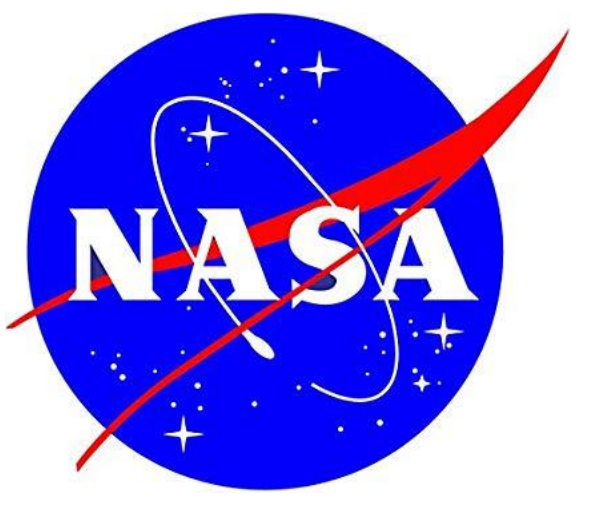


Atmospheric Data-Driven Visualization of Air Quality Variation in Megacities

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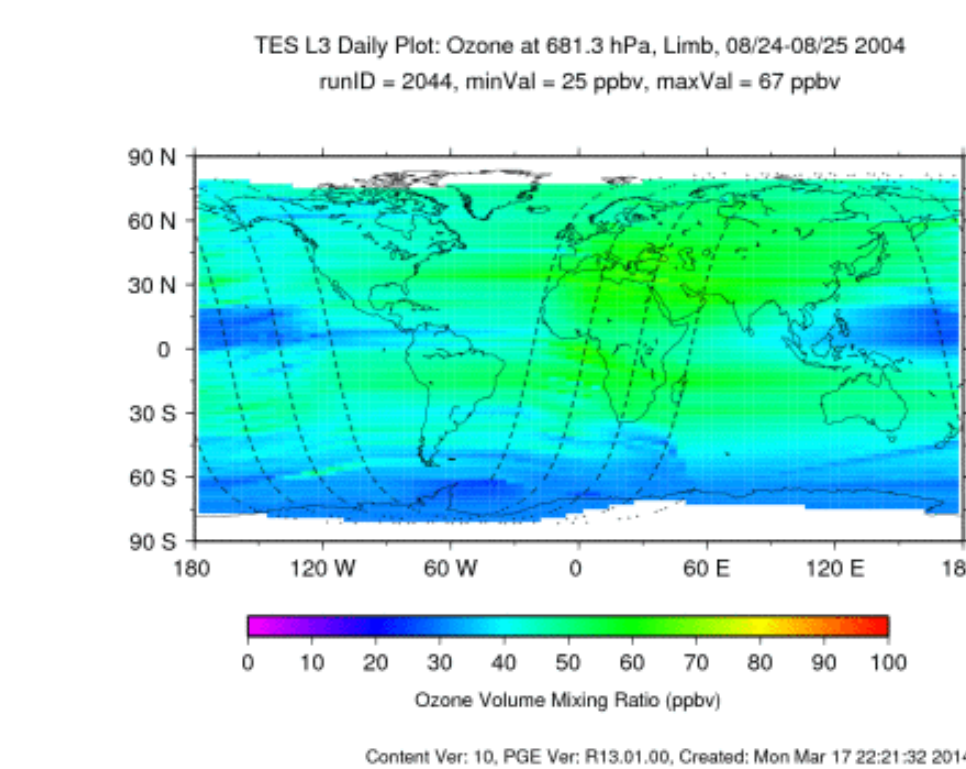
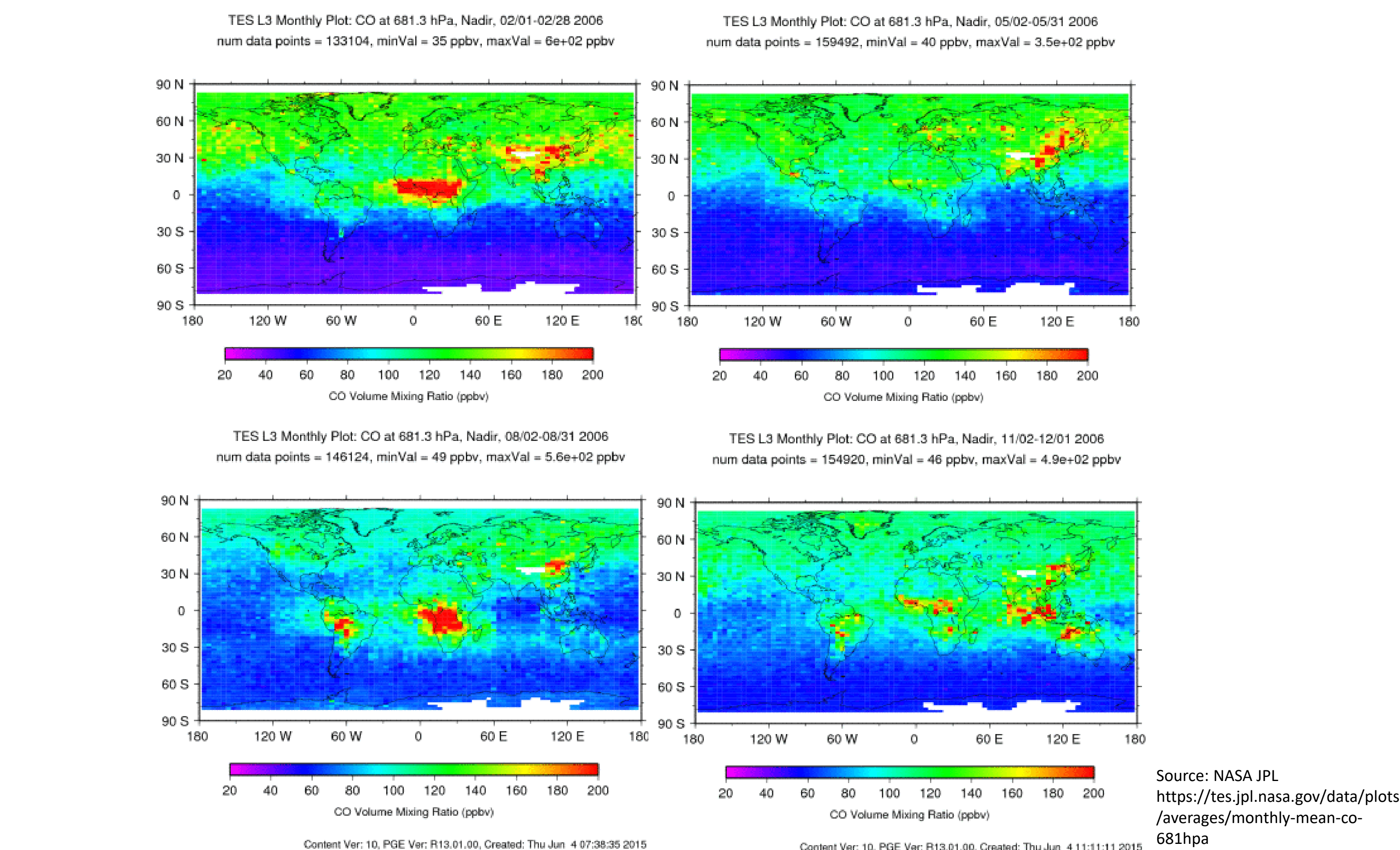
Introduction

