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# Impact of landcover on snow depth estimation from SSM/I data over Boreal regions

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The hydrological cycle for boreal regions is inherently linked with the snowpack. Several studies have shown the importance of the large spatial scale snowpack evolution to understand arctic river discharge regimes. As these rivers supply fresh water into the arctic ocean, a modification in their discharge, induced by a change in the snow fall, could lead to a modification in the thermohaline circulation. Thus accurately monitoring the snow depth and the associated aerial coverage are crucial issues.

Passive microwave satellite measurements are the only global means of monitoring snowpack over the boreal regions. While the temporal evolution of snow extent can be monitored globally from microwave radiometers, the determination of the corresponding snow water equivalent is more difficult A dynamic algorithm that accounts for the dependence of the microwave scattering on the snow grain size has been developed to estimate snow water equivalent from the Special Sensor Microwave/Imager (SSM/I) brigthness temperature. This algorithm uses the gradient between air temperature and soil temperature to compute the spatio-temporal evolution of the snow crystal size used as a proxy to retrieve snow water equivalent from the passive microwave radiometer data. The purpose of this study is to determine the dynamic algorithm performance for different types of vegetation and to tune it to different land cover. We show that the dynamic algorithm always performs better than static algorithms, which are based on constant snow grain size and are commonly used to retrieve snow depth from SSM/I data. We compare the snow water equivalent estimate using the dynamic algorithm obtained for different vegetation types (taïga, tundra, steppes, lakes and wetlands). The analysis are performed over North America and Siberia for areas with different vegetation types and a land cover dependent algorithm is proposed. The results are compared to the Global Soil Wetness Project-Phase2 (GSWP2) snow water equivalent climatology computed from several state-of-the-art land surface schemes

over the same time period covered by the SSM/I data.