Earthzine VPS Transcript
Stennis Space Center – Health and Air Quality Team

Shelby Barrett: Increased concern for the environment throughout the late 20th Century has led to legislation to regulate the nation's air quality. Tropospheric ozone, commonly referred to as ground level ozone, is the most significant air pollutant having a greater cumulative effect on the environment than all other air pollutants combined. Federal land managers are charged by the Clean Air Act to monitor tropospheric ozone levels; however, ground level ozone monitors are sparsely located throughout the United States. This project created a method for determining the feasibility of using NASA air quality remote sensing to augment the USDA Forest Service's ambient ozone monitoring program and performed an analysis of a small sample of data.

Aaron Brooks: Hi, I'm Aaron Brooks, and I recently completed my masters in neuroscience at Tulane University.

Shelby Barrett: I'm Shelby Barrett, and I'm studying environmental biology and chemistry at William Carey University.

Aaron Brooks: Ozone forms in both the stratosphere and the troposphere. In the stratosphere, ozone serves as a vital shield against harmful ultraviolet radiation; however, in the troposphere, ozone is a pollutant harmful to both humans and plants. Tropospheric ozone forms as a result of reactions between sunlight, nitrogen oxides, and volatile organic compounds. Significant sources of these reactants include solvents and organic chemicals, biomass burning, and the burning of fossil fuels. These pollutants can be carried over long distances.

Shelby Barrett: Ozone damage to plants causes forest foliage to change colors, shortens their life span, and increases their susceptibility to invasive species and drought. Ozone is readily absorbed by plants and can reduce photosynthetic activity. In this image, the soybean leaves on the left show normal photosynthetic activity and the leaves to the right show the reduced photosynthetic activity of soybean leaves exposed to elevated ozone levels. Prolonged human exposure to elevated levels of ozone can aggravate asthma, reduce lung capacity, and even lower the immune system.

Aaron Brooks: Currently the USDA Forest Service monitors ambient ozone levels with in situ monitoring stations located throughout the United States. These stations are heavily concentrated near urban areas such as this station in the New Orleans, Louisiana area and are sparsely located throughout rural and other undeveloped areas. The Forest Service processes information collected by monitors into statistics that are used to assess the threat of increased ozone levels on vegetative and overall forest health.

Shelby Barrett: This project utilized an experimental product that combines data from two sensors aboard NASA's Aura mission. The Ozone Monitoring Instrument measures a total column of ozone between the sensor and the earth's surface, and the Microwave Limb Sounder measures stratospheric column ozone. Scientists at the Goddard Space Flight Center have created a method that, in essence, subtracts these two data sets from one another leaving only tropospheric column ozone measurements. This data is currently being investigated as a way to measure global ground level ozone trends, but our project developed a method for testing the feasibility of using this data on a more local scale.

Aaron Brooks: The first step in creating a method to compare the US Forest Service data with the NASA product was to convert the two data sets into a comparable format. The OMI/MLS raw data product provided monthly mean ozone measurements in volume mixing ratio in parts per billion. These data were processed and converted to parts per million using ENVI's IDL reader and ESRI's ArcGIS. A shape file of Forest Service ozone monitoring sites was created using ArcGIS, and these points were linked with monthly mean ozone measurements derived from in-situ ozone measurements taken at the approximate time the OMI/MLS sensors passes over the ozone monitoring location. Each ozone monitoring station was compared to the nearest OMI/MLS measurement using the ArcGIS Extract Multi Values to Point tool.

Aaron Brooks: The most valuable result gained from this project is a methodology to compare remote sensing ozone values to ambient ozone measurements obtained by the Forest Service. This will be valuable as the project continues into the next DEVELOP term. We also performed a high level comparison between the OMI/MLS and Forest Service data. This graph shows the difference between these data; however, we would like to perform a more in depth analysis and expand the study area and period to include more locations and multiple years. This image shows a graduated point scale that represents the percent difference of the data sets for September 2005. This shows that most of the point measurements for September were only 10 to 20% different than the remote sensing values derived from the OMI/MLS data product.

Shelby Barrett: Future work for this project includes: performing an in-depth comparison of the forest service ozone measurements with the OMI/MLS data product, comparing ambient ozone measurements with data from other NASA instruments available through the NASA Giovanni tool including total column ozone from OMI, the tropospheric emission spectrometer, and the atmospheric infrared sounder. We would also like to create a sustainable tool that the US Forest Service can use to enhance its current monitoring practices using remote sensing data.