The growth and spread of human settlements and increasing urban density are important processes in global change. Urbanization has accelerated with population growth, and more densely populated urban areas have major effects on the local and regional environments. Air quality in megacities has been a concern for decades. Data for anthropogenic emissions, pollutants, and particulate matter can inform research on the interactions between urban landscapes and the atmosphere, assist policy makers in developing sustainable, healthy environments, and inform the general public.

To better assist researchers, students, the public, and policymakers in understanding the annual and seasonal variation of aerosol and gas intensity in megacities, the Science Outreach Team at NASA Langley Research Center's Atmospheric Science Data Center (ASDC) Distributed Active Archive Center (DAAC) demonstrate data products at the ASDC that can be used to visualize these parameters. The presentation uses data from the ASDC-supported NASA missions Measurements Of Pollution In The Troposphere (MOPITT), Cloud-Aerosol and Infrared Pathfinder Satellite Observation (CALIPSO), Tropospheric Emission Spectrometer (TES), and Multi-angle Imaging SpectroRadiometer (MISR)

TES Ozone, CH₄, CO, CO₂, & H₂O

The TES dataset provides a record of ozone, methane, carbon monoxide, carbon dioxide, and water vapor sampled from a lidar instrument that resolves data points at multiple altitudes in the column. Global coverage time series data, averaged monthly, is available from October 2004 to 2018 although some gaps exist. Shown here is TES L3 Monthly average CO at the surface for Feb, May, Aug, Nov 2006:

