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# Aeolian sand transport systems on Mars and Earth: Thermal infrared remote sensing of the volcaniclastic Shifting Sand Dunes, Christmas Lake Valley, Oregon, U.S.A.

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Satellite images of desert regions provide synoptic views useful for deciphering aeolian sand composition and transport paths. Multispectral thermal infrared data from the Mars Global Surveyor Thermal Emission Spectrometer and the Earth Observing System Advanced Spaceborne Thermal Emission and Reflectance Radiometer will be obtained starting 1998. These will be ideally suited for detection of mineral variation and mixing. To prepare for these capabilities, I have examined a dune field of Mars-like composition using images from the airborne Thermal Infrared Multispectral Scanner (TIMS) flown by the NASA Ames Research Center C-130 Earth Resources Program.

The Shifting Sand Dunes of Christmas Lake Valley, Oregon, are composed of glass fragments, plagioclase crystals, ash aggregates, basalt lithics, and pyroxenes. The compositions, lack of quartz, and setting (at the downwind side of a flat-floored basin) are analogs to intracrater dune fields on Mars. The dunes record a minimum of two major dune-building events in the past 9000 years.

A linear unmixing model was applied to 6-band (8–12 micron) TIMS emissivity images obtained September 1991. The results show three distinct sand types, two that are themselves mixtures and the third is composed of volcanic ash aggregates derived from a specific ash layer in the dry lake sediments. The other sands appear to be (1) dominated by reworked airfall from the 6800 BP terminal eruptions of Mt. Mazama and (2) from aeolian deflation of older volcanic sediment in the Pluvial Fort Rock Lake bed. The ash aggregates are contributed from local sources and do not transport through the entire dune field. The TIMS images also demonstrate the use of thermal emissivity to distinguish active dunes from inactive and interdune surfaces.

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