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GISC 606

*Air Pollution Monitoring and Analysis*

Air pollution is an important issue in many developing and urban areas around the world. It can result as a consequence of industry activity, vehicle emissions, and many other anthropogenic activities. Air pollution can cause many health issues including asthma, cancer, and an overall decreased life span. Unfortunately, this issue predominately effects lower-income, minority communities. Thus, it is important to be able to monitor air pollution in order to determine its source and determine which communities are facing the most effects. One method of monitoring air pollution is to use remote sensing.

The California Air Resources Board (CARB) is an agency which oversees all air pollution control in California. Using NASA’s Moderate Resolution Imaging Spectroradiometer (MODIS) Aersol Optical Depth (AOD, 10 km data), CARB is able to use satellite remote sensing to measure air quality. AOD is a measure of light extinction by atmospheric aerosols. By measuring it, researchers are able to predict ambient PM2.5, a criteria pollutant (CARB). Measuring the spatial distribution of these pollutants can be a useful way to study air pollution hotspots, health effect studies, and air pollution trends.

One country who faces many issues with air quality is China. Since China’s economy has developed so rapidly, it has come at a great detriment to the environmental quality. Common air pollutants that affect China are nitrogen oxides, carbon oxides, sulfieds, particular matter, photochemical oxides, and more (Xue et al., 2016). Another NASA satellite, the Aura Satellite, is a satellite used to observe and study the earth’s ozone layer. The satellite is equipped with an ozone monitoring instrument (OMI) and uses pixel based analysis to analyze pollutants in the atmosphere (Ju, et al, 2022).

The OMI sensor measures criteria pollutants in the atmosphere and can also detect volcanic ash and sulfur dioxide produced in volcano eruptions.The OMI is derived from NASA’s Total Ozone Mapping Spectrometer (TOMS) instrument. The OMI measures ozone profiles (in UV) complementary to the measurements of TES and HIRDLS (in IR) and MLS (in microwave). Specifically in the OMI measures the backscattered radiation of the atmosphere with a wide-angle telescope which feeds the images to two imaging grating spectrometers. Each spectrometer uses a CCD detector. Onboard the sensor, the instrument is calibrated using white light sources, LEDs and a multi surface solar calibration diffuser. A depolarizer is used to remove polarization from the backscattered radiation (NASA Aura).

With the use of this technology, researchers can gather important information on localized areas of pollution in order to determine the causes and work on remediation at the source. For many developing countries such as China, this can be an important tool to help them develop in a sustainable way and to quantify exactly how the development is affecting the health and safety of their citizens. In general as well, these satellites are an important tool in areas worldwide to be able to accurately monitor pollution and air quality.

*The Aura Mission*. (n.d.). Aura. https://aura.gsfc.nasa.gov/

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