Geophysical Research Abstracts
Vol. 15, EGU2013-6354, 2013
EGU General Assembly 2013

Cloud properties and bulk microphysical properties of semi-transparent cirrus from IR Sounders

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Satellite observations provide a continuous survey of the atmosphere over the whole globe. IR sounders have been observing our planet since 1979. The spectral resolution has improved from TIROS-N Operational Vertical Sounders (TOVS) to the Atmospheric InfraRed Sounder (AIRS), and to the InfraRed Atmospheric Sounding Interferometer (IASI); resolution within the CO_2 absorption band makes these passive sounders most sensitive to semi-transparent cirrus (about 30% of all clouds), day and night.
The LMD cloud property retrieval method developed for TOVS, has been adapted to the second generation of IR sounders like AIRS and, recently, IASI. It is based on a weighted [U+F063]2 method using different channels within the 15 micron CO_2 absorption band. Once the cloud physical properties (cloud pressure and IR emissivity) are retrieved, cirrus bulk microphysical properties (De and IWP) are determined from spectral emissivity differences between 8 and 12 [U+F06D]m. The emissivities are determined using the retrieved cloud pressure and are then compared to those simulated by the radiative transfer model. For IASI, we use the latest version of the radiative transfer model 4A (http://4aop.noveltis.com), which has been coupled with the DISORT algorithm to take into account multiple scattering of ice crystals. The code incorporates single scattering properties of column-like or aggregate-like ice crystals provided by MetOffice (Baran et al. (2001); Baran and Francis (2004)).
The synergy of AIRS and two active instruments of the A-Train (lidar and radar of the CALIPSO and CloudSat missions), which provide accurate information on vertical cloud structure, allowed the evaluation of cloud properties retrieved by the weighted [U+F063]2 method.
We present first results for cloud properties obtained with IASI/ Metop-A and compare them with those of AIRS and other cloud climatologies having participated in the GEWEX cloud assessment. The combination of IASI observations at 9:30 AM and 9:30 PM complement the AIRS observations at 1:30 AM and 1:30 PM local time, giving information on the diurnal cycle of clouds.

References:
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