Type of Report: Quarterly, July to September 1995. Alfredo R. Huete, University of Arizona - NAS5-31364

OBJECTIVES

1. Work on VI compositing and coding with BRDF dependency.

2. Prepare science data simulation plan for testing of vegetation index algorithms.

3. Prepare for and conduct SCAR-B campaign in Brazil.

4. Continue write up of VI validation plan.

TASK PROGRESS

1. SCAR-B Campaign

Three of us participated in the Brazil SCAR-B experiment during August-September. We spent three weeks in the field mostly in the Porto Velho, Jamari, and Ji-Parana areas, where there was extensive fire activity and smoke laden atmospheres. As a result of a last minute government decree, banning non-atmospheric, ground-based experiments, we canceled all portions of our study related to canopy and soil biogeochemistry and plant and soil sampling. Our activities were restricted to radiometric measurements of incoming solar radiation over clear and smoke-filled skies within and outside of the forests, including 'controlled' burns. Overall, much was gained in understanding the vegetation signal in the forest and in burned forests and how this signal is affected by the atmosphere. Irradiance measurements were made with Exotech's mounted over reference Spectralon panels. For blue green and NIR spectral bands, canopy irradinace measurements within primary, secondary, and burned canopies were made at each of the study sites, which were located in close proximity to Brent Holben's sun photometer network. Some canopy floor reflectance measurements were also made as well as PAR measurements. Preliminary results also indicate that the airborne sensors, AVIRIS and MAS were successful.

2. TM-Validation Data Set

A manuscript is now completed and ready for submission concerning the use of a 'global' set of Landsat TM images, acquired from the Global Land Cover Test Site (GLCTS) initiative. This study was a good prelude to a much more comprehensive validation effort which will include field and satellite components. The paper is entitled: "A Comparison of Vegetation Indices over a Global Set of TM Images". The abstract follows:

A set of TM images representing a wide range of vegetation conditions from the global land cover test site (GLCTS) initiative were processed to simulate MODIS global vegetation index imagery at 250 m pixel size resolution. The sites included boreal forest, temperate coniferous forest, temperate deciduous forest, tropical rainforest, grassland, savanna, and desert biomes. Differences and similarities in sensitivity to vegetation conditions were compared among various spectral vegetation indices. The normalized difference vegetation index (NDVI) was sensitive to and responded primarily to the highly absorbing red reflectance band, while other indices such as the modified vegetation index (MVI) were more responsive to the near-infrared (NIR) band. As a result, we found the NDVI and red reflectances to saturate and depict very little variation among the forested sites. The MVI, by contrast, did not saturate over the vegetation conditions encountered in this study and was more sensitive to structural canopy parameters such as LAI and leaf morphology. In the arid and semiarid biomes, the NDVI was very sensitive to canopy background variations. Vegetation index sensitivity to the red and NIR reflectances differed among desert, grassland, and forested biomes. Maximum differences among vegetation index behavior occurred over the evergreen needleleaf forest sites relative to the deciduous broadleaf forests and drier, grassland and shrub sites. These differences appear to be useful in complimenting the NDVI for improved monitoring of vegetation, and in the distinct derivation of biophysical parameters, such as fraction of absorbed photosynthetic active radiation (fAPAR) and leaf area index (LAI).

3. SDST product development

Level 2 and level 3 code was written for the VI and submitted to Eric Vermote for integration with the surface reflectance product. Preliminary coding for a sliding window compositing algorithm is now complete. Larger and more realistic test data sets are being assembled and tested to determine the success and limitations of this algorithm. We are currently working on integration of HDF or M-API. Different compositing scenarios are being tested with and without the BRDF adjustment and sensitivity analyses are being incorporated to determine the feasibility of a BRDF correction.

4. AMBRALS-BRDF integration

Shuping Jia has been testing AMBRALS utility for the level 3 compositing VI work. Thus far, we are getting inconsistent results regarding the utility of AMBRALS in VI compositing. We are not always getting an improvement in normalization of angular data to nadir. Within a certain range of view angles, BRDF adjustment tends to increase the error. These preliminary results indicate that a mixed 'optimization' and BRDF code may be needed, whereby only in the case of angles exceeding (e.g., 30¡) do we implement AMBRALS. The main limitation of AMBRALS occurs when there are only 7 or fewer points available over a compositing cycle.

5. ASPEN Global Change Institute

Participant in sixth annual Aspen Global Change Institute Summer Science Session, Aspen, Colorado, July 9-22, 1995. The session theme of the 2-week workshop was entitled "Changes in Global Vegetation Patterns and Their Relationships to Human Activity", with Jim Tucker and Bill Emory as co-chairs. I presented a paper entitled "Soil radiative influences in satellite monitoring of vegetation".

Next Quarter Activities:

1. Version 1 Code to be finalized.

2. Continue Utah field work/ microphyte sampling.

3. Work on simulation data plan and validation plan for the vegetation index.

4. Analysis of SCAR-B results.

5. Finish write up of a manuscript on validation of atmospheric correction over land for the aerosol meeting.

6. Continue Chile field and validation goals.