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A SHUTTLE THERMAL INFRARED MULTISPECTRAL SCANNER

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ABSTRACT

Remote sensing of the earth in the thermal infrared is on the threshold of becoming a valuable new geologic tool. The thermal infrared portion of the spectrum available for geologic remote sensing extends from approximately 3 to 25 µm, with the 8-13 µm region by far the easiest spectral region to use. This is also a spectral region containing diagnostic spectral information on the silicates. Recent work with data from the new 6-channel aircraft Thermal Infrared Multispectral Scanner (TIMS) has demonstrated that there is significant geologic information which can be obtained from surface spectral emissivity data acquired by remote sensors. It was shown that in certain cases even minor differences in rock type could be distinguished, i.e., quartz latite/quartz monzonite could be distinguished from latite/monzonite. An extensive program is now underway to acquire and analyze TIMS aircraft data.

In order to make data available over a much larger suite of geologic materials and plant communities in a variety of environments, we propose a TIMS-type instrument as a candidate Shuttle experiment We are evaluating the capability of current technology to produce a 5-10 channel instrument in the wavelengths 8-13 µm and possibly also 3-5 µm, with an NEΔT of 0.1 to 0.3K.

PRELIMINARY SPECTRAL/STRATIGRAPHIC ANALYSIS OF LANDSAT-4 THEMATIC MAPPER DATA, WIND RIVER/BIG HORN BASIN AREA, WYOMING

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ABSTRACT

A geologic analysis of the Wind River/Big Horn basins, Wyoming, is currently underway utilizing lithologic information extracted from a Landsat-4 Thematic Mapper (TM) scene acquired November 21, 1982. A major objective of the study is to develop classification schemes that utilize TM data for stratigraphic analysis.

Image products developed include composites, ratio composites, unsupervised classifications, and principal component images. Preliminary analysis demonstrates that: 1) principal component images derived from the correlation matrix provide the most useful stratigraphic information. Components produced from the correlation matrix represent linear transformations based on ground reflectance. The separation of unique spectral classes, therefore is largely independent of non-random atmospheric and instrumental factors. 2) To extract surface spectral reflectance, the satellite radiance data must be calibrated. Reflectance measurements were not acquired during the overflight, but an empirical calibration, based on scatterplots of DN vs. reflectance for natural and cultural targets of assumed reflectance was carried out. Inconsistent responses from the 16-detector array, however, complicates the calibration problem. 3) Low instrumental offset and gain settings result in spectral data that utilize less than 1/2 of the full dynamic range (i.e. 255 DN) of the Thematic Mapper System.