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Inter-comparison of snow cover models for the snowpack in Sapporo, Japan

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Four snowpack model outputs were inter-compared in order to assess their performance for the snowpack in Sapporo, Japan, for 3 years. Since snowpack is locally characterized by their own local climate, we have tried to know if the snowpack model is needed to adjust the parameterizations for the Japanese snowpack, and if yes, what should be changed. The models used were: SNOWPACK, 2LM, MRI snow model, and SNTHERM. The forcing data for running the models were collected at the hydrometeorology observation site of the Institute of Low Temperature Science, Hokkaido University, Sapporo. The items of the forcing data are: air temperature, relative humidity, wind speed, global radiation, atmospheric radiation, barometric pressure, precipitation (liquid and solid). The partition of liquid or solid precipitation were followed by Yamazaki's method (1998). The precipitation data were adjusted by considering the gauge catchment (Yokoyama et al., 2003). The model outputs are: snow depth, snow water equivalent, liquid water contents, albedo, sensible heat flux and latent heat flux. All models showed the good timing of the maximum snow depth, but different maximum snow depth. The error in the timing of snow ablation was within 4 days for the all models. Only 2LM showed an earlier snow ablation but others showed later snow ablation than the real. Each models showed a characteristic albedo variations: SNOWPACK showed the largest albedo values, SNTHERM was the second and MRI model was the lowest. The albedo output of 2LM had a largest variation in January and the average albedo was the second lowest.

Keywords: snow model, snowpack, intercomparison, snowwater equivalent, albedo