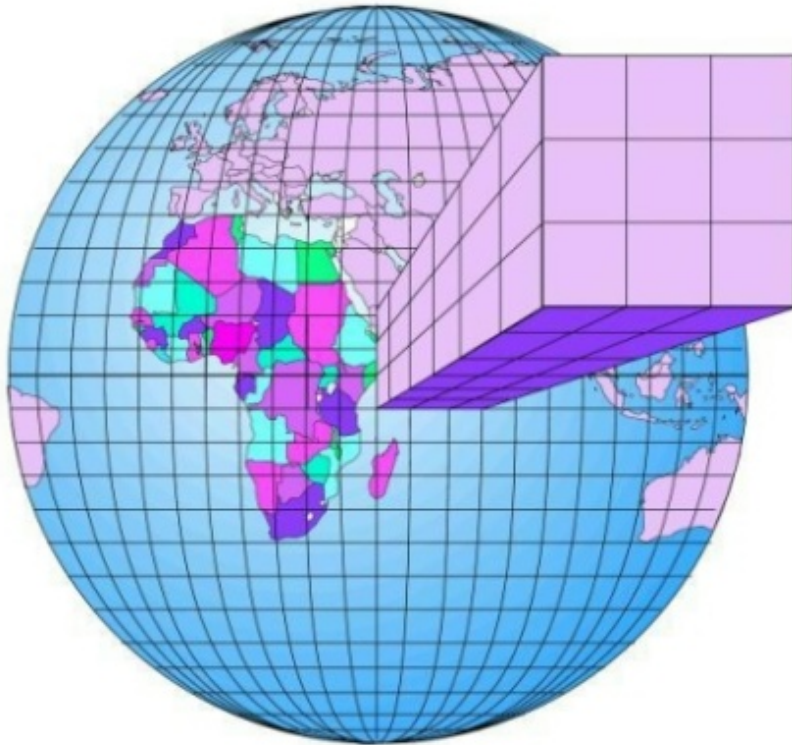
Atmospheric Chemistry and Dynamics Lab: Bryan Duncan, Sarah Strode

