

SSEC/CIMSS Seminar

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Handling IR emissivity spectrum in hyperspectral sounding retrieval

Retrieval of temperature, moisture profiles and surface skin temperature from infrared (IR) radiances requires the spectral information of surface emissivity. Using constant or inaccurate surface emissivity typically results in the large retrieval errors, particularly over the semi-arid or arid area where the variation of emissivity spectrum is large spectrally and spatially. In this research, a physically based algorithm has been developed to retrieve hyperspectral IR emissivity spectrum simultaneously with the temperature and moisture profiles. To make the solution stable and efficient, the hyperspectral emissivity spectrum is represented by the eigenvectors, derived from the laboratory measured hyperspectral emissivity database, in the retrieval process. Simulations are carried out with profiles over different land surface properties, results show that simultaneous retrieval of emissivity spectrum can improve the surface skin temperature as well as temperature and moisture profiles retrievals, particularly for the boundary layer moisture. The algorithm has also been applied to the Atmospheric Infrared Sounder (AIRS) radiance measurements of granule 11 for 8 September 2004, which covers a diversity of land surface types. The retrievals have then been compared with the ECMWF analyses and radiosonde observations, and shown a similar improvement revealed in the simulations.

Elisabeth Weisz

Cloudy sounding and cloud-top height retrieval from AIRS alone

High-spectral resolution measurements from the Atmospheric Infrared Sounder (AIRS) onboard the EOS (Earth Observing System) Aqua satellite provide unique information about atmospheric state, surface and cloud properties. This paper represents an AIRS alone retrieval algorithm to simultaneously retrieve temperature, humidity and ozone profiles under all weather conditions, as well as cloud top pressure (CTP) and cloud optical thickness (COT) under cloudy skies. These products are retrieved on AIRS single field-of-view (SFOV) basis. For optically thick cloud conditions the above-cloud soundings are derived, whereas for clear skies and optically thin cloud conditions the profiles are retrieved from 0.005 hPa down to the earth's surface. Initial validation has been conducted by using operational MODIS (Moderate Resolution Imaging Spectroradiometer) product, ECMWF (European Center of Medium-range Weather Forecasts) analysis fields and radiosonde observations (RAOBs). These inter-comparisons clearly demonstrate the potential of this algorithm applicable to process the data of high-spectral infrared (IR) sounder instruments like IASI (Infrared Atmospheric Sounding Interferometer) and CrIS (Cross-track Infrared Sounder).

Friday, 9 March 2007

10:00 a.m.

Room AOSS 351