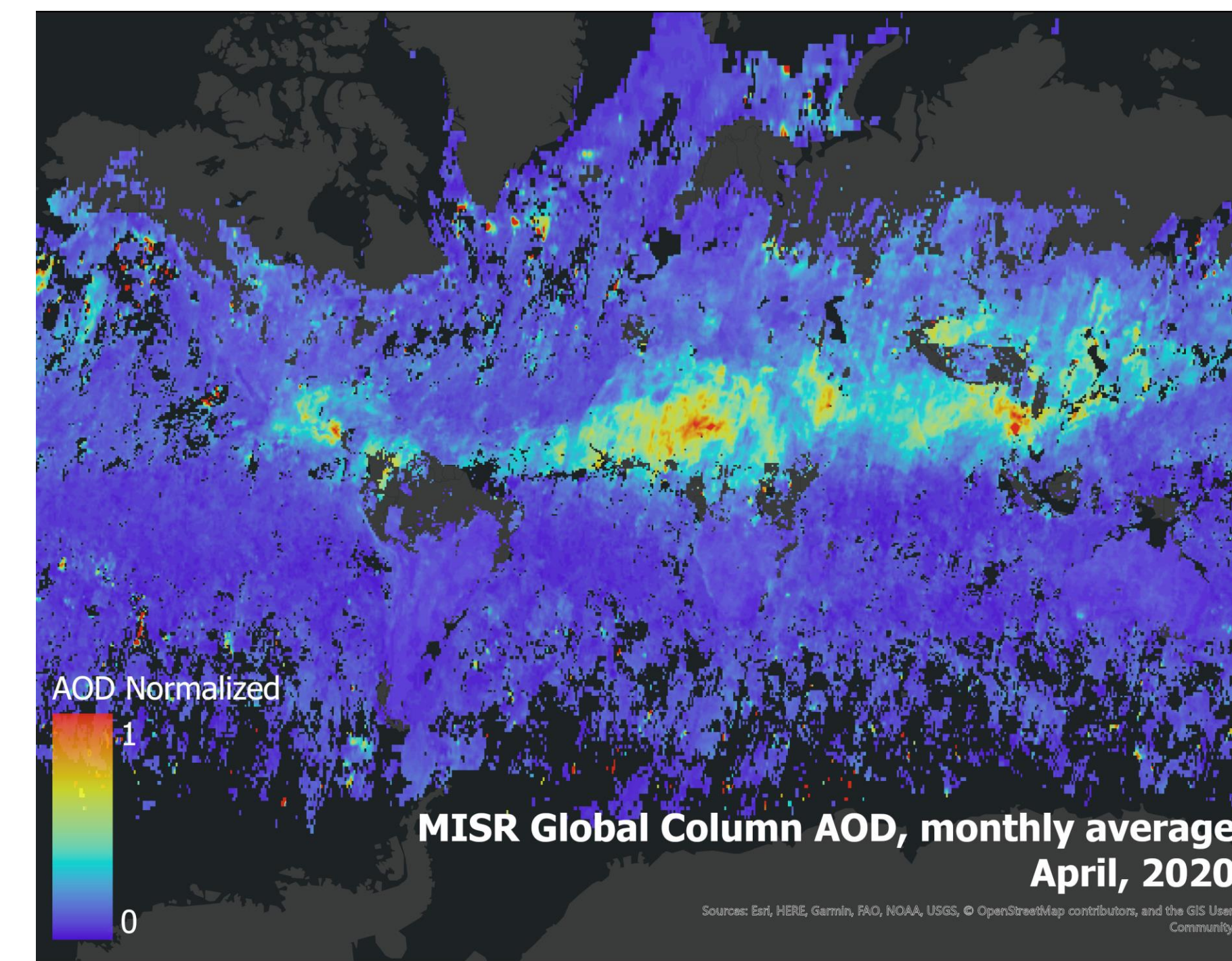


Use Case: Surface Ozone Studies

Time series TES data can provide a record of surface ozone samples from 2004 to 2018 for subset megacities or regions. Lidar footprints provide a continuous record at the same sampling points.

Source: NASA JPL
<https://tes.jpl.nasa.gov/data/plots/averages/monthly-mean-co-681hpa>

