Cloud properties from AIRS and evaluation with Calipso

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Since May 2002 the Atmospheric Infrared Sounder (AIRS), in combination with the Advanced Microwave Sounder Unit (AMSU), onboard the NASA Aqua satellite provides measurements at very high spectral resolution of radiation emitted and scattered from the atmosphere and surface. The instrument was developed to provide atmospheric temperature and water vapour profiles at a vertical resolution of about 1 km and 2 km, respectively, but the high spectral resolution of this instrument also allows the retrieval of cloud properties (especially cirrus), aerosol and surface properties as well as the quantity of trace gases. We present a cloud property retrieval scheme, which is based on a weighted 2 method using channels around the 15 micron CO2 absorption band, to determine effective cloud emissivity and cloud pressure. The influence of channel choice, cloud detection, spatial resolution and of assumed atmospheric profiles on the retrieval are discussed. The retrieval scheme is applied to all spots, without distinction between cloudy or clear sky spots. Cloud detection plays an important role in the cloud property retrieval: the tighter the cloud detection the larger the average cloud pressure and low cloud amount, because partly cloudy spots are identified as low clouds. To be independent on cloud detection thresholds which vary regionally and seasonally, a posteriori cloud detection is developed by comparing cloud pressure differences between AIRS and collocated L2 data from the Cloud-Aerosol Lidar with Orthogonal Polarization (CALIOP) onboard CALIPSO, both instruments part of the A-Train, for January and July 2007. This cloud detection is based on the coherence of cloud emissivity at different wavelengths and on brightness temperature heterogeneity. At the same time, CALIOP is used to evaluate the AIRS cloud altitude. Results are also compared to cloud properties from AIRS L2 products (version 5) and from the Moderate Resolution Imaging Spectroradiometer (MODIS) of the same time period, as well as to the cloud climatologies of the International Satellite Cloud Climatology Project (ISCCP) and TOVS (TIROS-N Operational Vertical Sounder) Path-B. The seasonal cycles of high, midlevel and low cloud amount in the tropical and subtropical regions are compared to the one of CALIPSO, using one year of data (August 2006 to July 2007) to results of cloud climatologies.

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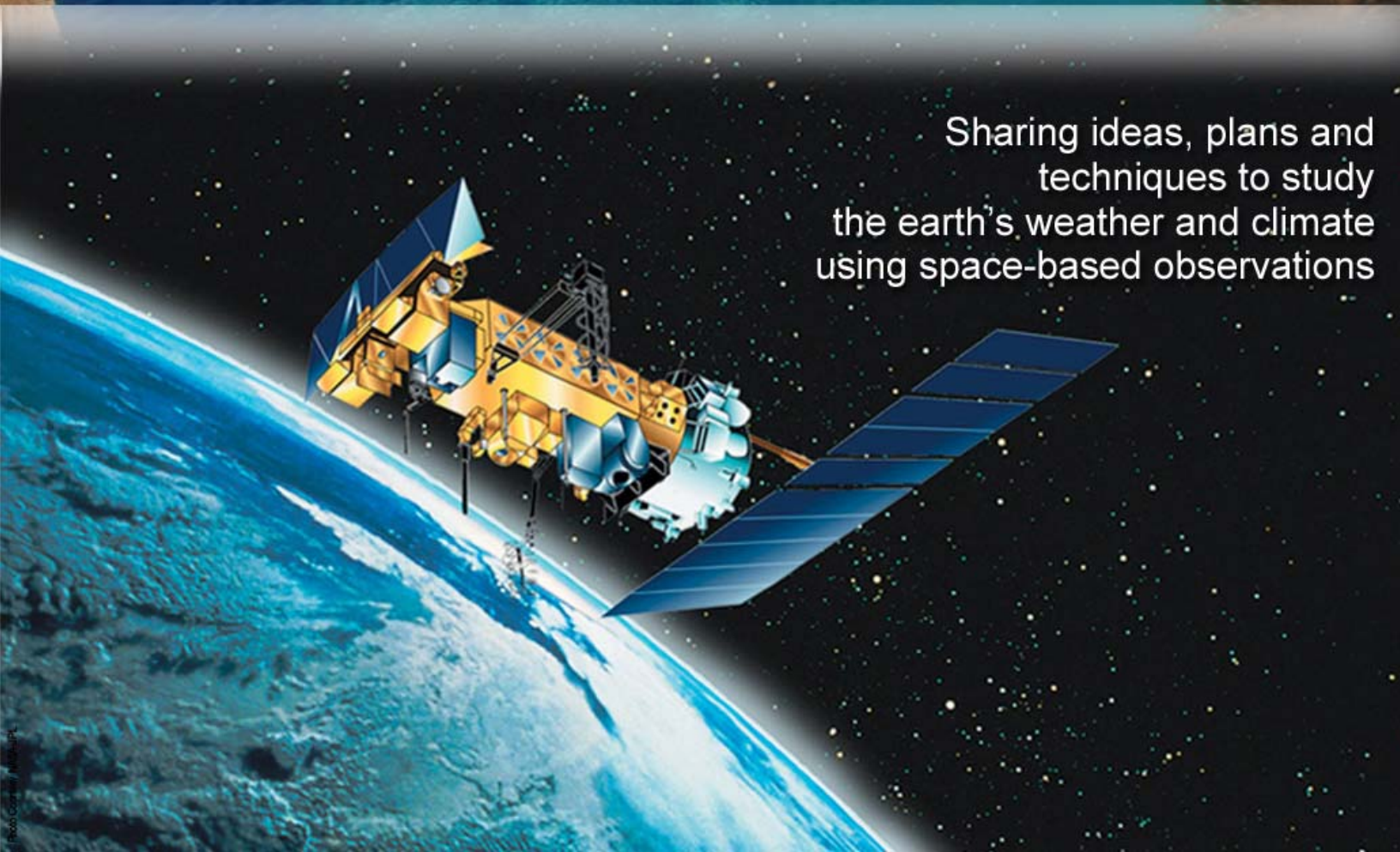

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