Recent updates of the UW/CIMSS high spectral resolution global land surface infrared emissivity database

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An accurate infrared land surface emissivity product is critical for deriving accurate land surface temperatures, needed in studies of surface energy and water balance. Current sensors provide only limited information useful for deriving surface emissivity and researchers are required to use emissivity surrogates such as land-cover type or vegetation index in making rough estimates of emissivity. Inaccuracies in the emissivity assignment can have a significant effect on atmospheric temperature and moisture retrievals. To accurately retrieve atmospheric parameters, a global database of land surface emissivity with fine spectral resolution is required. An accurate emissivity is also required for any application involving calculations of brightness temperatures such as the assimilation of radiances into climate or weather models. At the Cooperative Institute of Meteorological Satellite Studies (CIMSS), University of Wisconsin, the so-called UW/CIMSS Baseline Fit (BF) global infrared land surface emissivity database was developed. The monthly, global database has been available since 2006 at the http://cimss.ssec.wisc.edu/iremis/ website and includes data for each month from October 2002 at ten wavelengths (3.6, 4.3, 5.0, 5.8, 7.6, 8.3, 9.3, 10.8, 12.1, and 14.3 microns) with 0.05 degree spatial resolution. The BF approach uses selected laboratory measurements of emissivity to derive a conceptual model, or baseline spectra, and then incorporates MODIS MYD11 measurements at six wavelengths to adjust the emissivity at 10 hinge points. These wavelengths were chosen to capture as much of the shape of the higher resolution emissivity spectra as possible between 3.6 and 14.3 microns As a recent effort at the UW/CIMSS, an algorithm was developed to derive a high spectral resolution (HSR) IR land surface emissivity from a combination of HSR laboratory measurements of selected materials, and the UW/CIMSS Baseline Fit (BF) global infrared land surface emissivity database by using a principal component analysis (PCA) regression. The first Principal Components of 123 selected laboratory spectra (in this study the wavenumber resolution between 2-4cm-1, at 416 wavenumbers) were regressed against the 10 hinge points of the monthly UW/CIMSS BF emissivity. The algorithm to extract the high spectral resolution emissivity database from the UW/CIMSS BF emissivity dataset will be available in early 2008. In the presentation, after the introduction of the emissivity database, the impacts of varying the emissivity on the calculated top-of-atmosphere BT across the infrared spectral regions are examined, then an analysis of the effects of a change in emissivity on retrieved temperature and moisture profiles will be presented. At the end this MODIS-based emissivity database will be compared to the HSR emissivity database derived from AIRS measurements.

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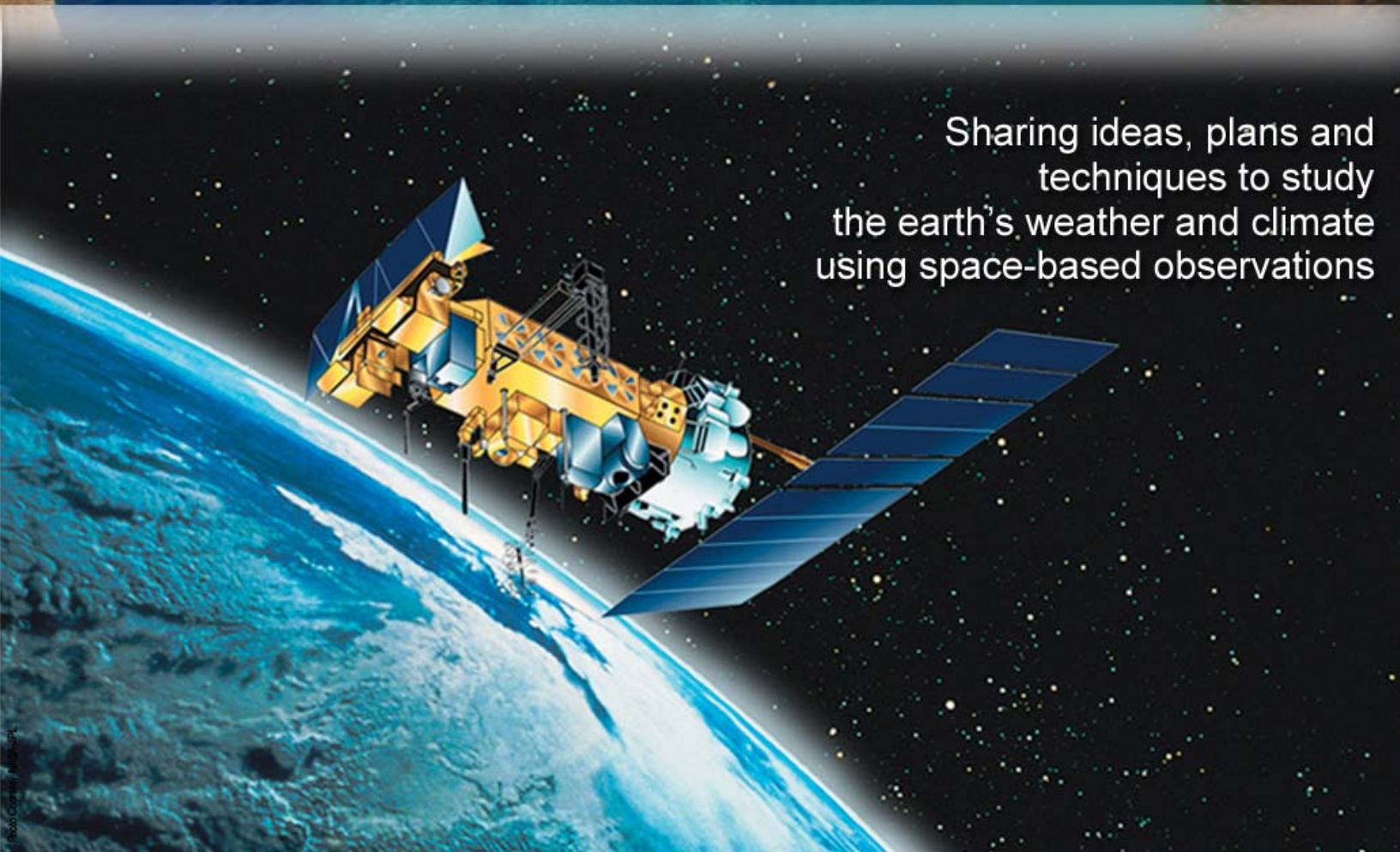

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