MISR Global Column AOD Time Series Daily and Monthly Image Service

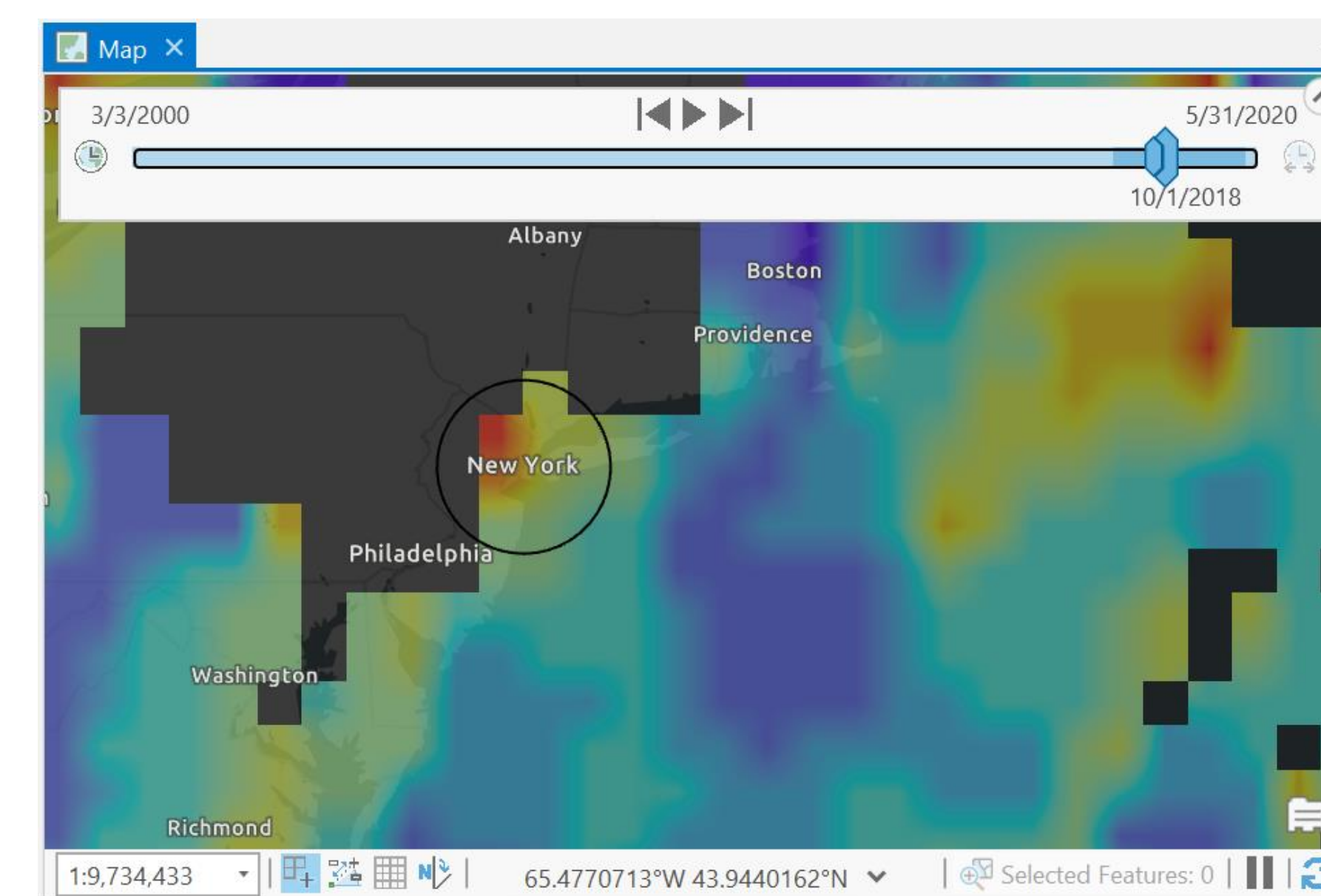


MISR Level 3 FIRSTLOOK Global Aerosol product is a global summary of the Level 2 aerosol parameters of interest averaged over a month and reported on a geographic grid.

