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Evaluating the COupled Snowpack and Ice surface energy and mass balance model in PYthon (COSIPY) with data from Glacier No. 1, Chinese Tien Shan

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Urumqi Glacier No. 1 in the Chinese Tien Shan has the longest measured mass balance record in China. It is located in Xinjiang province and forms the headwaters of Urumqi River. It is under constant monitoring since 1959 and therefore offers great potential for glacier mass balance modeling. Generally, glaciers in the Tien Shan, both in China and Kyrgyzstan, are strongly retreating. Since glacier meltwater is a considerable contribution to downstream freshwater supplies in surrounding lowlands, it is important to investigate possible future changes of melt water supply at high spatial and temporal resolution related to physical processes such as the atmospheric forcing, sublimation, refreezing, densification, etc. Here, we use the newly updated COupled Snowpack and Ice surface energy and mass balance model in PYthon (COSIPY) in its 2-dimensional spatially distributed version to simulate energy and mass fluxes of Urumqi Glacier No. 1 since the year 2000. Available observational data include weather station data from a station close to the glacier, runoff data, and mass balance data based on ablation stakes and snow pits. COSIPY is forced by reanalysis data (ERA5), including air pressure, air temperature, cloud cover, relative humidity, solar radiation, solid or total precipitation, and wind speed at hourly resolution. ERA data is downscaled to the location of the glacier by statistical methods. The spatial pattern on the glacier is calculated subsequently based on a high-resolution digital elevation model. We present detailed spatial and temporal patterns of energy and mass fluxes and relate these to the observations in the study period. Future work will include model coupling with an ice dynamical model and coupling of the mass balance model with a subsequent hydrological model.