

The NASA AIST Fire Alarm: Science Data Platform for Wildfire and Air Quality platform is an Integrated Air Quality Information Platform, which extends the very successful AIST Air Quality Analytic Collaborative Framework (AQ ACF) investment. AIST Fire Alarm aligns the open-source AQ ACF architecture with the AIST Integrated Digital Earth Analysis (IDEAS) digital twins framework with an emphasis on the impact that wildfire fire has on air pollution. The AIST Fire Alarm effort established a data, ML, and numerically driven assimilation platform for air quality analysis, visualization, and prediction.

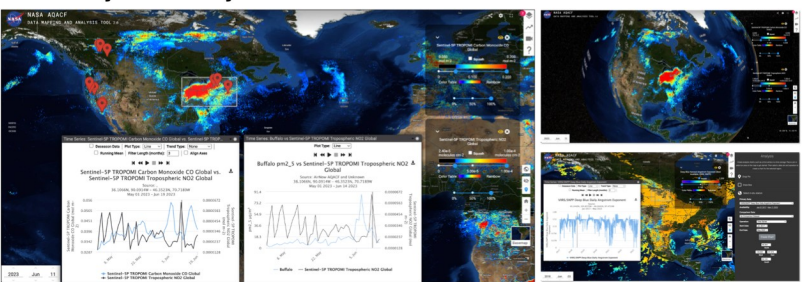
Analytic Collaborative Framework (ACF) is a concept to encapsulate scalable computational and data infrastructures and to harmonize data, tools and computation resources to enable scientific investigations. Apache Science Data Analytics Platform (SDAP) is a professional open-source ACF solution. It is an ensemble of big data technologies for Earth science that is optimized to leverage the elastic cloud or on-premises computing clusters. Apache SDAP has a growing collection of capabilities including satellite and model data analysis, in situ data integration, fast data subsetting, OpenSearch, etc. Apache SDAP can be separated into two main subsystems. The Analysis Optimized Storage subsystem focuses on storing and managing access to data partitions that is optimized for parallel analytics. It ingests data from data centers and performs a lossless transformation operation so the data can leverage different storage architecture for parallel computation. The Services and Workflows subsystem provides analytic capabilities that users/applications can interact with. The workflows automate generation of pre-computed statistics, such as min/max, standard deviation, regional averages for pre-defined time windows, etc. The visualization capability leverages a combination of OGC standards-compliant solutions consisting of OnEarth, MapServer, and GDAL, which is the same stack used to power the NASA Global Imagery Browse Services (GIBS). The AIST Fire Alarm project uses Apache SDAP for

- Streamlining data onboarding and image generation.
- Expanding data analytics to support fire by combining satellites, models, and ground measurements.
- Exploring low-cost cloud-based storage for access and analysis of very large remote sensing data sets.

The AIST Fire Alarm established a one-stop Air Quality Information Platform for researchers and decision-makers. It is a platform for science visualization and analytics platform for wildfire and air quality. The platform is open to the public with web-based tool and downloadable jupyter notebooks. It encapsulates the complexities of big data management and parallel computing (public and private clouds, and on-prem cluster) by offering simple, programming language- neutral RESTful APIs for applications and researchers. AIST Fire Alarm offers three types of applications to demonstrate the power and portability of its visualization and analytics platform.

- ### Current Datasets
- #### Satellite
- Sentinel 5P TROPOMI**
 - Carbon Monoxide (CO)
 - Methane (CH₄)
 - Sulphur Dioxide (SO₂)
 - Ozone (O₃)
 - Nitrogen Dioxide (NO₂)
 - MODIS Aqua**
 - Aerosol Optical Depth (AOD)
 - Suomi NPP VIIRS**
 - Deep Blue Aerosol Angstrom Exponent
 - Deep Blue Aerosol Optical Thickness
 - OCO-3**
 - Snapshot Area Maps XCO₂
 - EMIT**
 - Methane Plume
- #### In-Situ (BC, CO, O₃, CO₂, NO, NO₂, PM₁₀, PM_{2.5})
- PurpleAir**
 - AirNow**
 - QuantAQ**
- #### Model
- High Performance GEOS-Chem (GCHP)**
 - Methane (CH₄)
 - Nitrogen Oxide (NO)
 - Nitrogen Dioxide (NO₂)
 - Sulphur Dioxide (SO₂)
 - Ozone (O₃)
 - MERRA-2**
 - Planetary Boundary Layer Height (PBLH)
 - Surface Air Temperature (TSLU)
 - Surface Exchange Coefficient for Heat (CDH)
 - GEOS Composition Forecasts (GEOS-CF)**