23 February 2022



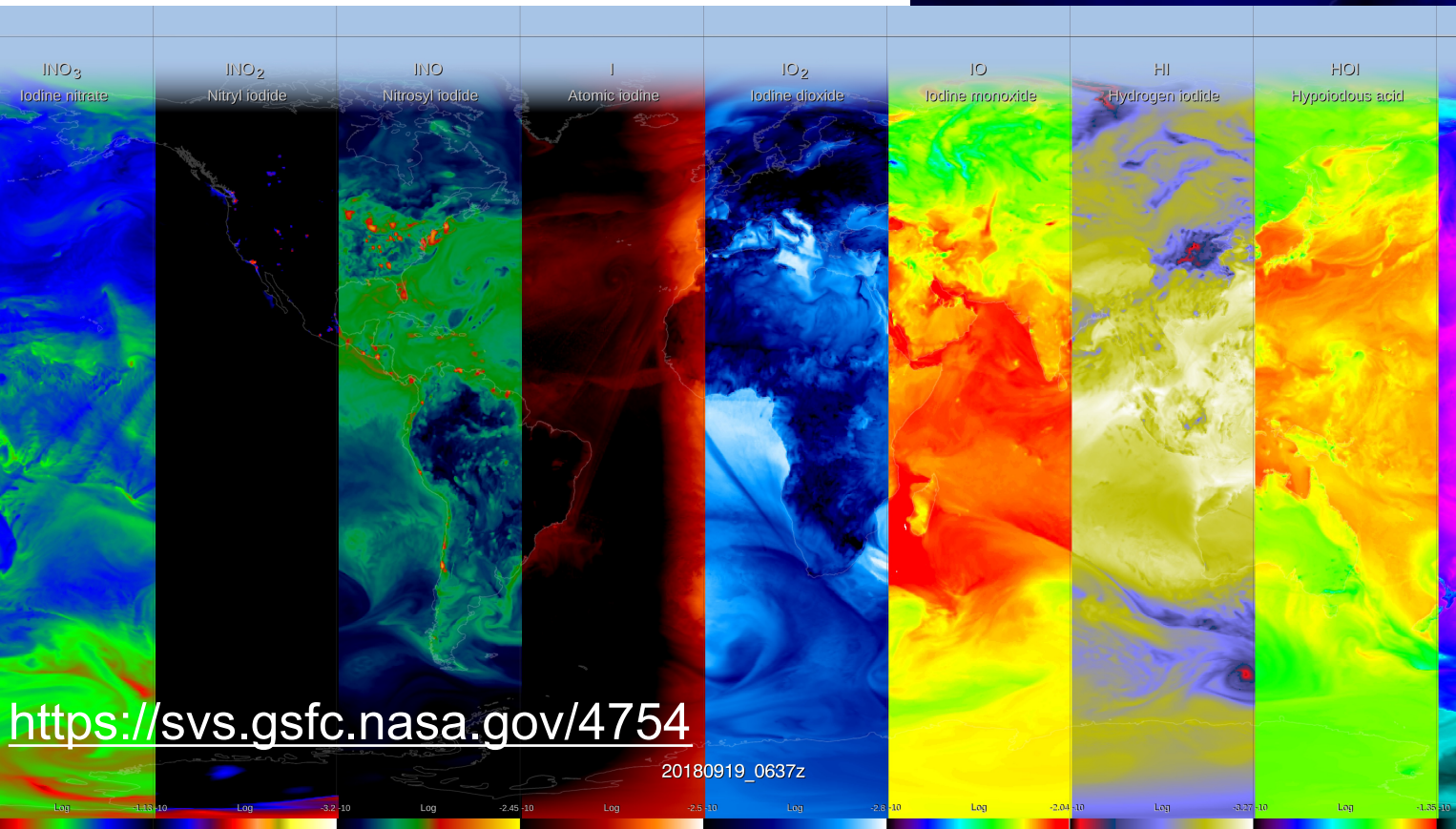
