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## Saharan dust infrared optical depth and altitude retrieved from AIRS: a focus over North Atlantic – comparison to MODIS and CALIPSO

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**Abstract.** Monthly mean infrared (10  $\mu\text{m}$ ) dust layer aerosol optical depth (AOD) and mean altitude are simultaneously retrieved over the tropics (30° S–30° N) from almost seven years of Atmospheric Infrared Sounder (AIRS) observations covering the period January 2003 to September 2009. The method developed relies on the construction of look-up-tables computed for a large selection of atmospheric situations and follows two main steps: first, determination of the observed atmospheric thermodynamic situation and, second, determination of the dust properties. A very good agreement is found between AIRS-retrieved AODs and visible optical depths from the Moderate resolution Imaging Spectroradiometer (MODIS/Aqua) during the main (summer) dust season, in particular for three regions of the tropical North Atlantic and one region of the north-western Indian Ocean. Outside this season, differences are mostly due to the sensitivity of MODIS to aerosol species other than dust and to the more specific sensitivity of AIRS to the dust coarse mode. AIRS-retrieved dust layer mean altitudes are compared to the Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP/CALIPSO) aerosol mean layer altitude for the period June 2006 to June 2009. Results for a region of the north tropical Atlantic downwind of the Sahara show a good agreement between the two products ( $\sigma \approx 360$  m). Differences observed in the peak-to-trough seasonal amplitude, smaller from AIRS, are principally attributed to the large difference in spatial sampling of the two instruments. They also come from the intrinsic limit in sensitivity of the passive infrared sounders for low altitudes. These results demonstrate the capability of high resolution infrared sounders to measure not only dust aerosol AOD but also the mean dust layer altitude.

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