

IDEA-I Air Quality Forecast Software Package: Aerosol, Ozone, and Carbon Monoxide Detection and Trajectories

Rebecca Cintineo, James Davies, Bradley Pierce*, Elisabeth Weisz, Nadia Smith, and Kathy Strabala
Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison
**NOAA/STAR/ASPB*

The Infusing Satellite Data into Environmental Applications – International (IDEA-I) software package has been developed as a part of the NASA funded International MODIS/AIRS Processing Package (IMAPP) to aid air quality forecasters in the prediction of the movement of aerosols and trace gases using direct broadcast satellite data. The initial development of IDEA came about as a partnership between NASA, NOAA and the US Environmental Protection Agency (EPA) whose defined goal was to improve air quality assessment, management and prediction. After a successful deployment of the system in the US using direct broadcast polar orbiter data, the software was ported for use by the international community. There are now separate IDEA-I software packages available for forecasting the movement of aerosols and ozone that can be downloaded from <http://cimss.ssec.wisc.edu/imapp>.

Basic software workflow

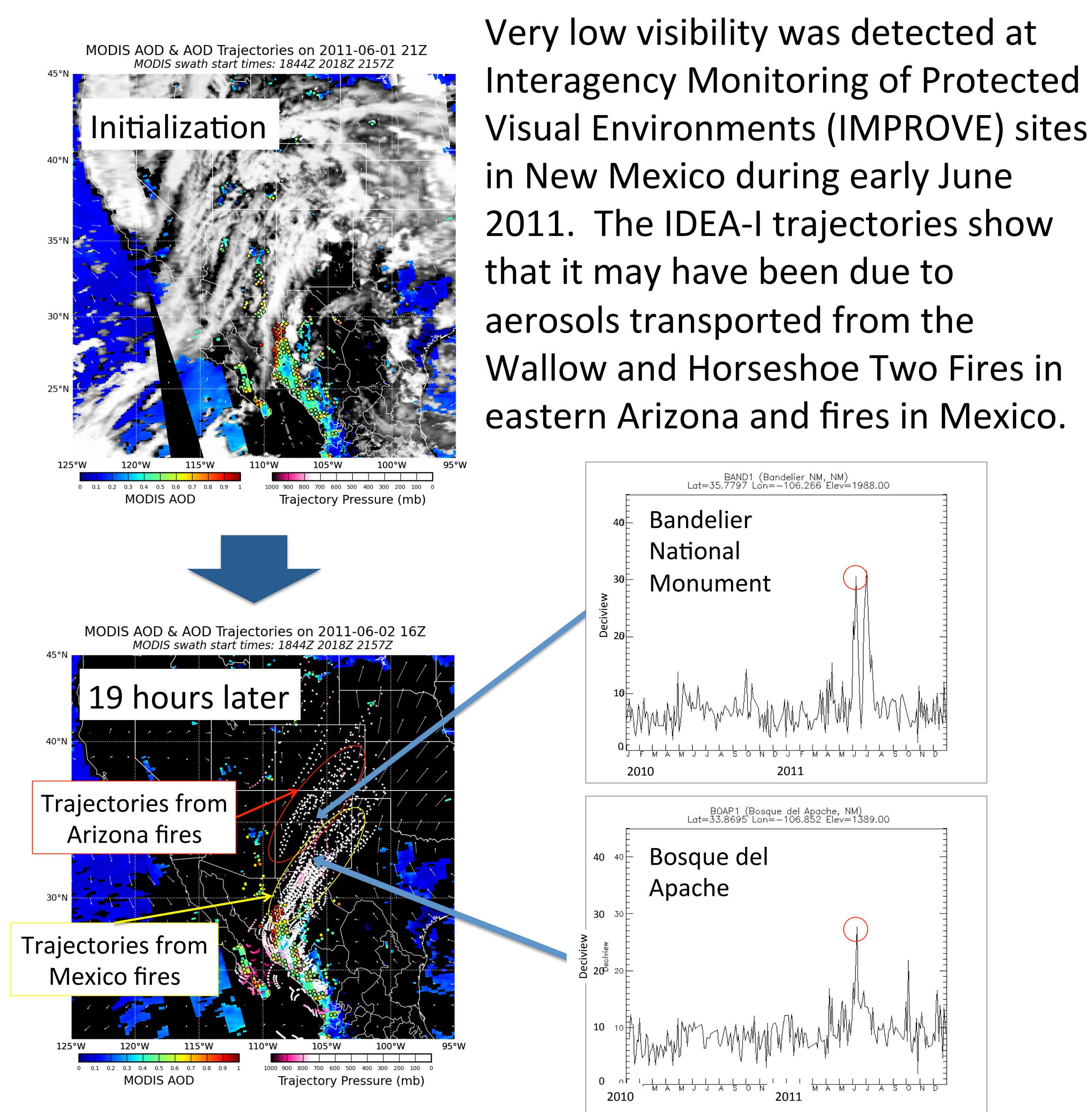


IDEA-I Aerosol

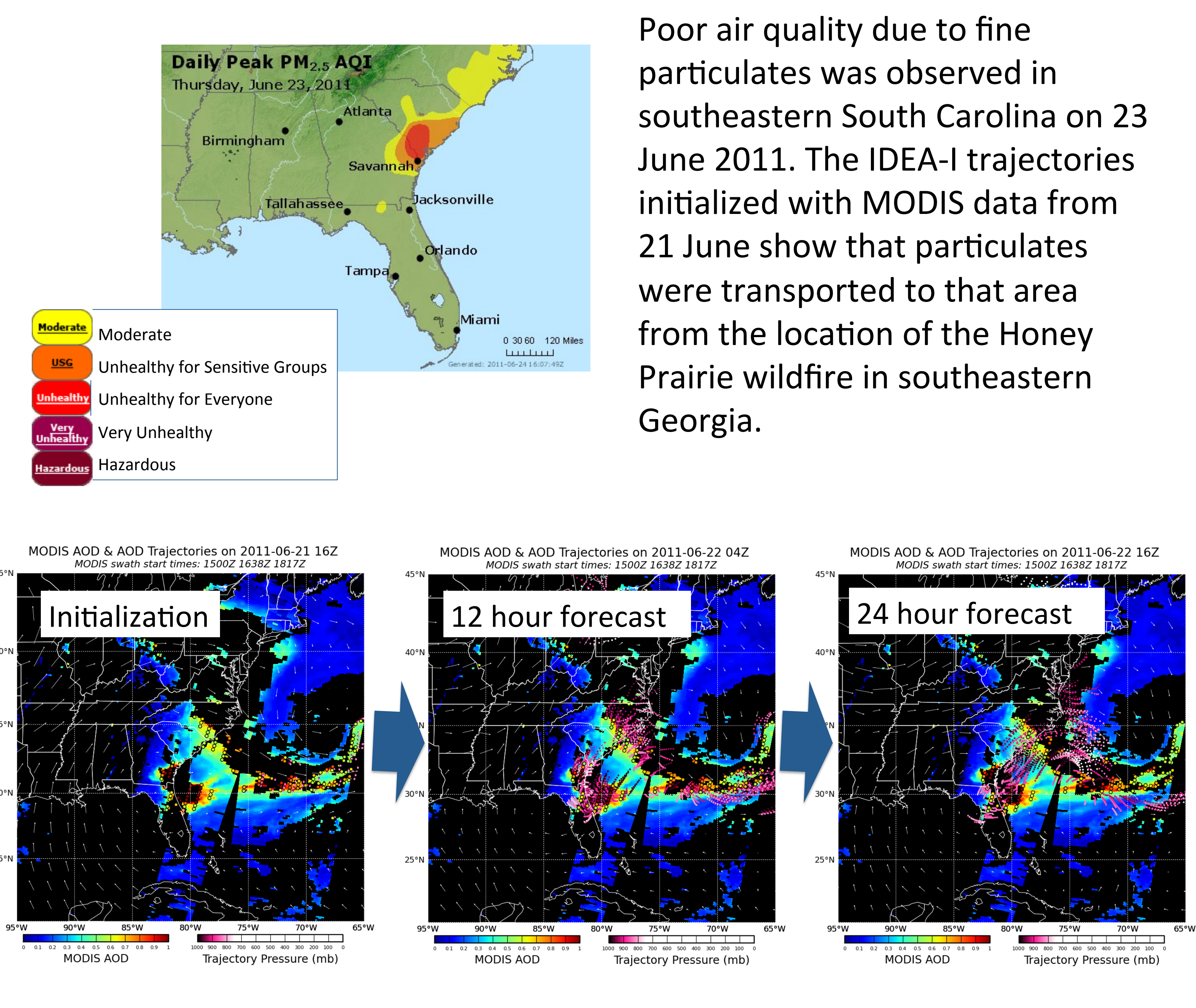
The IDEA-I Aerosol software uses the MODIS aerosol product (MOD04) to identify locations with large aerosol optical depth that are used to initialize the trajectory model to forecast where the aerosols may be transported in the next 48 hours. The output can be used to determine whether they could potentially end up at heights that would affect the air quality in the boundary layer or, inversely, from where pollution may have originated.

The MODIS aerosol products are created using the MODIS Level 2 software available for download at <http://cimss.ssec.wisc.edu/imapp>. Collect 5 or Collect 6 products can be used with IDEA-I aerosol.

Real time IDEA-I Aerosol products for the US can be viewed at <http://cimss.ssec.wisc.edu/idea-i/USaerosol>.



