THE AEROSOL MEASUREMENT AND PROCESSING SYSTEM AND APPLICATIONS TO AFRICAN STUDIES

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The Aerosol Measurement and Processing System (AMAPS) simplifies access to aerosol data by moving computationally expensive and I/O intensive operations to the data sources, and returning the condensed results in a simple common format. This relieves analysts from much of the overhead associated with data retrieval. Analysis algorithms for collocation and comparison between sources are generalized so that researchers have access to a common set of tools applied consistently to each source.

AMAPS is an extension to the SciFlo [Yunck et al., 2004] grid computing system, tailored to the analysis of aerosol data. The SciFlo system provides efficient data query and access to remotely stored data. Complex and varied data formats and their locations are hidden from the user through a simple and consistent user interface. Parameters are combined on the fly from different sources and reduced before transfer, according to the needs of the analyst, and returned in an XML document. Among the satellite and ground aerosol data sources supported by SciFlo are the aerosol products from the Multi-angle Imaging SpectroRadiometer (MISR) [Diner et al., 1998] and Moderate-resolution Imaging Spectroradiometer (MODIS) [Kaufman et al., 1997] instruments on the EOS AM-1 Terra platform, MODIS on the EOS PM-1 Aqua platform, and the ground-based AErosol RObotic NETwork (AERONET) [Holben, et al., 1998], including the ocean-based Maritime Aerosol Network (AERONET-MAN).

AMAPS further simplifies data access and usage by geolocating data sources, interpolating parameters to common wavelengths, and providing an array of data reduction, analysis and plotting functionality. Because operations can be performed remotely, only the reduced results need to be transferred over the network, greatly diminishing the time and storage necessary for atmospheric studies. Objective assessments of the MISR and MODIS results are made possible by the use of consistent techniques. AMAPS has been used to assist in the areas of comparisons with and improvements to Global Climate Models, assessing potential MISR algorithm improvements, measuring instrument bias, studying air quality, examining dust sources and transport, and measuring regional aerosol variability. AMAPS may be used in two different modes: Power User and Service User modes. The Power User has full access to the AMAPS source code and the ability to add

functionality. The Service User has access only to a predefined set of capabilities through web-accessible forms. A portion of the Service User functionality will be made operational via the NASA Langley Data Access and Archive Center (DAAC) in the Spring of 2009. This interface will enable any user to access any MISR aerosol parameter(s) simply by entering geographic coordinates and a time range. Results are returned in an ASCII file.

In this paper, we describe the AMAPS system in detail, and demonstrate the application of the tool for studies tailored to the African continent and surrounding oceans. We assess the performance of MISR and MODIS optical depth retrievals using the African AERONET ground stations, identify instrument biases, and study atmospheric trends. We analyze particle properties such as size, shape, and Angström exponent, and their distributions. Particular attention is paid to the desert regions and the oceans west of them, and to the grasslands and forest regions that give rise to fires and smoke. We also illustrate the usage of the Langley DAAC web access to MISR data via the AMAPS Service User capability.