



Boundary layer and clouds in Arctic regional climate models

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Results from six state-of-the-art regional-scale models are compared to observations from the Surface Heat Budget of the Arctic Ocean – SHEBA – experiment. All models were set up on the same moderate-sized domain over the western Arctic and run through the SHEBA-year, using six-hourly ECMWF analyses at the lateral boundaries. To further neutralize the different models cryospheres from the atmospheric models, sea and ice surface temperatures, as well as ice fraction, was prescribed from satellite data.

Since surface temperature was prescribed and the model domain was relatively small, all models conform relatively well to the synoptic scale atmospheric variability. Temperature and moisture shows a good comparison, while wind speed shows somewhat larger but tolerable model-specific biases. Momentum fluxes are typically biased high, while the magnitude of the turbulent heat fluxes are two to four times the observed values, regardless of sign and show no correlation to the observations. The surface radiative fluxes on the other hand shows good correlation, but has large model dependent biases

Although many models show reasonable cloud climatology, there is a very poor correlation between modelled and observed clouds. In winter, no model has any cloud liquid water, while observations show significant values of cloud water at even very low temperatures. In summer, on the other hand, many models under-predict low-level cloud water but compensates by having too much high clouds.