# Demonstration of a Global Fire/Aerosol Operational Product

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The Atmospheric Composition Constellation (ACC) is one of four Constellations proposed by CEOS to support the overall goals of the Group on Earth Observations (GEO) and to provide prototype space-based Earth-observation systems for GEOSS, the Global Earth Observation System of Systems. As part of a CEOS ACC, it is envisioned that a constellation prototype can be developed using several satellites that have the capabilities to measure the global distribution of fire occurrences and aerosol distributions. The fire and aerosol distributions, in conjunction with trajectory models, can be used to produce a forecast product related to large-scale aerosol events. The forecast product, in turn, can be used to provide forecast guidance for users to develop warnings on instances of potential degradation of air quality due to long-range transport of aerosols from widespread burning as well as from naturally occurring dust storms.

The satellite instruments proposed to make up this constellation include MODIS and CALIPSO to provide global aerosol products and GOES to provide regional aerosol products. Global fire detection would be provided by MODIS and regional fire detection would be provided by GOES. Dissemination of these products will follow the basic infrastructure that eventually came to fruition as part of the IDEA (Infusion of Satellite Data for Environmental Applications) Project which currently provides forecast guidance for the long-range transport of aerosols to US air quality forecasters.

Aerosol Optical Depth (AOD) algorithms have been developed from MODIS and GOES data while CALIPSO provides retrievals of attenuated aerosol backscatter. The AOD algorithms similar to MODIS data can be used to develop similar products for other operational satellites such as Meteosat Second Generation (MSG) Spinning Enhanced Visible Infrared Imager (SEVIRI). A fire detection product developed for the U.S. GOES satellite, the Wild Fire Automated Biomass Burning Algorithm (WF-ABBA) can likewise be used to provide the basis of such algorithms for other geostationary platforms, such as those currently operated by ESA, JAXA, etc.). NOAA is already developing/applying WF-ABBA to SEVIRI, MTSAT-1R and will apply it to INSAT-3D when it is launched, tentatively within the next year.

Initially, the project will focus on extending the AOD and fire detection data from the MODIS and GOES instruments to produce a global aerosol forecast based on the fire/aerosol forecast that has already been developed for IDEA. This product involves the coordination of efforts from NASA, NOAA, and EPA in the U.S.

The project will expand on this initial demonstration in two ways. First, the project will incorporate high vertical resolution of the distribution of aerosols obtained from CALIPSO measurements. These data uniquely provide altitude information about the distribution of particulate matter that is vital to forecasting whether or not these aerosols will entrain into the boundary layer where they can become detrimental to human health.

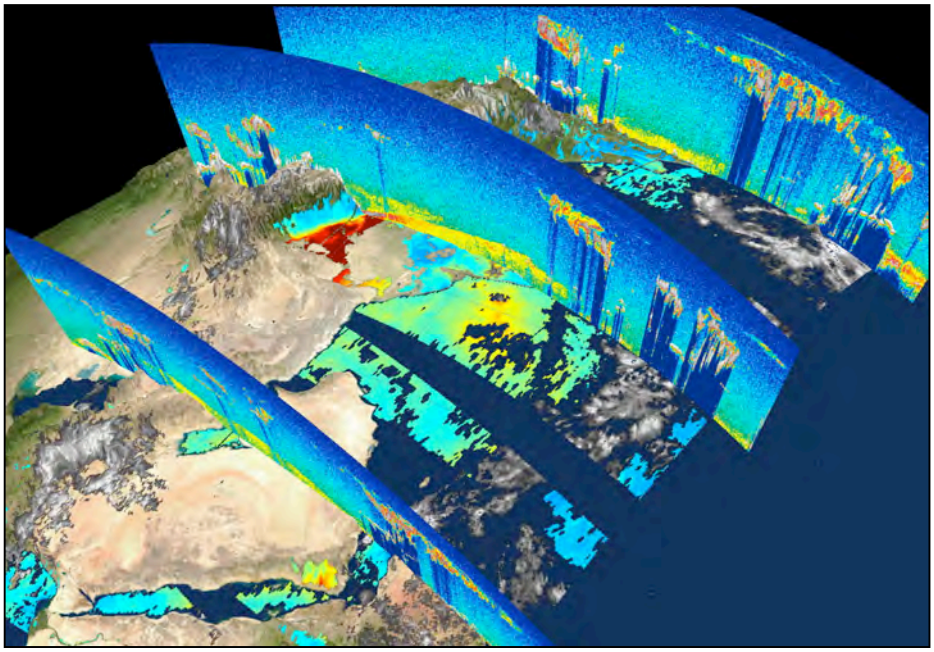
Second, the project will explore the extension of the system internationally by seeking distribution of the global products through SERVIR and other data delivery systems and by

working with international partners to create other regional implementations using data from other geostationary satellites (e.g. MSG/SEVIRI, INSAT-3D, etc.).

Using examples from ongoing interagency collaborations, the United States can illustrate the ability to integrate ground- and satellite-based observations of ozone, fine particulates, and fire activity with meteorological and air quality models in near real time to improve air quality forecasts and to provide valuable information to the public and to management and health officials. The information management and scientific tools used to perform this integration can be adapted and applied in other countries.

To develop generic tools that can link ground- and satellite based observations and air quality models to improved air quality forecasts and public health information requires some international agreements on data formats, quality, and accessibility. Some standards to guide this effort and a framework for further developing necessary standards are currently being addressed by GEO, and thus CEOS, as the space observations component of GEO, can spearhead this effort as the GEOSS vision emerges in the forthcoming years.

Thus, this project is consistent with the objectives outlined in the current (30 March 2007) GEO Work Plan which specifically identifies providing an "Integrated Atmospheric Pollution Monitoring, Modelling and Forecasting (HE-07-03)" as one of its highest priorities. By developing these tools and their applications through GEO, the individual applications of these tools can be linked together to create a global network of air quality information systems. The air quality information can then be linked to other relevant environmental and public health information to provide additional insights for environmental and public health management.



An example of the product that can be developed from a constellation of two currently existing satellite instruments: MODIS (2-dimensional horizontal depiction of AOD in color scale and clouds, in gray scale) and CALIPSO (2-dimensional vertical cross section showing altitude location of aerosols and clouds). Image is from 25 October 2006 looking east and northeast from Arabian Peninsula to the Tibetan Plateau in the north and the Bay of Bengal in the south. The depiction shows heavy aerosol loading over west India being transported into the Arabian Sea in the center of the image.