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Validation of the GEOtop Model for a Continuous Permafrost Basin in the Arctic

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GEOtop 1.145 is used to model the thermal and hydrological state of the subsurface in the Imnavait and Upper Kuparuk basins, Alaska. GEOtop is a distributed hydrological model with coupled water and energy budgets [Rigon et al., 2006]. The surface energy balance scheme includes sensible, latent and radiative heat fluxes at the air-soil or air-snow interface. The subsurface represents heat and water fluxes in the vertical and horizontal directions. Meteorological data across the Kuparuk Basin collected by the University of Alaska Fairbanks, Water and Environmental Research Center (WERC) North Slope Hydrology Research Projects, as well as data from atmospheric reanalysis products are used to force the model. Model results using input data from meteorological observations are compared to model output with forcing from atmospheric reanalysis products. The use of atmospheric reanalysis products to force GEOtop will enable large-scale simulations to be performed over areas where in situ meteorological data is sparse, such as the North Slope of Alaska. Model results are validated for simulations with forcing from both meteorological stations and atmospheric reanalysis products, using measured soil temperature profiles, ground thaw depth, as well as remotely sensed data of snow coverage and soil moisture. The representation of the Arctic freshwater hydrological cycle by GEOtop is investigated by comparing the model output to measurements of discharge.