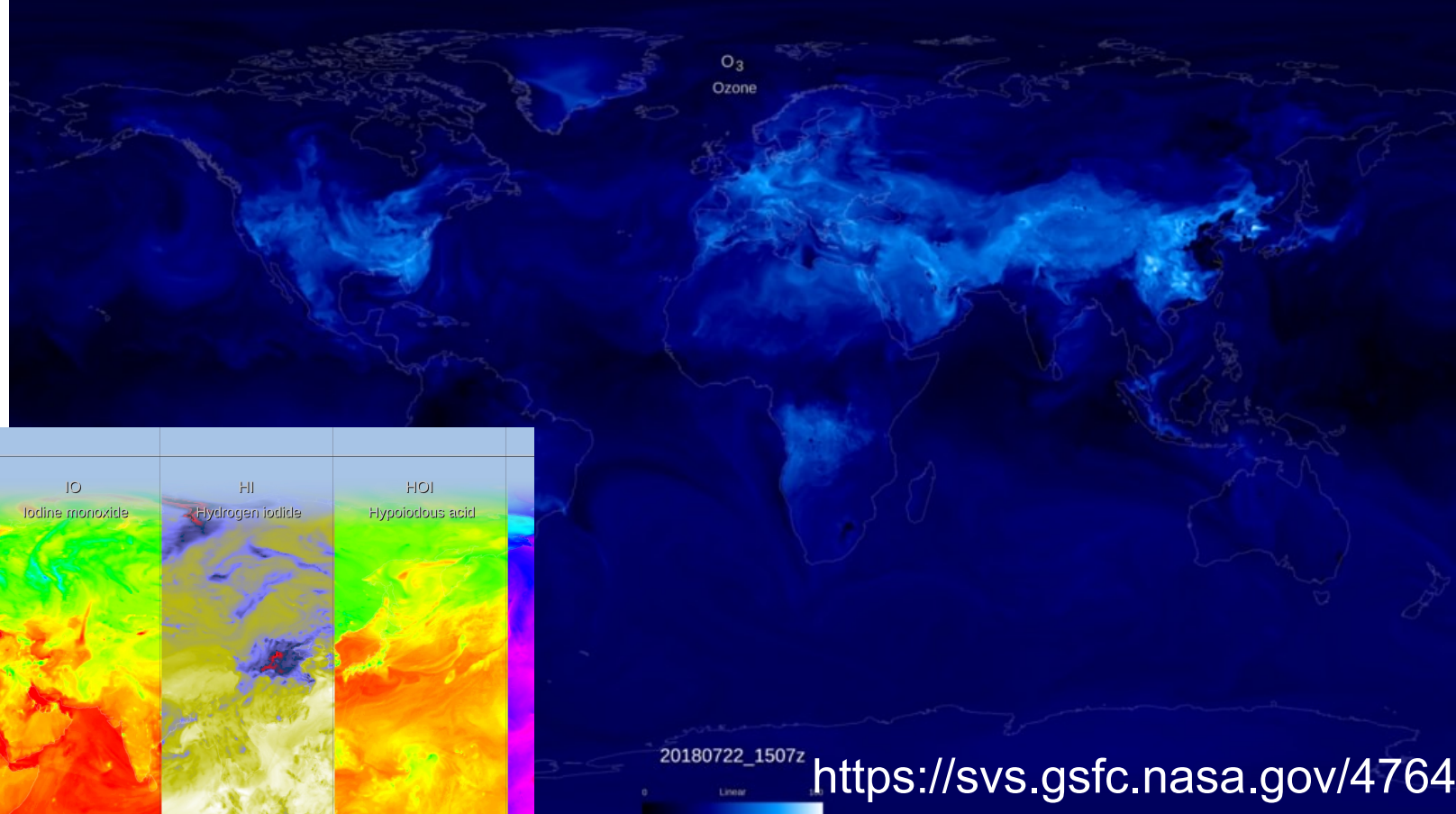
NASA GMAO global meteorology and chemistry products