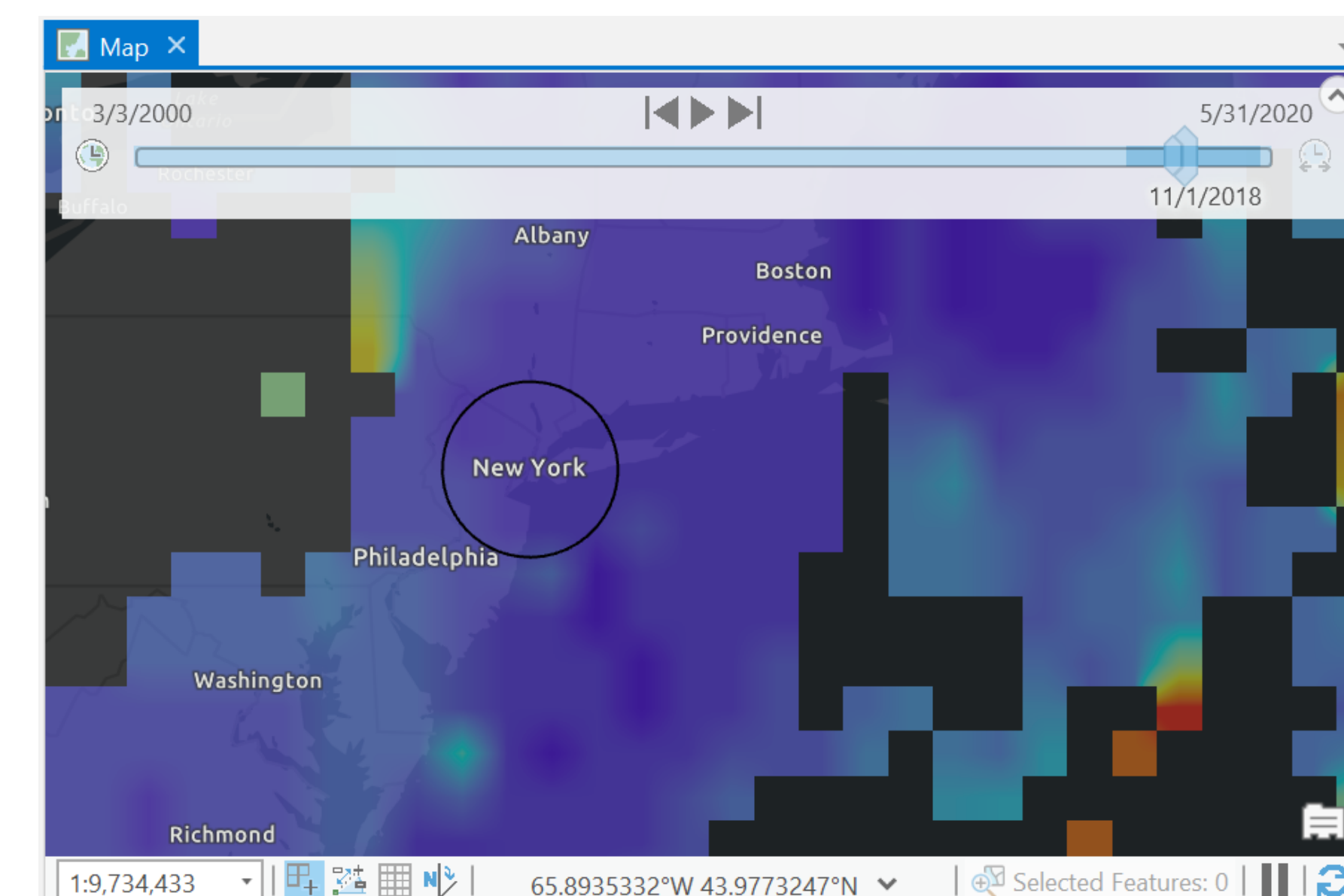
Spatial resolution: 0.5 degree by 0.5 degree.

