

IN13D-0599: Improving Access to the GEOS Composition Forecast Model with API Development and Ingestion into Google Earth Engine

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Openly Available Air Quality Model Fields

The NASA GEOS Composition Forecast (GEOS-CF) team has made several efforts to produce tools that grant increased access to air quality model fields such as nitrogen dioxide, particulate matter, and ozone.

The NASA GEOS-CF team has designed a RESTful API and dynamic map tool to improve GEOS-CF access. Public access to GEOS-CF has also been improved via an expansion of the NASA Google Air Quality partnership.

These new developments have drastically improved access to air quality information from the GEOS-CF model. A range of options for data ingestion and analysis are shown here.

The GEOS-CF Air Quality Data Explorer

The GEOS-CF team has designed tools that make use of the Google Earth Engine (GEE) open access data repository. The GEOS-CF Air Quality Data Explorer (Fig. 2) was developed in the GEE code editor, a web-based JavaScript IDE, and exported as a public application. The tool can be found at the QR code above.

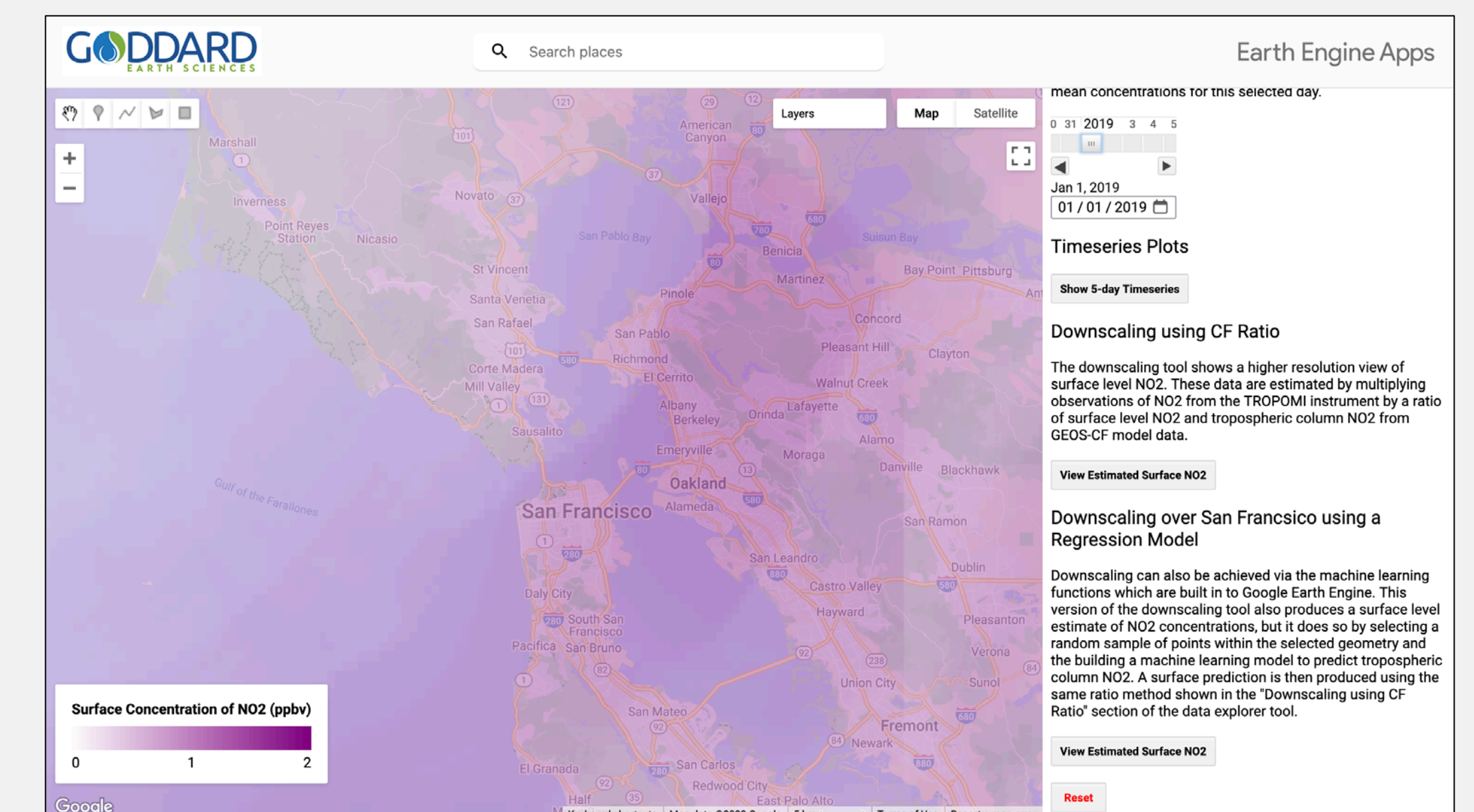
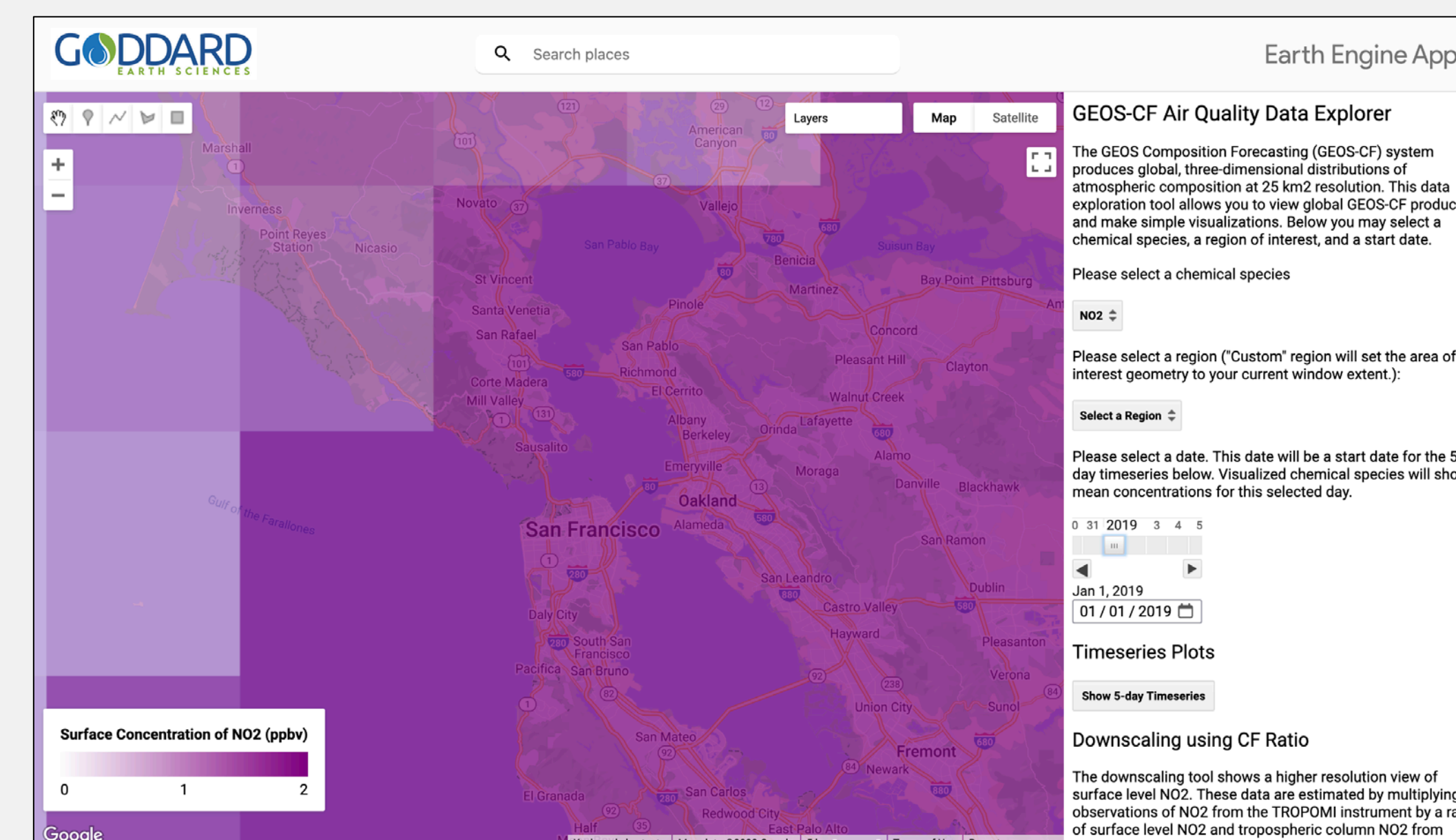
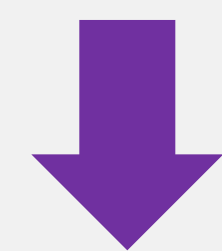
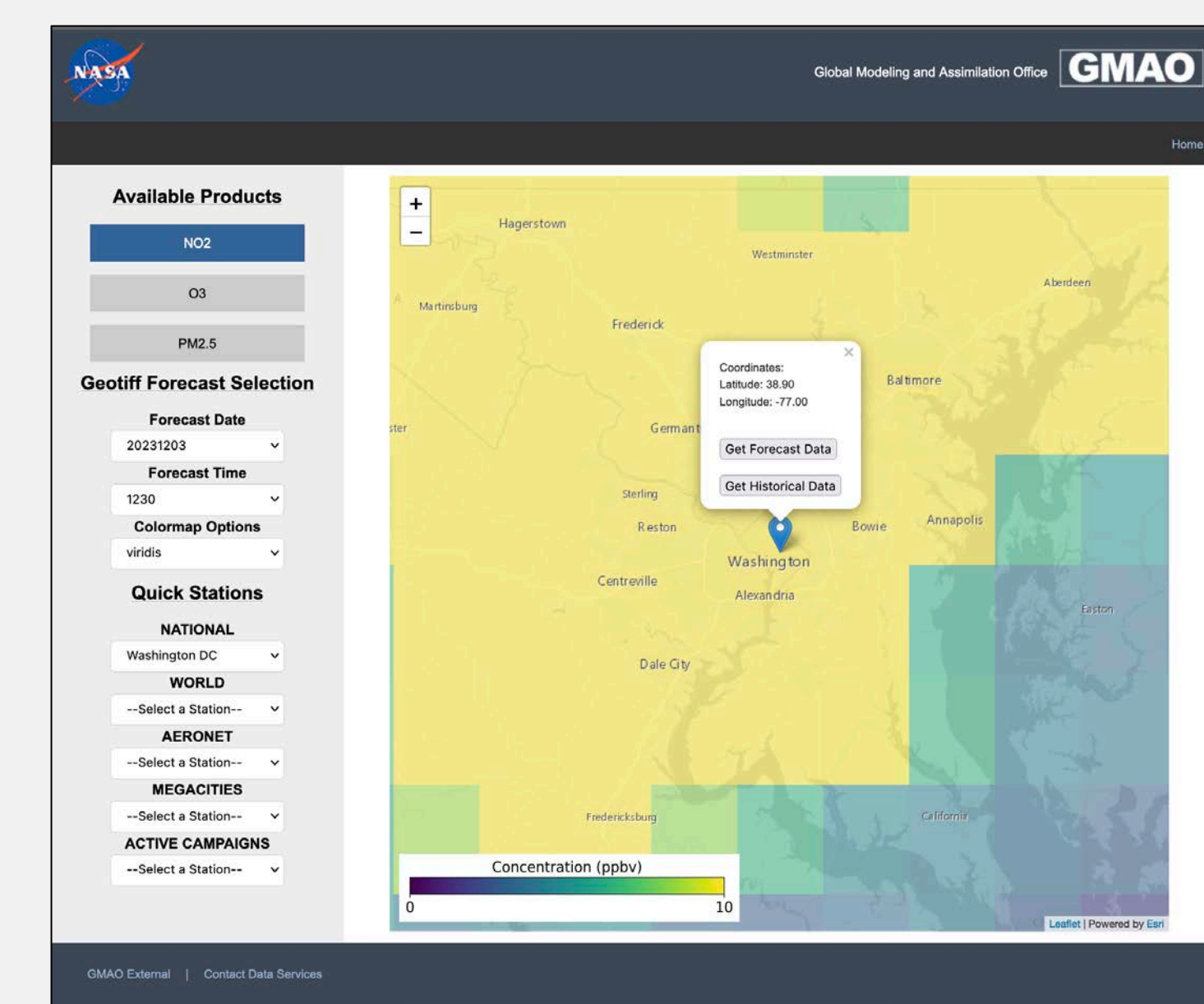


