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Comparison of ASTER and MODIS emissivity observation with ground measurements

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This work studied surface emissivity derived from data collected with the MODerate resolution Imaging Spectroradiometer (MODIS) sensor, onboard the NASA's Earth Observation System (EOS)-TERRA satellite. The emissivities are for bands 20, 22, 23, 29, 31 and 32, having central wavelengths of 3.75 μm, 4.09 μm, 4.19 μm, 8.53 μm, 11.02 μm and 12.03 μm, respectively. The spatial resolution for these bands is 1km which is degraded to 5 km for the day/night LST algorithm use to generate the MODIS level 3 standard products. The first site studied was White Sands National Monument, located in southern New Mexico, USA. It is a 710 km^2 field of white sand dunes composed of gypsum crystals. The Collection-4 MOD11C2 (8-day composites) and MOD11C3 (monthly composites) emissivity estimates at 5 km spatial resolution from June 1, 2005 until 1 October 2006, were compared with laboratory measurements for a gypsum sample taken from White Sands. The emissivity spectrum was obtained from the Jet Propulsion Laboratory (JPL) Spectral Library. Previous studies showed a very good agreement between emissivities estimates at 90 m spatial resolution derived from data collected with the Advanced Spaceborne Thermal Emission Reflection Radiometer (ASTER) sensor, onboard the NASA's (EOS)-TERRA, and laboratory measurements for years 2000 to 2003. We found lower emissivities than what would be expected from the laboratory measurements for MODIS bands 20, 22, 23, 31 and 32. Emissivities for band 29 were higher than what would be expected. For band 29 there is also an emissivity increase at the end of 2005 and the beginning of 2006 which we believe is related to soil moisture variations. In addition to the White Sands site, the emissivity data from the sand dunes of the Sahara desert in North Africa were consid-

ered for the same period of time and we found good agreement for bands 22, 23, 29, 31 and 32 with laboratory measurements for quartz sand. The result for band 20 was a little high than expected. It was shown that for the areas studied, surface infrared emissivities derived from the MODIS data are not always in good agreement with laboratory measurements of the samples and, therefore some considerations should be taken. We will continue the analysis with Collection-5 of the MODIS, which we expect will give better agreement due to improvements in the algorithm.