

SAR and Optical Satellite Observations of Ice-Covered Thermokarst Lakes, Old Crow Flats, Yukon Territory

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ABSTRACT

Recently, some investigators have shown the potential of ERS SAR data for monitoring ice formation, the thickening of ice cover, and freezing to the bottom, of shallow Arctic and Subarctic lakes. Shallow lakes represent promising sites for long-term monitoring and the detection of changes related to global climate change and its effects on the Polar Regions. However, monitoring of lake ice during the spring break-up period is more difficult because surface water (i.e., ponding and free liquid water in snow) causes the SAR signal to be absorbed, thus masking the ice below.

In this paper, results from the analysis of backscatter and reflectance signatures of ice and snow on shallow thermokarst lakes will be presented. The study area is located in the Old Crow Flats, northern Yukon (68° N, 140° W). A time series of ERS-1 images (winter 1994–1995) is used to monitor the evolution of ice cover from 30 lakes of known depth. Emphasis will be placed on the analysis of spring imagery. In particular, ERS-1 backscatter and Landsat TM reflectance signatures from late May acquisitions will be compared to show: 1) the limitations of SAR in differentiating various ice and snow types during the break-up period, and 2) the benefits of using SAR and optical satellite data in concert.

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