Figure 2: The GEOS-CF Air Quality Data Explorer is a proof-of-concept for creating spatial downscaling models in the GEE code editor.

The GEOS-CF API (CFAPI) and CF Map Tool



```
dataset: "chm_tavg_thr_g144x721_v1"
description: "5-day forecast of hourly concentrations of NO2"
forecast initialization time: "2023-12-03T12:00:00Z"
lat: 38.9
lon: -77
product: "NO2"
response time: "3.579318667918156"
type: "Object"
units: "ppbv"
time: "1"
values: [...]
```

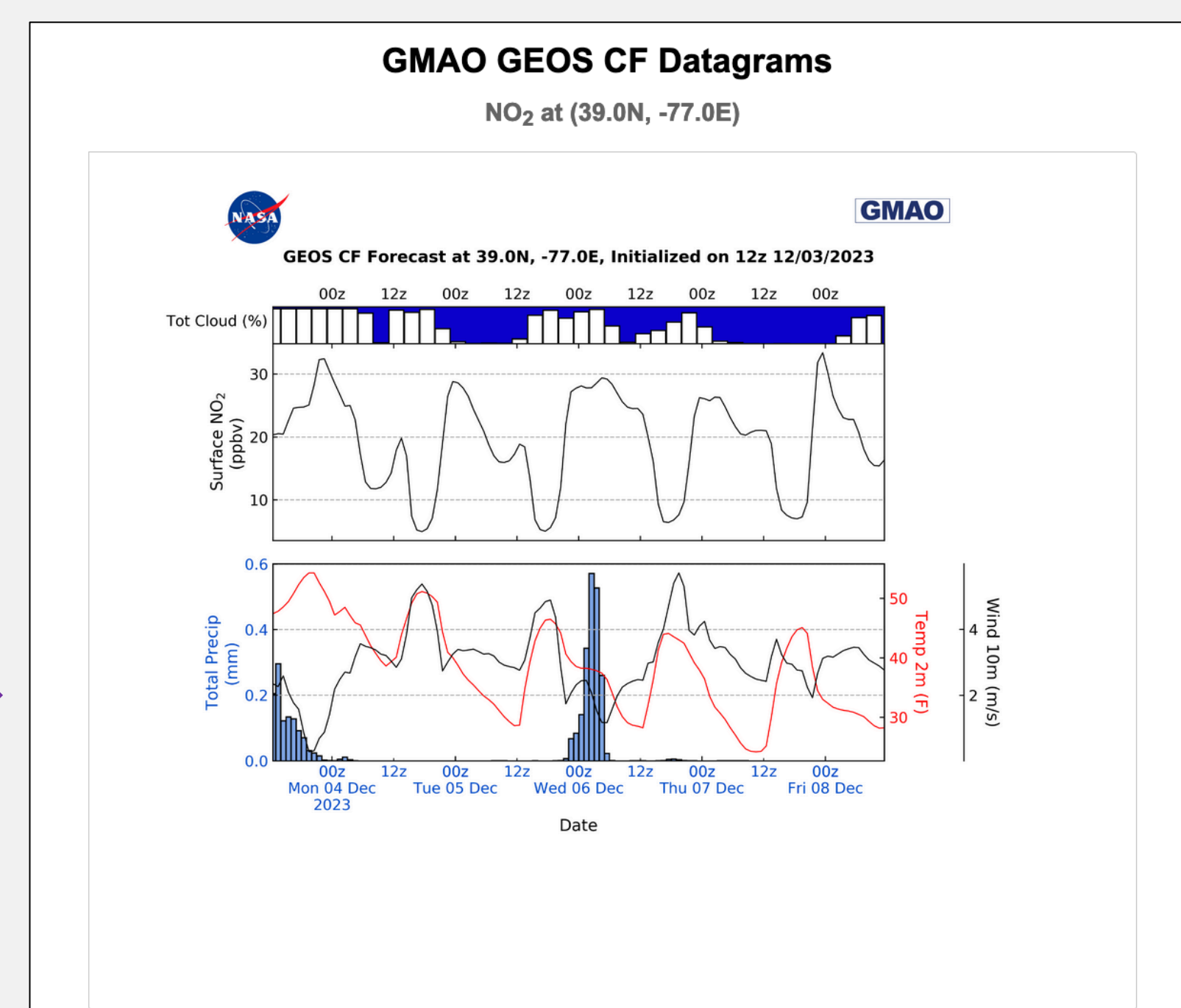
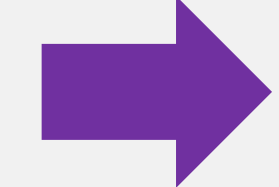


Figure 1: The CF Map tool allows users to select a site anywhere in the world, request data from the CFAPI, and produce a plot of the GEOS-CF forecast or historical estimates for that location.



