# Spectral Reflectance of Natural Snow in Laboratory Conditions

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Snow cover monitoring by optical remote sensing in high latitudes is hampered due to low sun elevation angles and frequent cloud cover. Prevailing snow characteristics and illumination geometry highly affect the observed reflectance. Many efforts have been made to investigate these interactions. For example Salminen et al. (2009) have determined typical snow reflectance of different snow types in various weather conditions during spring time in northern Finland. However, in field circumstances it is difficult to control all the desired parameters at the same time. On the other hand, controlled laboratory measurements made with artificial snow, although, offering valuable theoretical information, may not capture the complicated natural conditions.

In this study, a third aspect is added by measuring natural snow in stable laboratory conditions. First measurements were made during two days in spring 2013. Dry snow, wet snow, and wet littered snow were measured in a dark laboratory with ASD Field Spec Pro JR Spectroradiometer (ASD Inc., Boulder, Co, USA). Snow was sampled with a 35 cm x 35 cm x 23 cm aluminum sampler, which was placed inside a black insulating box, carefully carried into the cooled laboratory room and measured immediately. A 1000 W halogen lamp, calibrated to 250-2500 nm, was used as a light source. Two distinct light elevation angles (25 and 35 degrees) were used resembling the typical spring time sun elevations in high latitudes. Reference measurements including snow layering, snow grain size, density, temperature profile, and SSA were made in each sample site to detect differences in measured snow types.

The preliminary results indicate that the light elevation angle has a significant effect on observed snow reflectance in dry snow until around 1400 nm. In wet snow, the difference between measurements with two light elevation angles is lower and negligible already around 1150 nm. Organic litter in snow surface introduced higher variability in observations and, in general, lowered the observed reflectance. However, the shape of average spectral reflectance of wet snow and wet littered snow were quite similar. Measurements will be repeated in spring 2014 and more different snow types will be sampled.