Temporal range: October 2017 to June 2020

Use Case: AOD time series in New York City with GIS



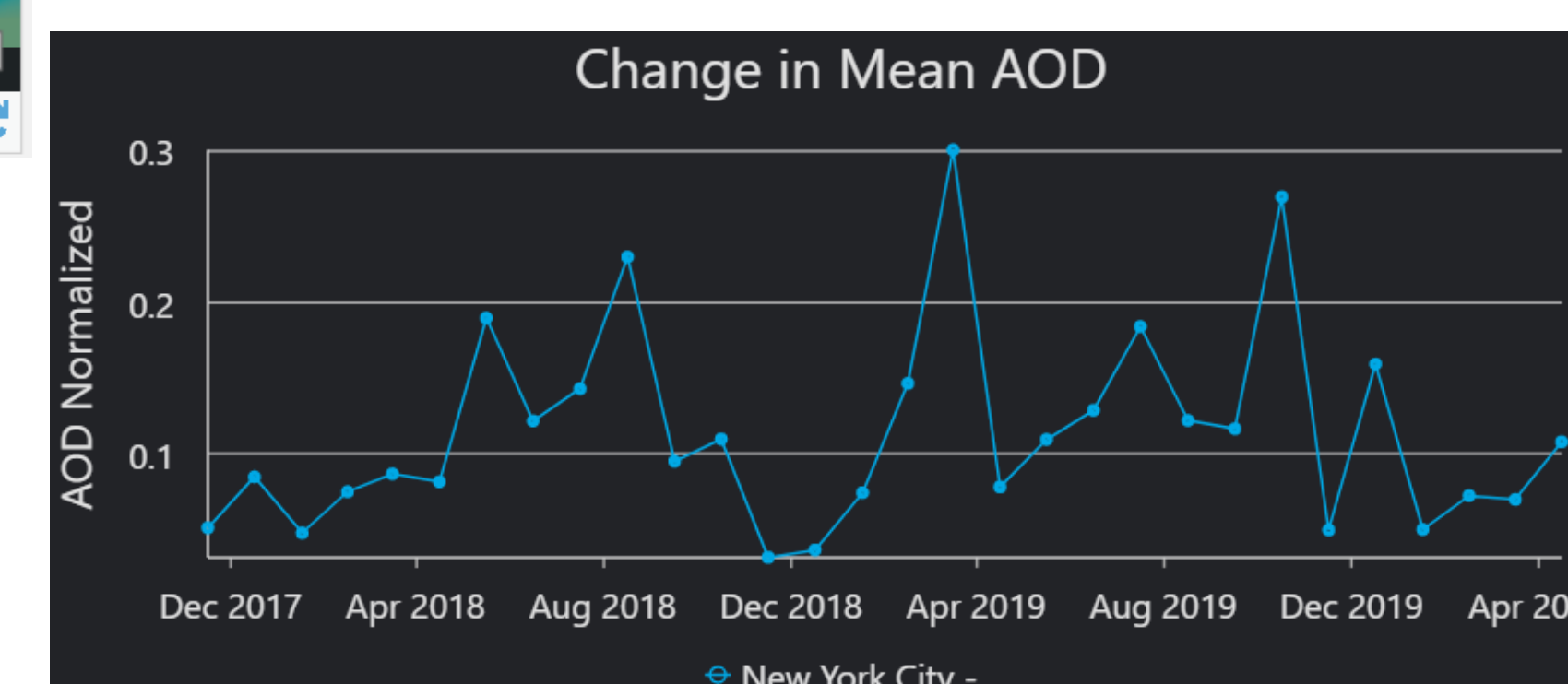
MISR AOD for October 2018, in GIS



MISR AOD for November 2018, in GIS

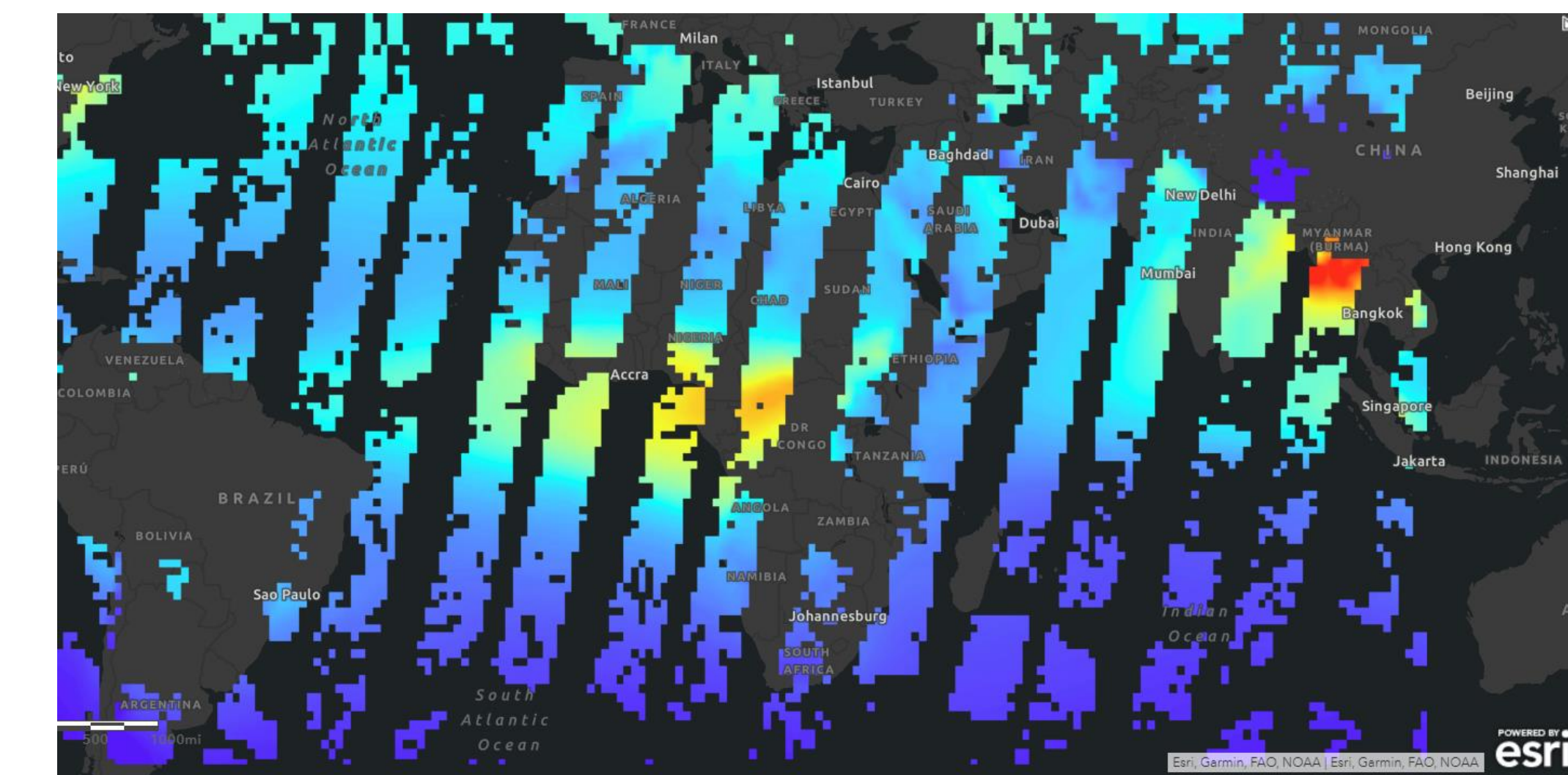
Earth observation data can be helpful in advancing knowledge about particulate pollution and its related risks for cities and populations. Aerosol Optical Depth (AOD) detected from space such as the MISR product provides one such measure of surface air quality.

