**NASA DEVELOP National Program**

NASA Langley Research Center

**Summer 2014**

**Texas Health and Air Quality**

*Evaluating the Application of DISCOVER-AQ Data to Monitor Air Quality in Houston, Texas*

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**Past or Other Contributors:**

N/A

**Applied Sciences National Applications Addressed:**

Health and Air Quality

**Study Area:** Houston, Texas, USA

**Study Period:** September 2013

**Partners/Collaborators**

NASA DISCOVER-AQ Team: Dr. Richard Ferrare, Dr. Patricia Sawamura and Amy Jo Scarino

**80-100 Word Blurb**

In September 2013, the NASA DISCOVER-AQ team deployed a campaign to more accurately monitor aerosols in Houston, Texas. The operation used NASA satellites and airborne measurements to capture data in accordance with ground-level measurements at 10 locations throughout the greater Houston area. Throughout the summer term, the Texas Health and Air Quality team is working to analyze the data acquired from the DISOVER-AQ team. Our objective is to observe how well PM2.5 ground levels can be remotely monitored. A more effective and accurate method could better predict future levels and assist public health officials in determining air quality standards and warnings.

**Community Concerns**

* Aerosol and airborne particle inhalation can cause respiratory issues such as asthma and lung cancer.
* Houston only has 10 ground stations that measure PM2.5 data, which limits the amount of data gathered for air quality forecasts.
* High Resolution Spectral LIDAR (HSRL) measurements could more accurately predict air quality, leading to more informed community health.

**Current Management Practices & Policies**

The City of Houston’s Bureau of Pollution control and Prevention (BPCP) currently monitors PM2.5 levels from 10 stationary air monitoring sites. The Environmental Protection Agency (EPA) calculates levels of particulate matter and four other major pollutants - ground-level ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide - to formulate the Air Quality Index (AQI). The AQI is used to determine how safe and clean the air is in a certain area, and is represented on a numbered scale with levels of under 100 being generally healthy. The AQI is used by Houston officials to report daily air quality for the city area.

**Abstract**

Surface level particulate matter (PM2.5) strongly impacts air quality and is known for being a common pollutant that is destructive to a person's lungs and overall health. Monitoring PM2.5 is more difficult in urban areas, and in the Houston, Texas area specifically, there are only 10 ground level monitoring stations. Public health officials in Texas worked with NASA’s DISCOVER-AQ to capture Earth observations throughout the month of September, 2013. The total data acquired includes information from NASA’s Moderate Resolution Imaging Spectroradiometer (MODIS) onboard the Aqua and Terra satellites, High Spectral Resolution LIDAR (HSRL) sensors on the B200 King Air Aircraft, *in situ* data from the P-3B Aircraft, and ground monitors. Comparing measurements from these sources will produce a more robust understanding of near-surface pollution. Analyzing measurements from the aircraft and from ground-based monitoring sites can help in evaluating and predicting future ground-level pollution from space. Increased accuracy when monitoring can help officials assess and forecast air quality. Air quality forecasts will help the general public take the necessary health precautions such as avoiding prolonged outdoor activity when PM2.5 levels are high.

**Decision Support Tools**

* Maps of PM2.5 particle measurement in the Houston Area
* PM2.5, Extinction, AOD correlation between the different platforms
* Improved MODIS data analysis for air quality monitoring

**Benefit to End-User:**

* Improved air quality forecasting and assessments
* Potential for increased understanding of seasonal and long term respiratory health issues

**Earth Observations & Parameters**

B200 King Air Aircraft, HSRL- Aerosol Extinction, Aerosol Optical Depth

P-3B Aircraft, TSI SMPS, DMT UHSAS, TSI 3321 - Aerosol Particle Size, Average Humidification Factor

Aqua and Terra, MODIS - Aerosol Optical Depth

**Future Applicable NASA Missions**

N/A

**Models Utilized**

N/A

**Ancillary Datasets Utilized**

Texas Commission on Environmental Quality and the City of Houston – *in situ* PM2.5 measurements from 10 ground measurement sites in the flight path

**Software Utilized**

Matlab - Data visualization and analysis

ArcGIS - Raster manipulation/analysis, and map creation to project Aqua and Terra, MODIS, HSRL, and in-situ data