



The accurate determination of the specific surface area of snow by IR reflectance

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The specific surface area (SSA) is a central variable in snow physics and chemistry. It determines optical scattering and the ability of the snowpack to adsorb chemical species. SSA can be measured accurately using methane adsorption at 77 K, stereology, or X-ray tomography, but all these methods are time-consuming and impose logistical constraints during field campaign. We propose here a rapid method based on the field measurement of the IR reflectance of snow at various wavelengths, based on an integrating sphere.

The IR reflectance of snow samples is found to depend mostly on snow SSA, but also on snow density and on grain shape, so that obtaining an accurate SSA determination from IR reflectance requires modeling. This is done using a discrete ordinance method (DISORT). We estimate that the absolute accuracy of our method is better than 15%. One measurement in the field takes about 1 minute, while treatment using DISORT is almost instantaneous.

Illustration of the use of the method in the Arctic and in the Alps will be shown, and its potential discussed.