Temporally Downscaling NO₂ Observations with the GEE Python API

To explore the use of GEE-based data in creating temporally downscaled NO₂ forecasts, a GEE Python API Jupyter Notebook was developed (Fig. 3). This notebook can be accessed on the GEOS-CF Tutorials Git repository via the below QR code.

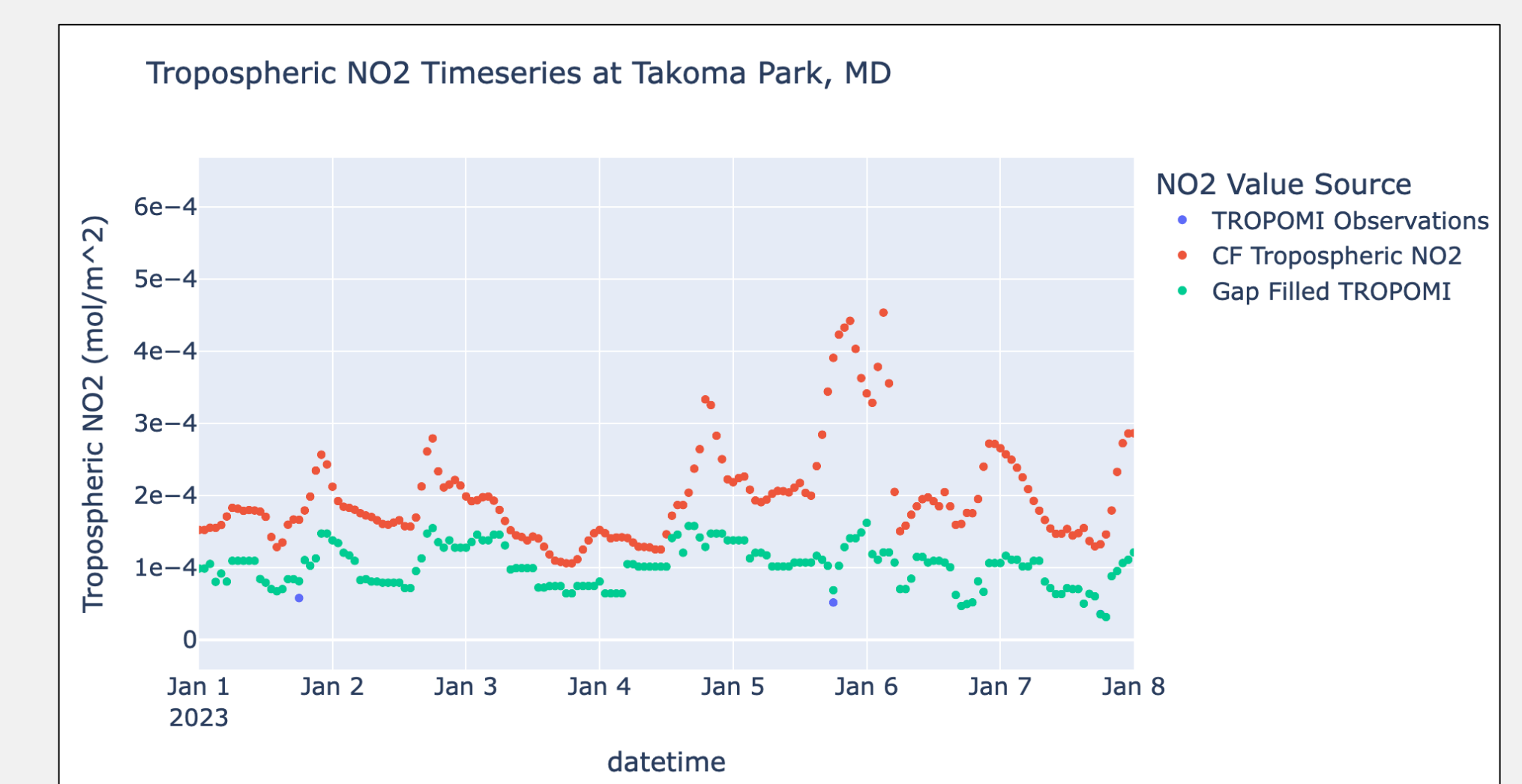
