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Evaluation of JULES multi-layer snow scheme for Norwegian snow conditions

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In this study we have evaluated the JULES (Joint UK Land Environment Simulator) multi-layer snow-scheme at 18 weather stations in Norway. The stations are mainly located close to or within forested areas, but some are also located at exposed high-mountain areas. JULES has been run for single points (1D study), using forcing data which combines both weather station observations and short-term weather forecasts from the Met Office Unified Model (MetUM). Not all input parameters used by the JULES model are observed at the weather station on an hourly basis. Different experiments have been carried out with JULES replacing observations with forcings from MetUM. The results suggest that short-term forecasts of radiation, air humidity, wind and air pressure may replace observations without reducing the quality of the JULES snow simulations.

Evaluation of the ability of the JULES snow scheme to simulate the evolution of the seasonal snow depth has been carried out by modifying the parameter values for snow density, snow albedo and snow roughness. The modeled snow depths have then been compared to the corresponding observed snow depth for the winter season 2010/2011. In these experiments we employ three snow layers. The modeling results show that reducing the fresh snow density improves the modeled snow depth during accumulation periods. Reducing both visible and near-infrared albedo improve the modeled snow depth during snow melting events. A change in the snow roughness length has only a minor impact on the modeled snow depth. Results from this evaluation are used for carrying out 2D snow modeling experiments for a mountainous region in Norway.