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The energy balance of a patchy snow cover at a low arctic tundra site in northern Sweden

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Snow is a high albedo surface and acts to moderate the global energy budget. High albedo snow patches interspersed with low albedo surfaces creates a complex pattern of energy exchange. Current land surface schemes generally do not incorporate this small-scale variability leading to underestimation of energy exchange. As part of the Snow in Tundra Environments: Patterns, Processes and Scaling project (STEPPS – www.dur.ac.uk/stepps.project); the spatial and temporal patterns in snow accumulation and melt are investigated through a variety of field measurements and hydrological modelling, for an exposed low arctic tundra site. This study aims to quantify the energy balance of a patchy snow cover, and describe the processes operating.

The spatial heterogeneity in snow cover is a result of the interaction between blowing snow and the highly variable topography. This creates areas that remain snow free throughout the winter, and deep drifts that remain to mid-summer. This heterogeneity appears to be fixed between seasons. Small-scale advection between bare ground and snow patches is an important feedback process by which snow patches melt increasingly rapidly as the snow covered area decreases. Including this sub-grid heterogeneity within the Met. Office Surface Exchange Scheme (MOSES) suggests that standard MOSES significantly underestimates energy exchange.