THERMAL REMOTE SENSING OF SAND TRANSPORT SYSTEMS

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The spectral emissivity and kinetic temperature of the land surface can be derived from thermal radiance data (TIR) collected by The Advanced Spaceborne Thermal Emission and Reflection (ASTER) radiometer. The spectral emissivity is used to determine mineral composition for dune fields and sand seas. Kinetic temperature and apparent thermal inertia (ATI) data may also reveal surface properties such as variation in soil moisture and grain size. Gypsum sand transported by westerly winds is continually resupplied to the dune fields in the White Sands National Monument originating from ephemeral playa lakes southwest of the dune field. Wet-dry cycles resupply material by evaporation and mineral formation on the surface. The dune field remains dynamic with dunes moving in the northeastly direction. Over the duration of ASTER's mission, a high-temporal resolution, cloud-free remote sensing data set of day- and night-time has been generated for the area from May 2, 2000 to March 12, 2008. Changes in emissivity, temperature and ATI through time can be used to observe and study the relative timing of the wetting and drying of Lake Lucero, the transport of sand, changes in mineral composition and changes in dune morphology. In addition, ASTER also provides high spatial resolution (15m) visible/near-infrared (VNIR) data and optically-generated digital elevation models (DEM) that can be combined with these thermal data sets. The high temporal ASTER TIR data set may be used as a useful tool for using White Sands as a terrestrial, analogue for aeolian sites on Mars.