Using the MISR AOD time series we can explore data and evaluate change in the column AOD over any subset city or region with GIS tools. Connecting to the MISR monthly AOD product via the GIS data portal, the multidimensional toolkit provided with the GIS software quickly produces graphs of the time series plots like the one shown here. With these tools we can view trends and evaluate change over time.



Average AOD time series for NYC

MOPITT CO Total Column Daily Time Series Image Service



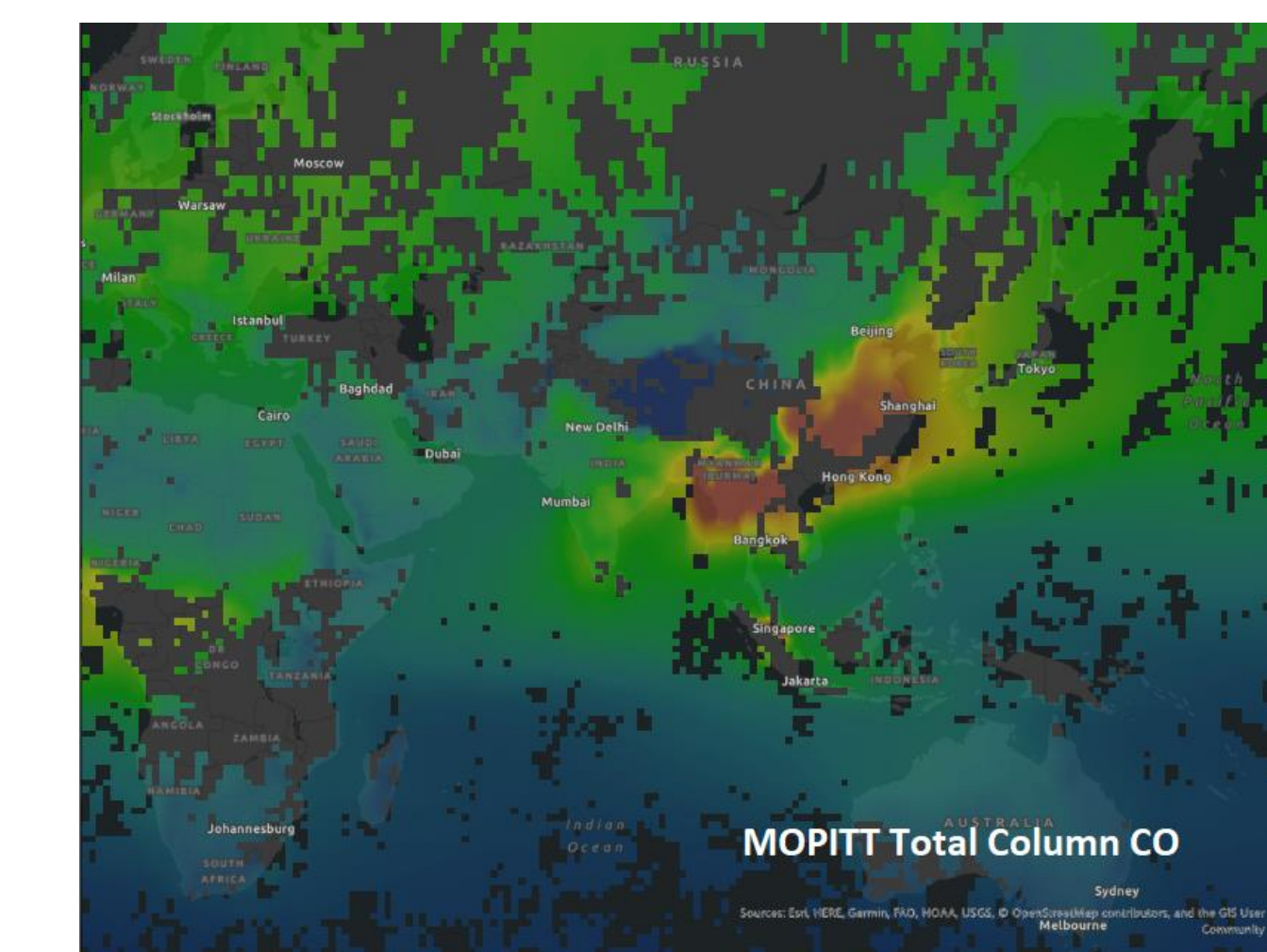
MOPITT A Priori CO Total Column Gridded Daily mean time series product.