GEOS



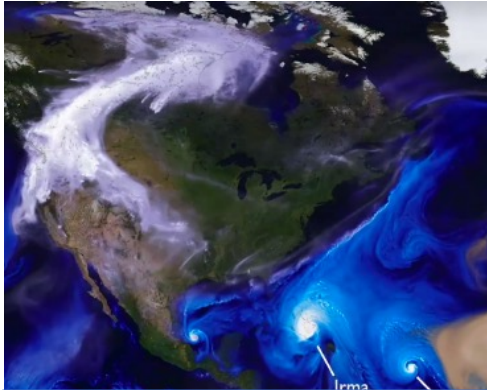
www.nasa.gov

GEOS - CF

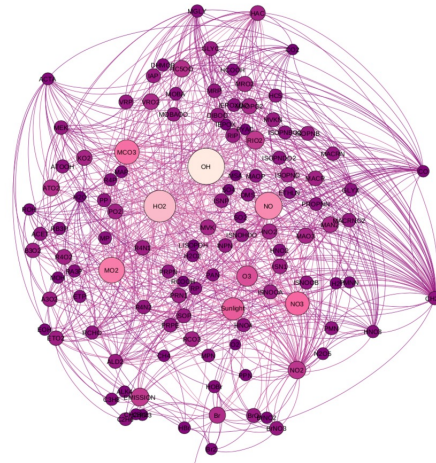
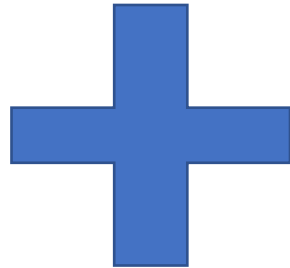


Global historical model estimates and daily 5-day forecasts of major air pollutants like Ozone & PM_{2.5}

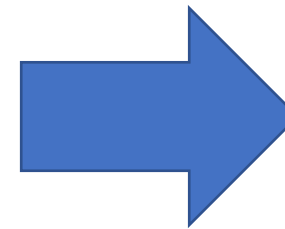
GEOS Composition Forecast



GEOS weather forecasting



GEOS-Chem



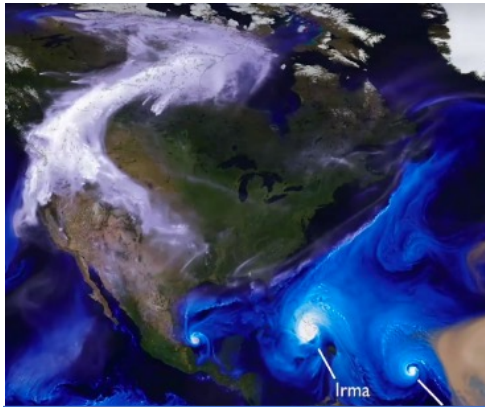
GEOS - CF

Version 12

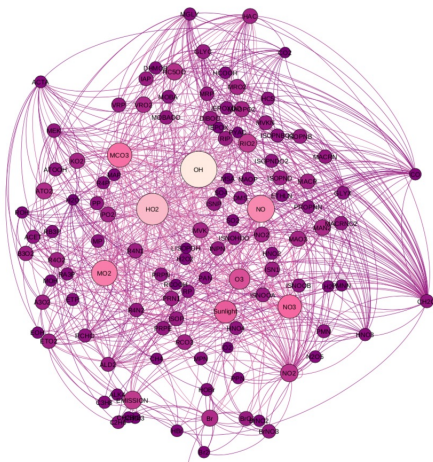
Tropospheric and Stratospheric chemistry