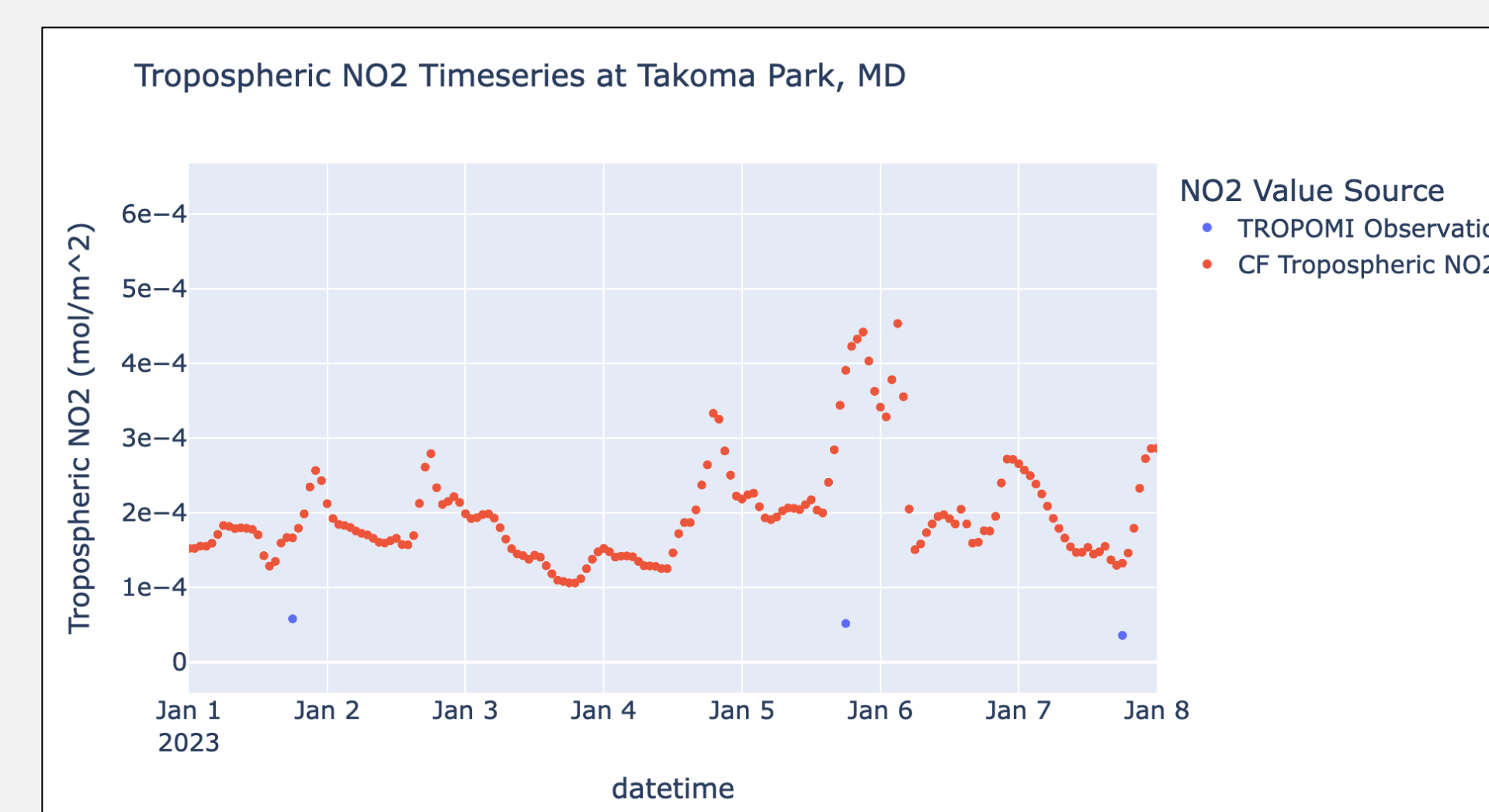


Figure 3: A proof-of-concept XGBoost model is trained to predict TROPOMI observations of tropospheric NO₂. The model is trained on 170 points of data and tested on 52 points. Inputs include a suite of model fields from GEOS-CF. The model output is an hourly estimate of TROPOMI observations.