MODIS/Snow Quarterly Report (July-Sept.1994)
Submitted (10/15/94) by D.K. Hall/974

Summary

Progress was made in several areas during the last quarter. Two presentations were made at scientific meetings, and one paper is nearing completion for submittal to a journal, and one proceedings paper was published. Additionally, an abstract was submitted for presentation at the AGU Fall meeting in December. Plans for a snow/sea ice mission in Alaska were formulated, and flight hours were approved. The ATBD version 2.0 peer-review panel results were received and responses have been prepared for submittal to the EOS Project in November. ATBD revisions are underway. The SDST Flathead Lake meeting on MODIS data simulation was attended.

A comparison of Landsat TM data, mapped by conventional supervised-classification techniques, and by SNOMAP is underway. MAS data acquired in February at the BOREAS test site have been analyzed in a preliminary manner. Problems with mapping snow cover under cirrus clouds have been identified in the MAS data.

TM scenes of sea ice in Hudson Bay and near Antarctica have been acquired and classified. Results show that SNOMAP is a useful algorithm for mapping sea ice. No validation studies have been performed as yet.

Supervised classification of Landsat TM data

Snow cover on TM scenes of the following areas has been mapped: Glacier Bay, Alaska, Vatnajokull ice cap area, Iceland, northern Minnesota, 3 scenes of Glacier National Park, Montana and the Chugach Mountains. We are in the process of running SNOMAP on each of these scenes. Preliminary results show that SNOMAP and the supervised-classification results agree to within 2 percent. Following completion of that activity, we will compare results generated by the supervised classifications (which we consider the 'truth') and SNOMAP. We will determine the accuracy of the SNOMAP results, on a scene-by-scene basis, with the results derived from the supervised classifications. We have already done this with a carefully mapped TM scene of the Sierra Nevada Mountains, and results have been reported previously.

This activity is time consuming because we first have to calculate the reflectances for each TM scene before we can run SNOMAP. Also, doing the supervised classification is a very time-consuming activity.

BOREAS/MODIS snow work

In connection with the MODLAND BOREAS project, some progress has been made. We found a problem in the original MAS data of the BOREAS site that was given to us. The reflectances were calculated improperly. RDC (Paul Hubanks and Liam Gumley) corrected the problem and issued us revised data. We ran SNOMAP on the MAS data of 2 flight lines. SNOMAP mapped a cirrus cloud in the scene as snow. We could easily correct this problem by changing the threshold level of the band ratio, but this is undesirable because the algorithm has to be run automatically. With the 8 TM scenes mentioned above, we will further assess the seriousness of the cirrus cloud problem.

Another problem area in the mapping of snow using SNOMAP on the BOREAS MAS data is dense forest cover. Dense forests characterize the area and there was snow underneath the trees according to ground measurements. However, only about 60 percent of the scene was mapped by SNOMAP though we know that the entire area was snow covered.

Other BOREAS work includes the analysis of the passive-microwave data that were acquired. We have averaged the brightness temperatures in the flight lines and are beginning to compare results with ground measurements acquired by the Canadians.

Sea Ice

TM scenes of sea ice have been acquired and analysis has begun. Some TM quarter scenes were acquired from Ron Welch (ASTER team) of the South Dakota School of Mines and Technology. Another scene was purchased from the EROS Data Center of Hudson Bay. Preliminary analysis indicates that SNOMAP is useful for mapping sea ice. As analysis continues, it will be modified and called ICEMAP. Validation activities will be done in collaboration with Dr. Welch.

Meetings attended

D. Hall attended the AVHRR Polar Science Workshop in Boulder, CO in July and presented a talk on the MODIS snow algorithm-development efforts.

V. Salomonson attended the IGARSS'94 symposium in Pasadena, CA in August and presented a paper on the MODIS snow-cover algorithm. The paper was published in the proceedings of the symposium.

G. Riggs/RDC attended the Flathead Lake, MT workshop on MODIS data simulation in September.

Abstracts, papers and reports prepared or in preparation

A paper is being prepared for submission to Remote Sensing of Environment. This paper discusses results of the ATBD Version 3 which is to be turned into the EOS Project in November.

An abstract was submitted to the Fall AGU conference dealing with preliminary results of analysis of the BOREAS MAS data for determination of snow-covered area.

Version 3 of the ATBD is in the process of being revised according to comments by reviewers and comments by the peer-review committee that met last May.

Other reports have been written as required by the MODIS Project. And there have been several such requests. Answering the many requests for information has been a time-consuming effort.

Multi-aircraft campaign in Alaska (Spring 1995)

32 ER-2 flight hours have been approved for the MODIS/snow project for a mission next spring (March/April) in Alaska and in the Bering Sea. This mission is being planned jointly by D. Hall/974 and Don Cavalieri/971. The objective of the mission is to acquire passive-microwave and MAS data, simultaneously if possible, of snow and sea ice to verify our SNOMAP and ICEMAP algorithms, and to determine the extent of the synergy expected by using both passive-microwave and MODIS sensors together in the future. Field measurements will be acquired in central and northern Alaska in collaboration with the University of Alaska and the U.S. Army Cold Regions Research and Engineering Laboratory.