Spatial resolution: 0.5 degree by 0.5 degree.

Temporal range: March 2000 to March 2020

Use Case: Surface CO studies

Carbon Monoxide emissions are some of the most abundant, and are primarily driven by transportation sources. At sufficiently high concentration they can cause health problems in humans. This continuous time series data is available as GIS image service for subsetting and analysis at regional and national scales.

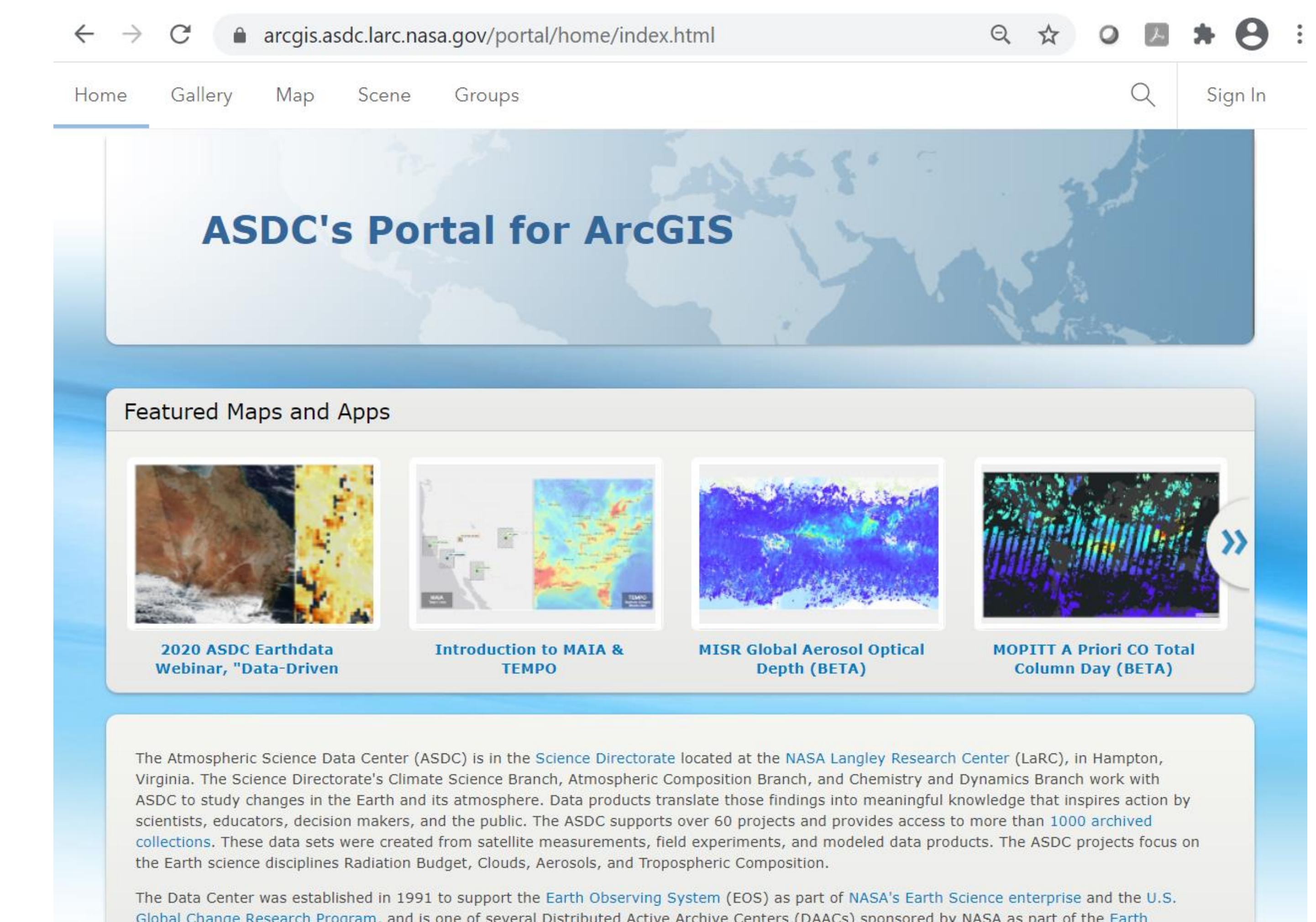


Accessing the MOPITT time series image service provides the user with access to explore, query, and aggregate data over the time dimension for trend analysis.

Here is a plot of aggregate mean monthly CO for east Asia.

Connect to the NEW Portal for ArcGIS at ASDC

- Access point for MISR and MOPITT time series image services for GIS
- Explore ASDC Storymaps



<https://arccgis.asdc.larc.nasa.gov>