June 2011 Wildfire Examples



IDEA-I Ozone

A separate IDEA-I system uses ozone and dew-point depression retrievals from the Aqua AIRS, S-NPP CrIS, and MetOP IASI hyperspectral sounder instruments to initialize trajectories. The products that are created can be used to help determine when and where high surface ozone due to stratospheric intrusions (SI) may arise.

3 criteria are used to determine potential SI profiles with which to initialize the trajectories:

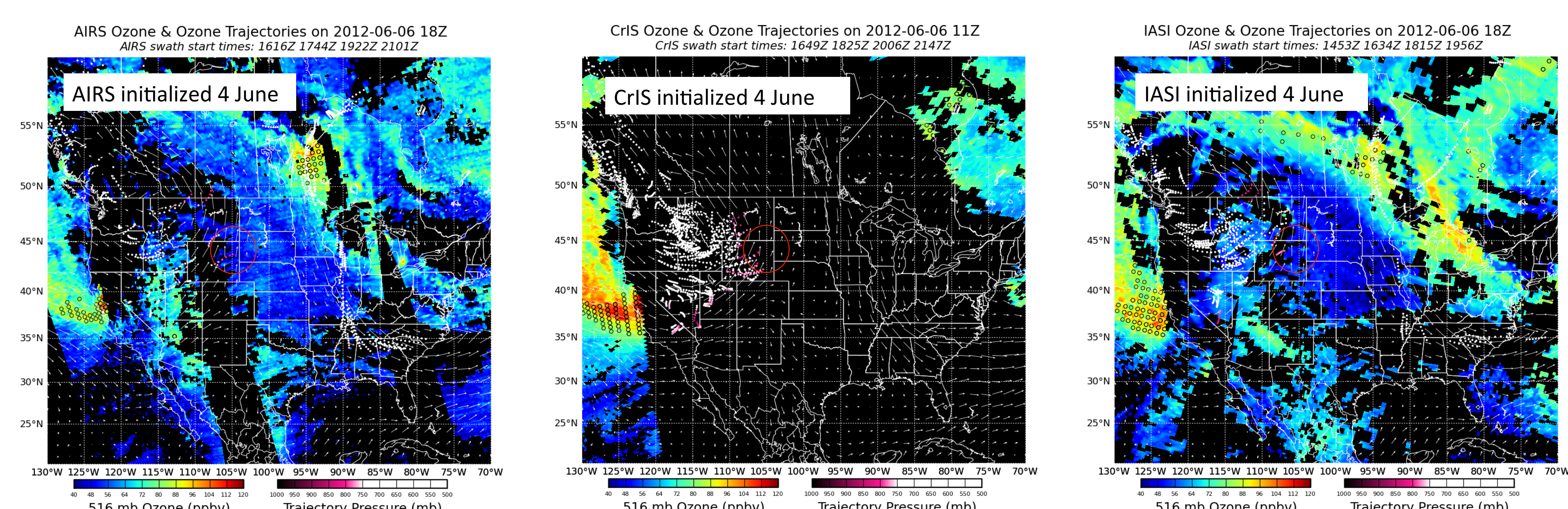
- 1) Pressures below 500mb
- 2) Ozone above 80 ppb
- 3) Dew point depressions > 15°C

The retrievals are created using the IMAPP UW-Madison AIRS, CrIS and IASI Dual Regression Single FOV Retrieval software which is freely distributed from <http://cimss.ssec.wisc.edu/imapp>.

Real time IDEA-I Ozone products for the United States can be viewed at <http://cimss.ssec.wisc.edu/idea-i/USozone>.

The current ozone National Ambient Air Quality Standard (NAAQS) set by the Environmental Protection Agency (EPA) is an 8-hour average of 75 ppb. If the cause of an ozone event that exceeds that standard can be proven to be natural and not human, that event does not count against the location's exceedances. Thus, it is important to be able to trace the origins of high-ozone events.

On 6 June 2012 a maximum surface ozone of 99 ppb was detected in northeastern Wyoming with an 8-hour average of 88 ppb, which is above the threshold set by the EPA. The IDEA-I SI ozone trajectories initialized with all three sounders show that a ozone SI detected off the coast of California two days prior was a likely source of the high ozone levels in the boundary layer in Wyoming on 6 June.



June 2012 Stratospheric Intrusion Example

Future Plans

- Update IDEA-I Aerosol to use the Collection 6 Deep Blue and 3-km Dark Target products
- Include carbon monoxide (CO) retrievals from AIRS, CrIS and IASI
- Create trajectory forecasts based on MODIS fire detection and enhanced CO

IDEA-I supports the Global Earth Observation Systems of Systems (GEOSS) Group on Earth Observations (GEO) Health Societal Benefit Area (SBA) and has been developed within the framework of the GEO Earth Observations in Decision Support. The views, opinions, and findings contained in this report are those of the authors and should not be construed as an official National Oceanic and Atmospheric Administration or U.S. Government position, policy, or decision.



Rebecca Cintineo
rebecca.cintineo@ssec.wisc.edu