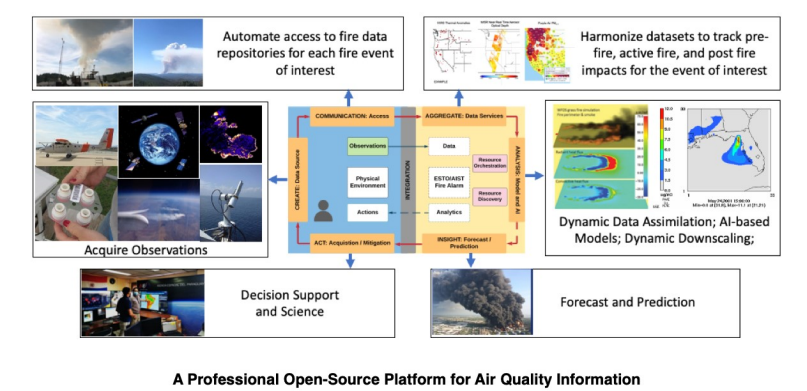
Air Quality Data Analysis Tool



Interactive Jupyter Notebook

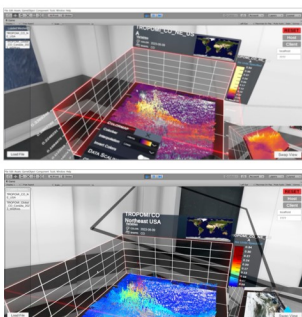


<https://ideas-digitaltwin.jpl.nasa.gov/airquality>

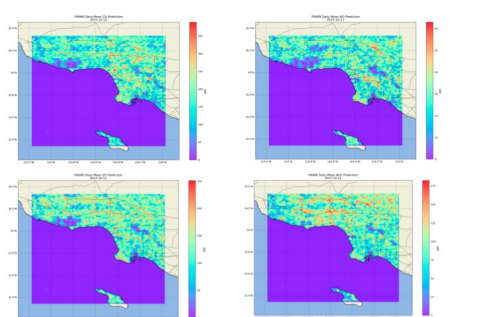


A Professional Open-Source Platform for Air Quality Information

Immersive Science



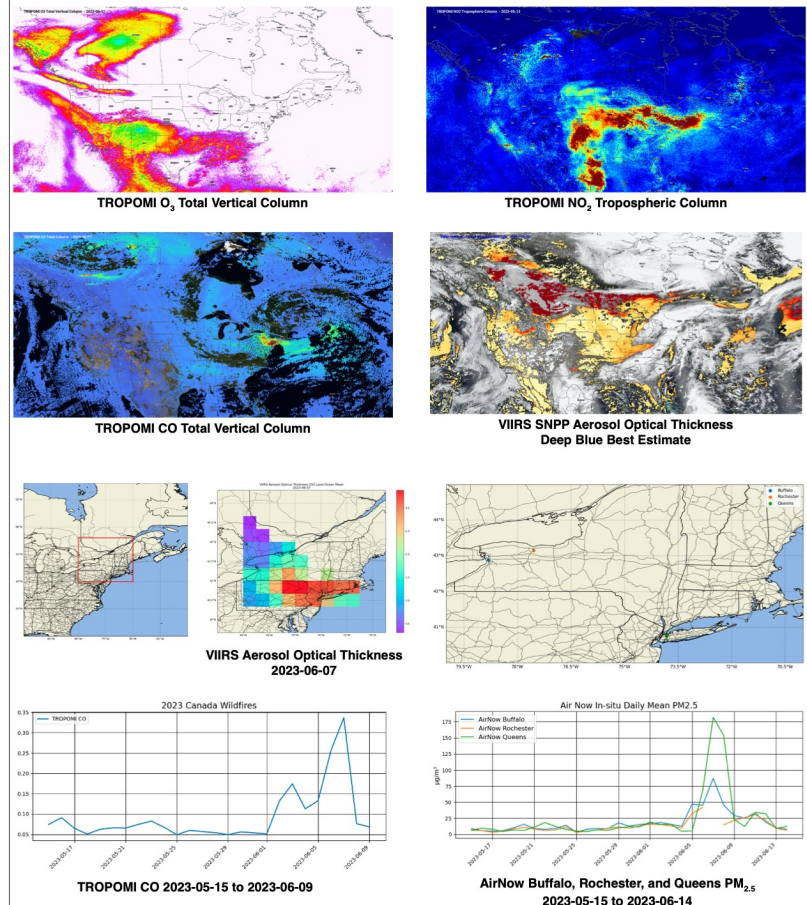
ML-based AQ Predictions



ONE PLATFORM for AIR QUALITY

Example Interactive Visualization and Analysis Applications

Air Quality (Case Study: Canadian Wildfire Smoke)



Greenhouse Gases

