Geophysical Research Abstracts, Vol. 7, 08038, 2005
SRef-ID: 1607-7962/gra/EGU05-A-08038

Remote sensing of aerosol properties over land using total and polarized measurements from the visible to the middle infrared.

F. Waquet, P. Goloub, J.F. Léon, J.L. Deuzé, F. Auriol, C. Verwaerde, J.Y Balois D. Tanré.

Laboratoire d' Optique Atmosphérique (LOA), Université des Sciences et Technologie de Lille 59655 Villeneuve d'Ascq. E-mail :*waquet@loa.univ-lille1.fr

The most important difficulty in aerosol remote sensing over land surfaces, where the main aerosol sources are located, is to discriminate the aerosol contribution from the ground. The POLDER space-borne instrument has shown the interest of polarized and angular measurements to retrieve the aerosol properties, especially over land surfaces. Indeed, the ground contribution in polarization is weak and exhibits a small spatial and spectral variability. Polarized radiances measured at 0.67 μm and 0.865 μm provided by POLDER have been shown to be useful to detect the main anthropogenic aerosol sources located over land. Nevertheless, the lack of measurement beyond 0.865 μm and the use of semi-empirical surface model finally prevents from getting more accurate determination of aerosol properties over land.

An new approach consists in performing polarized measurements at longer wavelength, up to 2.2 μm. At this wavelength, the atmospheric contribution can be neglected, then, the surface contribution should be directly measured. To improve this new concept, the LOA with the support of CNES have developed the prototype version of a new multi-spectral polarimeter. This instrument, called MICROPOL, participated to several aircraft campaigns over land and ocean, in association with ground-based observations (AERONET/PHOTONS) and spatial measurements (MODIS/POLDER2) and lidar (LEANDRE). Measurements of spectral and polarized radiances, at high and low altitude has been acquired over various surface (country side, forest, urban surface) and for various atmospheric condition (urban aerosol, mineral dust associated with large AOT, mixed cases).

The polarization generated by the surface shows a very small spectral effect both over natural and urban surface for a wide range of viewing geometry. However the spectral neutrality is not observed in the backscattering direction. The investigations of the properties of the surface have also revealed the existence of a linear relation between total and polarized measurements in the 1.6 and 2.2μm channels. A new algorithm including polarized measurements in the middle infrared have been developed. The comparison with an standard algorithm shows that the measurements at 2.2μm allow to optimize the retrieval of aerosol optical thickness over land. A comparison with a only radiance approach (path radiance technique, MODIS approach) shows that only the spectral polarization approach is able to retrieve the AOT with a sufficient accuracy over urban surface. The MICROPOL experience is the first step in the development of a new generation of POLDER instrument (OSIRIS), including multi-angular and multi-spectral polarized measurements.