GRID ENABLED SIMULTANEOUS RETRIEVAL OF AEROSOL AND GROUND SURFACE REFLECTANCE FROM INTEGRATION OF AERONET AND SATELLITE DATA

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We present a method for simultaneously retrieving aerosol optical thickness and ground reflectance from ground-based and satellite observations collocated in space and time.

The exploiting the synergy of TERRA and AQUA MODIS data algorithm has been effective at retrieving the aerosol distribution and properties for various ground surfaces, including for high-reflective surface. However, uncertainties of this algorithm that are mainly introduced by factors, such as aerosol and water vapour spectral absorption, assumptions on invariant aerosol type, and the ground surface bidirectional properties effects, will cause fluctuations on result accuracy.

We show that a combination of down and up-looking observations provides sufficient measurement constraints for determining both aerosol and ground surface properties with minimal assumptions, and improves the accuracy of results retrieved only from satellite imagery.

In order to employ this concept in the method, the new inverse algorithm has been developed to retrieve surface reflectance in addition to aerosol parameters when co-incident Aerosol Robotic Network (AERONET) measurements are available.

The algorithm is described that will be implemented to retrieve aerosol properties globally using MODIS data. Over land, a choice of processing is made, depending on the surface types within a scene-dark water bodies, cloud contaminated areas, or average land. The aerosol property data acquired by ground stations can support such modeling by offering accurate atmospheric information. However, for retrieving modeling and AERONET data assimilation to be employed on a global operational basis, emphasis will have to be put

on bridging the mismatch between data availability and accuracy on one hand, and model and user requirements on the other. This was achieved by integrating imagery with different spatial resolutions, and the fusion of data with interpolation.

The increasing complexity of data assimilation methods and of functions retrieving surface reflectance has significantly increased computational demands. For this reason, we include a short section on the potential of parallel processing on a Grid platform to deal with the complex and computationally intensive algorithms. Because of the large volume of data to be processed on a daily basis, the algorithm relies on paralleled execution to expedite the radiative transfer calculations.

Experiments are presented in a realistic application, using real data collected by MODIS over land of China. We have developed middleware by which the retrieval algorithm can be parallel processed using Grid computing platform (RSIN) at IRSA (Institute of Remote Sensing Application), CAS (Chinese Academy of Sciences). Preliminary experiment of aerosol retrieval of nationwide range data set was conducted, in which aerosol properties and ground reflectance information can be simultaneously retrieved.

Results of retrieval sensitivity studies to aerosol properties are presented. Preliminary validations show good accuracy and this method has promising potential of being integrated to aerosol property monitor and high performance atmospheric correction.

Key words: Aerosol retrieval; Aerosol optical thickness; Surface reflectance; MODIS; Grid Computing;