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Observation of the Difference in Snow Cover Evolution Between Open and Forested Areas

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There are several significant differences in the snow accumulation and ablation processes in open compared to forested land surfaces. The resulting differences in snow cover evolution have considerable effects on runoff from melting snow covers, the surface energy balance, and the exchange of energy between the surface and the atmosphere. On the accumulation side, snow interception in the tree canopy and the subsequent loss of some of the intercepted snow due to direct sublimation is a crucial factor leading to large differences in the accumulation pattern of snow covers underneath a forest compared to adjacent open areas. Additionally ablation processes are also affected greatly by the presence of vegetation canopy due to shading effects, the reduction of wind speed, the difference in snow cover albedo, and long wave radiation being emitted from the canopy.

The study uses a variety of methods to observe the spatial and temporal differences in the accumulation and ablation rates in open and forested areas and the processes that are responsible for these differences. A station network of numerous low cost, yet accurate, snow monitoring stations was set up delivering distributed data on snow cover and climate conditions. Data collected by the sensors include: snow height, air temperature and humidity, total precipitation, global radiation, wind speed, and snow temperature. Many of the stations were set up as “paired stations” located in close proximity to each other, one in an open area and one underneath various forest canopies and differing slope expositions. “Paired” time-lapse cameras were also installed providing continuous information on snow interception in the forest canopies, the state of precipitation, and snow height and albedo in open versus forested areas. Additionally, manual snow surveys were conducted showing the differences in small scale variance between the snow covers of open and forested areas.

The results from these observations show the spatial and temporal differences in accumulation and ablation rates depending on the type of forest canopy, especially its density, the elevation and exposition of the location, the amount of snowfall per event, and the predominant climate conditions during and after a snowfall event.