- 250 Chemical Species
- 725 Chemical Reactions

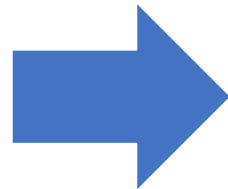
Daily composition forecast



GEOS NWP



GEOS-Chem



GEOS - CF

One **5-day forecast** per day

- Initialized at 12z
- 1-day meteorological replay (“analysis”)
- 5-day forecast
- 25x25 km² resolution, 72 model layers
- Chemistry: O₃, NO_x, PM, CO, VOCs, ...
- Meteorology: T, U, V, RH
- Since January 1, 2018

Emissions:

- HTAP (global bottom-up) for anthropogenic
- Near real-time fires (QFED)
- Online dust, sea salt, plant emissions



GEOS-CF are available online in near real-time

FLUID is a mobile-friendly website

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

Composition Forecast

CF Datagrams

NATIONAL

Anchorage

WORLD

Select a Station

AERONET

Select a Station

MEGACITIES

Select a Station

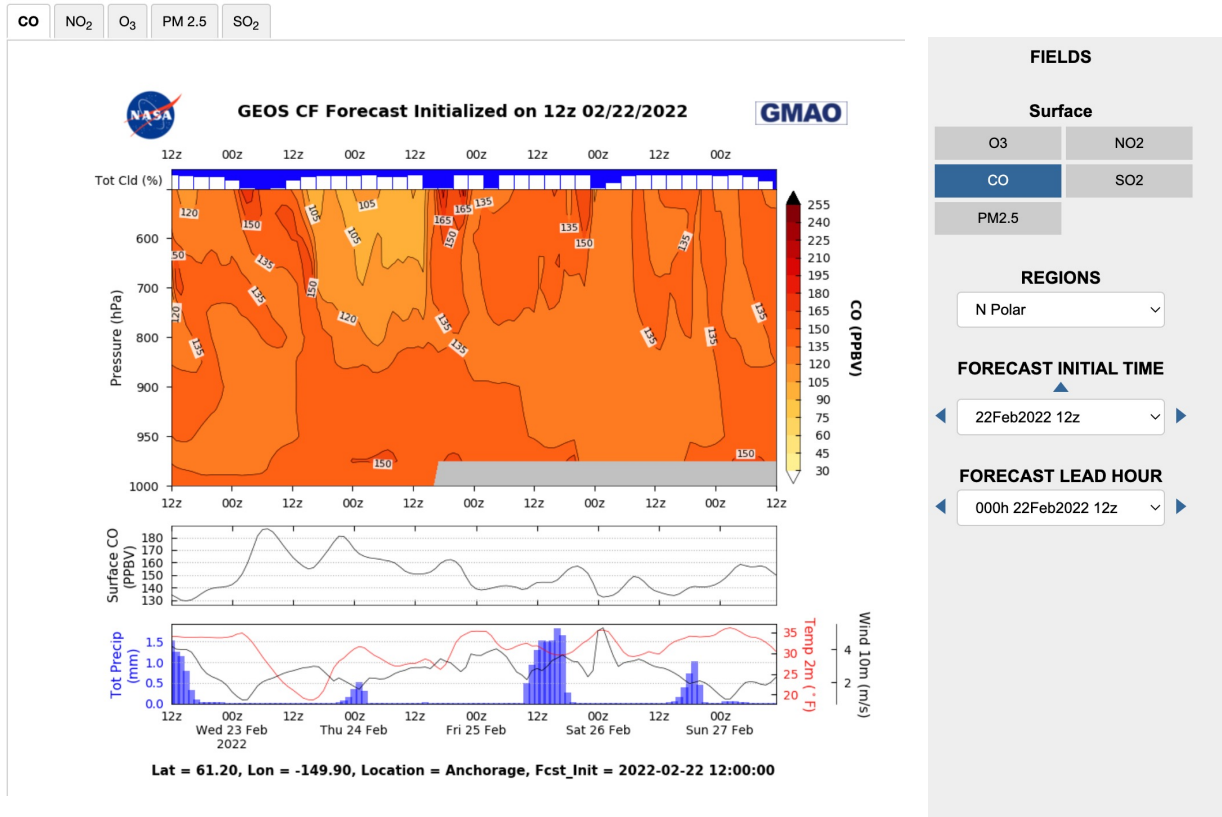
ACTIVE CAMPAIGNS

ABOVE

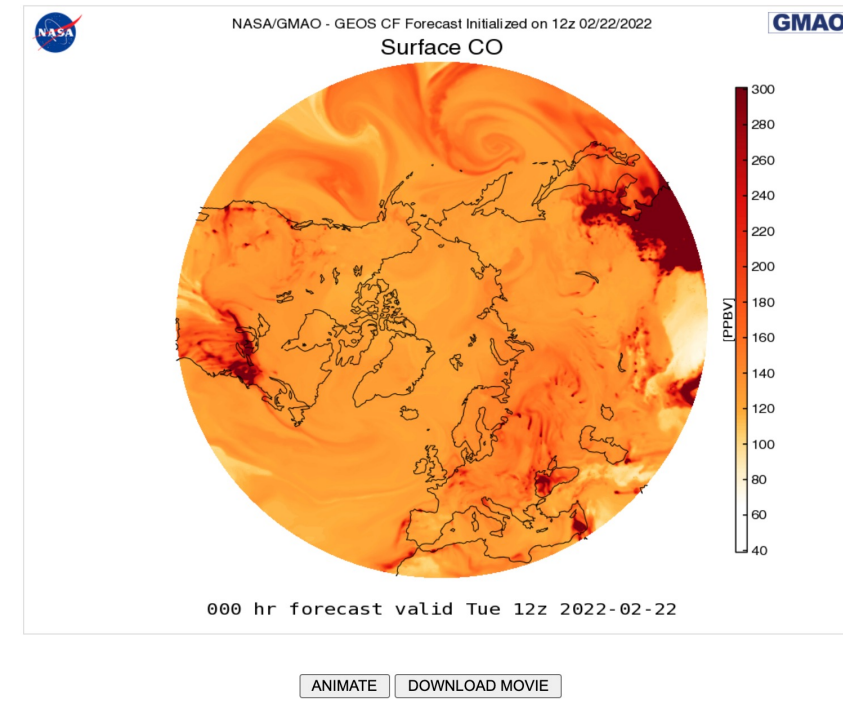
Anchorage

GMAO GEOS CF Datagrams

CO at Anchorage (61.20, -149.90)



