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## Air Quality Measurement and Analysis by TROPOMI, OMI, MLS, OMPS, TANSO-FTS , and MERRA-2

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Global and regional air quality measurements play an important role in the everyday life of people, inasmuch as atmospheric constituents such as ozone (O<sub>3</sub>), carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), methane (CH<sub>4</sub>), and aerosols may cause severe threats to human health and agriculture productivity. Space-based sensors on satellites are able to detect these atmospheric constituents directly and indirectly at high spatial and temporal scales. The TROPOspheric Monitoring Instrument (TROPOMI) on the Copernicus Sentinel-5 Precursor (Sentinel-5P) satellite provides measurements of O<sub>3</sub>, NO<sub>2</sub>, SO<sub>2</sub>, CH<sub>4</sub>, CO, formaldehyde (HCHO), aerosols, and cloud in ultraviolet-visible (UV-VIS), near infrared (NIR), and shortwave infrared (SWIR) spectral ranges. The Ozone Monitoring Instrument (OMI) aboard the Aura mission measures ozone, aerosols, clouds, surface UV irradiance, and trace gases including NO<sub>2</sub>, SO<sub>2</sub>, HCHO, BrO, and OCIO using UV electromagnetic spectrum bands. The Ozone Mapping Profiler Suite (OMPS) on the Suomi National Polar-Orbiting Partnership (Suomi-NPP or SNPP) provides environmental data products including O<sub>3</sub>, NO<sub>2</sub>, SO<sub>2</sub>, and aerosols. The Microwave Limb Sounder (MLS) on Aura has been monitoring atmospheric chemical species (CO, volcanic SO<sub>2</sub>, O<sub>3</sub>, N<sub>2</sub>O, BrO), temperature, humidity, and cloud ice since 2004. MLS measurements help understand stratospheric ozone chemistry, and the effects of air pollutants injected into the upper troposphere and low stratosphere. The Thermal And Near infrared Sensor for carbon Observation - Fourier Transform Spectrometer (TANSO-FTS) on the Greenhouse Gases Observing Satellite (GOSAT) covers a wide spectral range from VIS to thermal infrared (TIR), which enables remote observations of the greenhouse gases carbon dioxide (CO<sub>2</sub>) and CH<sub>4</sub>. Furthermore, atmospheric constituent data are also available in the second Modern-Era Retrospective analysis for Research and Applications (MERRA-2) NASA's atmospheric reanalysis data collection. MERRA-2 uses an upgraded version of the Goddard Earth Observing System Model, version 5 (GEOS-5) data assimilation system, enhanced with more aspects of the Earth system.

The NASA Goddard Earth Sciences Data and Information Services Center (GES DISC) supports over a thousand data collections in the focus areas of Atmospheric Composition, Water & Energy Cycles, and Climate Variability. Some of these data collections include atmospheric composition products from the ongoing TROPOMI, OMI, OMPS, MLS, TANSO-FTS, and MERRA-2 missions and

projects. The GES DISC web site (<https://disc.gsfc.nasa.gov>) provides multiple tools designed to help data users easily search, subset, visualize, and download data from these diverse sources in a unified way. We will demonstrate several methodologies employing these tools to monitor air quality.