MONITORING ENVIRONMENTAL STATE OF ALASKAN FORESTS WITH AIRSAR

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During March 1988 and May 1991, the JPL airborne synthetic aperture radar, AIRSAR, collected sets of multi-temporal imagery of the Bonanza Creek Experimental Forest near Fairbanks, Alaska. These data sets consist of series of multi-polarized images collected at P-, L- and C-bands each over a period of a few days. The AIRSAR campaigns were complemented with extensive ground measurements that included observations of both static canopy characteristics such as forest architecture as well as properties that vary on short term time scales such as canopy dielectric conditions. Observations exist for several stands of deciduous and coniferous species including white spruce (*Picea glauca*), black spruce (*Picea mariana*) and balsam poplar (*Populus balsamifera*).

Although the duration of each campaign was fairly short, significant changes in environmental conditions caused notable variations in the physiological state of the canopies. During the 1988 campaign, environmental conditions ranged from unseasonably warm to more normal subfreezing temperatures. This permitted AIRSAR observations of frozen and thawed canopy states. During May 1991, ice jams that occurred along the river caused many stands to flood while the subsequent clearing of the river then allowed the waters to recede, leaving a snow covered ground surface. This allowed observations of several stands during both flooded and non-flooded conditions. Furthermore, the local weather varied from clear sunny days to heavy overcast days with some occurrence of rain. Measurements of leaf water potential indicated that this caused significant variations in canopy water status, allowing SAR observations of water stressed and unstressed trees.

Mean backscatter from several stands is examined for the various canopy physiological states. The changes in canopy backscatter that occur as a function of environmental and physiological state are analyzed. Preliminary results of a backscatter

signature modeling analysis are presented. The implications of using SAR to monitor canopy phenological state are addressed.

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