Study of aerosol optical properties on South America using AERONET data analysis: preparation for EARTHCare ESA Satellite mission

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Abstract: In the last decade, a new generation of satellite missions have been developed using advanced lidar systems capable to retrieve several cloud and aerosol optical properties and distinguish different aerosol types by applying a polarization sensitive high spectral resolution lidar (HSRL) technique, as is the case of the Earth Clouds, Aerosols and Radiation Explorer (EarthCARE) mission, developed by the European Space Agency (ESA) together with the Japan Aerospace Exploration Agency (JAXA). The EarthCARE payload will be compound by four main instruments, a cloud profiling radar, with Doppler capability, the HSRL system, a multispectral imager and a broadband radiometer, enabling the retrieval of global profiles of clouds, aerosols, precipitation and radiation field properties. The Atmospheric Lidar system (ATLID) on board of EarthCARE will operate at 355 nm and will use the cross and co-polarized components of Mie and Rayleigh scattering to derive aerosol properties. An important task to be developed by ground-based research groups is the data validation process. In this context, the Latin American LIdar NETwork (LALINET) has been playing a key role in the cloud and aerosol studies by using lidar and/or the AERONET sunphotometers data. In order to prepare the most suitable strategy for calibration and validation (CAL/VAL) processes of the EarthCARE mission, we have employed an extensive study of aerosol optical properties derived from 21 AERONET sunphotometer stations all over South America, from a period of at least 20 year. The aim of this work is to present preliminary results of columnar aerosol optical properties, such as AOD, lidar ratio, scattering and absorption Angstrom Exponent, single-scaterring albedo and aerosol fine-mode fraction, in order to select cluster-zones by aerosol types to guide the validation methodology for ATLID system products, since the continent is dominated by high spatial and temporal variability of aerosol systems.

Keywords: AERONET sunphotometer; EarthCARE Satellite; validation process.

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