Composition Forecast Maps





GEOS-CF are available online in near real-time

FLUID is a mobile-friendly website

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

<https://portal.nccs.nasa.gov/datashare/gmao/geos-cf/v1/>

Composition Forecast

CF Datagrams

NATIONAL

Anchorage

WORLD

Select a Station

AERONET

Select a Station

MEGACITIES

Select a Station

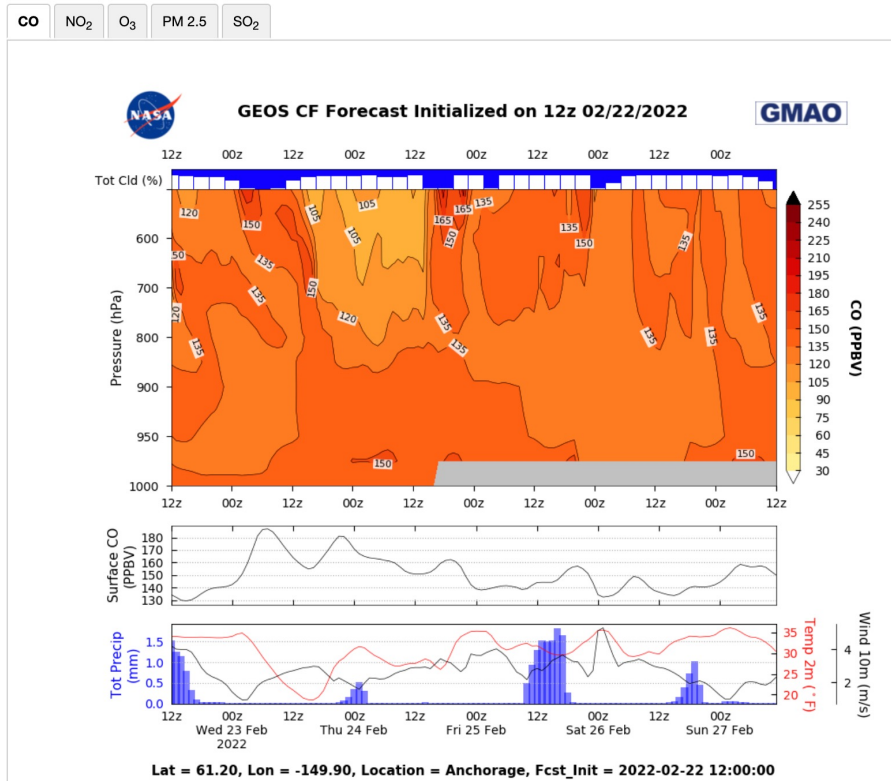
ACTIVE CAMPAIGNS

ABOVE

Anchorage

GMAO GEOS CF Datagrams

CO at Anchorage (61.20, -149.90)



GODDARD SPACE FLIGHT CENTER

+ NASA HomePage
+ NASA Center for Climate Simulation

NCCS Dataportal - Datashare

Name	Last modified	Size	Description
Parent Directory	-	-	-
das/	26-Aug-2019 10:41	-	-
forecast/	22-Mar-2019 13:49	-	-

USA.gov + Privacy Policy and Important Notices

Curator: Corey D Jones
NASA Official: Dan Duffy
Last Updated: 03/13/2019

<https://opendap.nccs.nasa.gov/dods/gmao/geos-cf/>

GrADS Data Server - info for /gmao/geos-cf/assim/chm_tavg_1hr_g1440x721_v1 : [dds](#) [das](#)

OPeNDAP/DODS Data URL: https://opendap.nccs.nasa.gov/dods/gmao/geos-cf/assim/chm_tavg_1hr_g1440x721_v1

Description: GEOS CF (Composition Forecast)

Documentation: (none provided)

Longitude: -180.0000000000°E to 179.7500000000°E (1440 points, avg. res. 0.25°)

Latitude: -90.0000000000°N to 90.0000000000°N (721 points, avg. res. 0.25°)

Altitude: 72.0000000000 to 72.0000000000 (1 points)

Time: 00:30Z01JAN2018 to 11:30Z31OCT2019 (16044 points, avg. res. 0.042 days)

Variables: (total of 52)

xyle xylene (c8h10, mw = 106.16 g mol-1) volume mixing ratio dry air

dst2 dust aerosol, reff = 1.4 microns (mw = 29.00 g mol-1) volume mixing ratio dry air

