Quarterly Report

Time Period: for January - March, 1997

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A) Near-term Objectives

1. Validation of LST algorithms

2. To establish the land-surface emissivity knowledge base

3. Working on LST V2 delivery

B) Task Progress

1. A field campaign for the validation of LST algorithms was conducted in Death Valley, California on March 3, 1997. The first two of the three groups (one from UCSB, one from Australia, one from JPL), that planned to join, participated in the field campaign. This is a very good test site for land-surface emissivity retrieval because there are so many different types of rocks and soils in the test area. MAS data were collected with noon and evening flights at the same time when field measurements were made. We received the MAS data from Ames in late March. Preliminary analysis shows the good quality of both noon and evening MAS images. An early attempt was made to retrieve the land-surface emissivity and temperature with the day / night LST algorithm from the MAS data. The retrieved band emissivities clearly show the geological features in the test area. But the retrieved LST is 2-4 degree C higher than the values obtained from ground-based measurements, and correspondingly the retrieved band emissivities are lower than those measured from samples in our laboratory. We noticed that the MAS channel configuration has been updated. There is a blue band in the current MAS configuration, and the central wavelengths of several MAS TIR bands used in the day / night LST algorithms have been moved.

2. A preliminary knowledge base of the land-surface emissivity has been established for using the MODIS generalized split-window LST algorithm. Land-cover types, NDVI, and the date-in-year information have been used to classify pixels into 14 emissivity groups. For each groups, the scene emissivities in MODIS bands 31 and 32 are estimated from the spectral reflectance values of the components and characteristics of the surface

structure in the scene by using the TIR BRDF kernel models that we have developed recently. We considered the variations of the spectra and the surface structure in wide ranges. Simulations show that for eight of the 14 emissivity groups (covering about 70% of the global land), the uncertainties in the estimated emissivities in these two bands are small enough so that the generalized split-window LST algorithm can be used to retrieve LST better than or at the specified accuracy 1K level. For the remaining 30% of the global land (mainly in semi-arid and arid regions), we have to use the day/night LST algorithm to retrieve land-surface emissivities and temperatures simultaneously.

3. We are working on MODIS LST V2 HDF specifications and coding.

C) Anticipated Activities During the Next Quarter

1. Write LST V2 codes for the levels 2 and 3 LST products.

2. To use the measured spectral response functions of TIR bands in the updated MAS for the refinement of look-up tables and coefficients so that the day/night LST algorithm can be used to process the MAS data accurately.

3. Participate in the joint US-Japan Cal/Val field campaigns in Railroad Valley, NV in late June.

D) Problems/Corrective Actions (None)

E) Publications

W. Snyder, Z. Wan, Y. Zhang and Y.-Z. Feng, Land-surface emissivity knowledge base for split-window LST algorithms, prepared for submission.