Characterization of aerosols properties from a synergy of 2nd generation vertical sounders and imagers (AIRS, IASI, MODIS) observations.

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Introduction
Dust aerosols contribute for the main part to the total load of aerosols in the atmosphere and they have an effect on atmospheric radiation both at visible and infrared wavelengths. Until recently, most of the studies have focused on the visible wavelengths or in-situ measurements. Nevertheless, it has been shown that the optical and microphysical properties (i.e. optical depth, mean altitude, effective radius) of dust aerosols can be retrieved from the observations of 2nd generation vertical sounders, in the infrared spectrum.1

Dust Optical Depth at 10 µm – Comparison with MODIS –

We study mean AOD time series over 12 regions in the tropical Atlantic. Although some regions cover land, only night data over ocean are considered here.

Data and method
We analyze 53 months of observations from the 2nd generation high spectral resolution infrared sounder AIRS over the tropical belt (30°N-30°S) for the period April 2003 to August 2007. Using a radiative transfer code (4A) coupled with a discrete ordinate algorithm (DISORT), and a Look-Up Table approach, we retrieve the optical depth at 10 µm and the altitude of dust aerosols (X).

A 4-year global climatology of these products is established. These results in optical depth (10 µm) are compared to those obtained from the MODerate Imaging Spectroradiometer (MODIS) at 0.55 µm.

Dust Altitude

The mean altitude of the aerosol layer can be retrieved from infrared vertical sounders, due to their ability to separate the contributions to the incoming radiation of the various atmospheric layers.

Validation:

In order to validate our results, we will be very interesting to use the synergy of the different platforms of the A-Train (i.e. Aqua and CALIPSO). Very soon we will be able to collocate our altitude products to active remote sensing data obtained from CALIP0 onboard CALIPSO since April 2006.

Conclusion and perspectives

Aerosol plays an important role in the climate system and have an impact on radiative transfer in the atmosphere, both at visible and infrared wavelengths.

Studying aerosols with IASI

The Infrared Atmospheric Sounding Interferometer (IASI) is developed by the Centre National d’Etudes Spatiales (CNES) and is scheduled to fly on METOP platform.

High spectral resolution sounds like IASI show that it is possible to retrieve aerosol optical properties in the infrared spectrum by carefully selecting channels based on their sensitivities to variables such as aerosols, water vapor, ozone... The Infrared Atmospheric Scattering Interferometer (IASI), with its important number of channels and very high spectral resolution, will allow selecting channels only sensitive to particular components of the atmosphere. This will allow finer determination of aerosol properties in the infrared spectrum.

30 channels have already been selected at LIHD for their ability to measure the signal of aerosol. Compared to the 8 IIRS channels used in this study, IASI should improve our knowledge of aerosols in the infrared spectrum.

References