hno4 peroxyntiric acid (hno4, mw = 79.00 g mol-1) volume mixing ratio dry air

pm25su_rh35_gcc sulfate_particulate_matter_with_diameter_below_2.5_um_rh_35

Emerging FLUID Features *in Development*

Capability to zoom in and select data for any grid box

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

Available Products

- NO2
- O3
- PM2.5**

Geotiff Forecast Selection

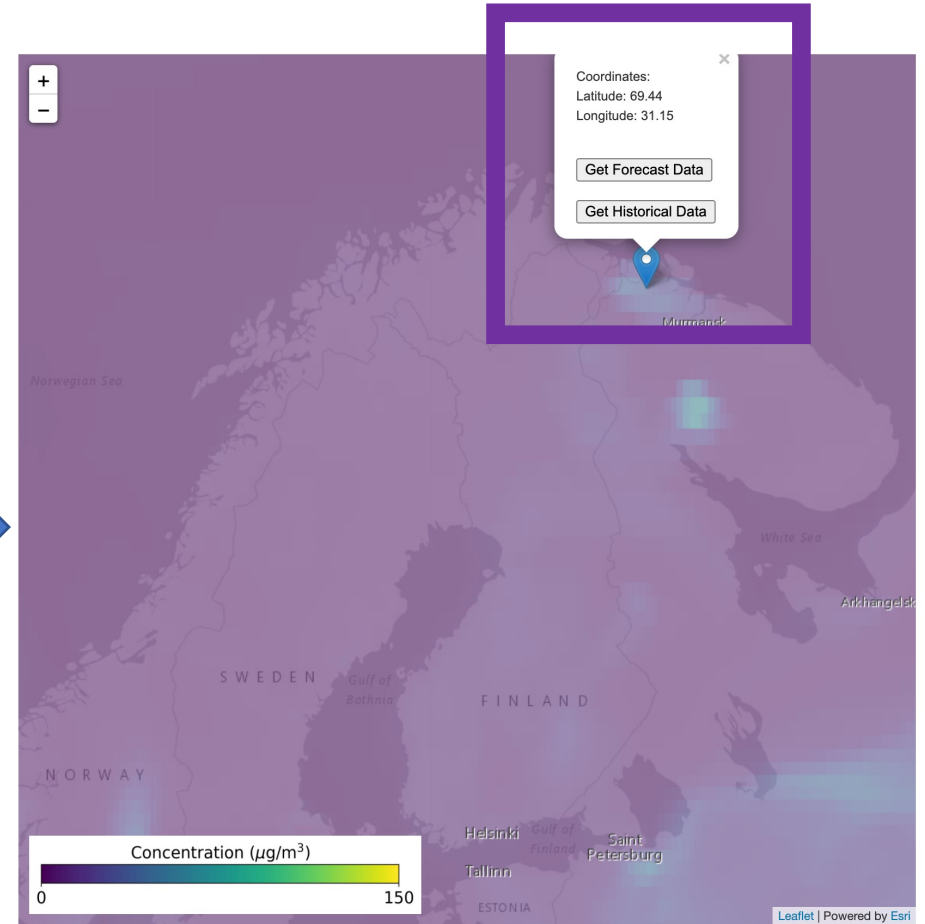
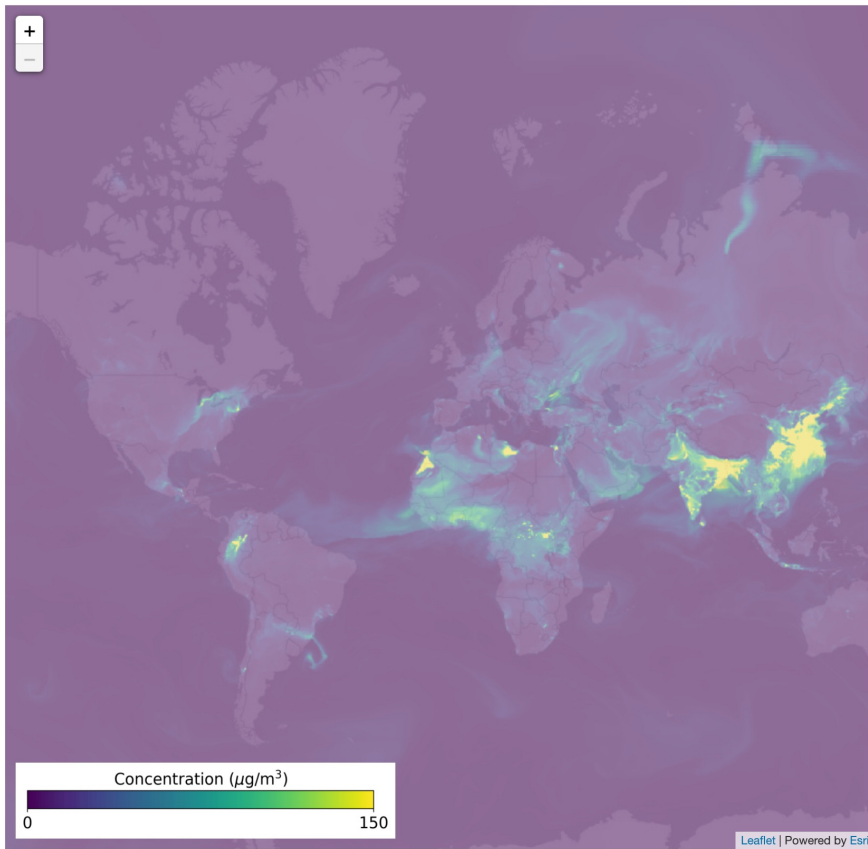
Forecast Date
20220222

Forecast Time
1930

Colormap Options
viridis

Quick Stations

- NATIONAL**
--Select a Station--
- WORLD**
--Select a Station--
- AERONET**
--Select a Station--
- MEGACITIES**
--Select a Station--
- ACTIVE CAMPAIGNS**
--Select a Station--



Summary

GEOS-CF produces daily global air quality forecasts at 25km (16 miles) horizontal resolution since 1 January 2018

- AQ maps and data access fluid.nccs.nasa.gov/cf
- Forecast anywhere in the world fluid.nccs.nasa.gov/cf_map

