**NOAA GOES-R Air Quality Proving Ground Workshop**

**September 14, 2010**

**Breakout Session: Review of Simulated ABI Case Study Data**

**Case Study 1: August 24, 2006**

**Goal:** The goal of this session is to give you the opportunity to view simulated ABI AOD data in detail, anticipate how it will enhance air quality forecasting and/or analysis, and provide feedback to NOAA on ABI data visualization and format options.

**Case Study Event Summary:** This was a fairly typical summer air quality episode in the East, with surface high pressure centered over the western Mid-Atlantic region. The result was several days of sunny skies, light winds, limited vertical mixing, and a modifying airmass. Code Yellow (Moderate) PM2.5 concentrations were widespread across the Mid-Atlantic, Southeast, and Mississippi Valley regions on August 24, with a few isolated areas of Code Orange (Unhealthy for Sensitive Groups) conditions. Several large wildfires burning in the northern Rocky Mountain States produced smoke that caused Code Red (Unhealthy) PM2.5 air quality in the vicinity of the fires. Smoke from the fires was transported aloft across the country to the Eastern U.S.

**Instructions:** The accompanying Power Point file contains general air quality and meteorological information, as well as simulated ABI data for August 24, 2006. Flip through slides 2-9 to familiarize yourself with the air quality event, using the steps below to guide your analysis. Then focus on slides 10-14, which contain simulated ABI AOD data for the event, and answer the associated questions in step 7. Your answers will be the basis of the Group Discussion this afternoon.

1. **Open the accompanying Case Study 1 Power Point file *and activate it in “slide show” mode.*** The file can be downloaded from the AQPG website (<http://alg.umbc.edu/aqpg/>).
2. **24-hour average PM2.5 and ozone AQI values for August 24 (slides 2-3).** Air quality in the East had been consistently in the Code Yellow-Orange range for several days leading up to August 24. Note the widespread Code Yellow PM2.5 AQI values across the Eastern U.S. on August 24 due to haze, and the Code Red, Orange, and Yellow PM2.5 AQI values in Idaho due to smoke from large wildfires in the northern Rocky Mountain States.
3. **Synoptic surface analysis and radar for 12-15 UTC on August 24 (slides 4-5).** Note the area of surface high pressure centered over West Virginia and lack of precipitation across much of the country.
4. **NOAA Hazard Mapping System (HMS) fire and smoke product (slide 6).** The HMS map shows fire “hotspots” (red dots) identified by satellites and locations of smoke plumes (grey shapes) identified by NOAA analysts using GOES visible satellite imagery. On August 24, HMS indicated that smoke from wildfires in the northern Rockies stretched across the central U.S. all the way to the Atlantic Ocean.
5. **Terra MODIS true color and aerosol optical depth (AOD) images for August 24 (slides 7-8).** The Terra satellite has a morning overpass, so these images correspond to observations at approximately 10:30 AM local time. The true color image looks like a photograph, but it’s generated from the visible (red, green, and blue) bands of the MODIS instrument. Note the smoke (grey diffuse feature) corresponding to the wildfires in Idaho, Montana, and Wyoming. The haze in the East is harder to see in the true color image due to the presence of clouds (bright white features). The Eastern haze is easier to distinguish in the MODIS AOD image. AOD is a unitless measurement of the scattering and absorption of visible light by particles in the atmosphere. Areas of high AOD (red, orange, and yellow regions in slide 7) correspond to high concentrations of PM2.5 from smoke in the northern Rockies and haze in the East.
6. **GOES Aerosol and Smoke Product (GASP) loop for August 24 (slide 9).** GASP is AOD from the GOES geostationary satellite. It is similar to MODIS AOD but has 30 minute temporal resolution, so there are many more observations per day, which can be more useful for forecasters. Areas of high AOD (red, orange, and yellow colors) correspond to high concentrations of PM2.5 from smoke in the northern Rockies and haze in the East.
7. **Simulated ABI AOD data loops for August 24 (slides 10-14).** Simulated ABI AOD data for the CONUS are presented in slide 10 and for the Northeastern, Southeastern, Northwestern, and Southwestern U.S. in slides 11, 12, 13, and 14, respectively. These simulated data are a representation of what AOD data from the ABI will look like when the GOES-R satellite launches in 2015. Recall from the presentations this morning that ABI will represent the “best of both worlds” of the current AOD products: ABI AOD will have the high temporal resolution of GASP (many observations per day) and the multi-wavelength band retrieval of MODIS (high accuracy).

* **Temporal Resolution:** The simulated ABI AOD data loops are in 30-minute increments. Actual ABI AOD data will have the potential for temporal resolution as high as 5 minutes, depending on image processing times.
  + **What is the maximum temporal resolution that you require for your forecasting and/or analysis needs? (30 min, 15 min, etc.)**
  + **Will you prefer still images of ABI AOD data or a loop? Or both?**
* **Spatial Resolution:** The simulated ABI AOD data have 4 km spatial resolution. Actual ABI AOD data will have 2 km spatial resolution.
* **Is 2 km spatial resolution sufficient for your forecasting and/or analysis needs? The resolution is fixed by the instrument technology, so we can’t increase it, but NOAA can take your feedback into consideration for future satellite instruments.**
* **Geographic Coverage:** The simulated ABI AOD loop covers the CONUS. Actual ABI AOD data will cover the entire disk of the northern and southern hemispheres, including the CONUS, Canada, Mexico, and Central America.
* **What areas of geographic coverage do you require? Is the CONUS sufficient? Do you prefer subsets of the CONUS, such as the ones presented in slides 11-14, or those that are available currently through IDEA for MODIS AOD data (http://www.star.nesdis.noaa.gov/smcd/spb/aq/)? Or do you prefer to view a larger geographic area that includes Canada and/or Mexico and Central America?**
* **Data Latency:** Actual ABI AOD data will be generated between sunrise and sunset, since visible light is required to make the measurement. The latency of ABI AOD data – how soon after observation that the data are available to you – will depend on image processing times.
* **What is the maximum latency that you can tolerate for your forecasting and/or analysis needs? (30 min, 1 hour, 2 hours, etc.)**
* **Is there a time of day (i.e., forecast deadline) after which you won’t consider ABI AOD data?**
* **Data Visualization:** The simulated ABI AOD data are only available as a graphical image loop. Actual ABI AOD data can be made available in a wide variety of data formats to support a range of visualization needs.
* **In what data formats would you like NOAA to make ABI AOD data available?** Examples include:
  + graphic files (gif, jpeg, png)
  + Google Earth/virtual globe files (kml, kmz)
  + GIS files (GeoTIFF)
  + data files (netCDF, HDF)
* **Data Applications:** 
  + **For what application(s) do you anticipate that you will use ABI AOD data?**
    - forecasting
    - retrospective analysis
    - outreach/briefing of policy-makers or stakeholders
    - justification for Exceptional Event exemptions
    - other (please specify)
    - **What aspect(s) of air quality do you anticipate that you will use ABI AOD data to analyze?**
  + regional/local transport of smoke/dust
  + location/extent of haze
  + other (please explain)
    - **What feature(s) of GOES-R ABI data will have the biggest impact on your applications, compared to current GOES products?**
      * high temporal resolution
      * “MODIS-like” accuracy of ABI AOD data
      * 16 bands of radiances (vs. 5 on current GOES)
      * other (please specify)
* **Data Validation:** 
  + **Would you like to have access to validation information for ABI AOD data, such as accuracy and bias measures and known artifacts?**
* **What can NOAA do in general or the AQPG do in particular to make GOES-R data more useful for air quality forecasters and analysts?**