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Monitoring of freeze/thaw transitions in taiga forests using ERS-1 SAR

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Automated recording stations have been installed at the Bonanza Creek Experimental Forest, a Long Term Ecological Research (LTER) site located near Fairbanks, Alaska, in a forest stand of the Tanana River floodplain underlain by discontinuous permafrost. These stations provide a continuous record of dielectric constant and temperature of the tree trunks, and soil moisture and temperature profiles down to the root zone. Along with the weather stations deployed at the same location, these measurements provide a continuous record of the environmental and phenologic conditions of the forest during a complete seasonal cycle. At the same time, ERS-1 SAR imaged the study site repeatedly from space to provide radar backscatter measurements of the forest approximately three times a month. Here, we examine the temporal dynamic of ERS-1 SAR measurements in relation with the changing environmental and phenologic state of the forest canopy and of the forest ground layers during the winter/spring and fall/winter transitions of 1992 and 1993. During these transitions, we examine whether changes in radar backscatter observed by ERS-1 may be related to freezing or thawing of the soil and vegetation in order to determine the start and end of the growing season for the forest.

The results of this analysis are used in turn to determine whether similar changes are observed over larger regions. Mosaics of SAR data generated along three different North-South Alaskan ERS-1 transects that intercept with our study site (Fig. in CD-ROM) are used in combination with hourly air-temperature and daily precipitation rates gathered at airport weather stations by the National Weather Service. Results obtained using ERS-1 data collected from January 1992 to mid-1993 will be discussed.

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