Quantify the range of projections of future changes in glacier mass caused by differences among observed past climate datasets

*Megumi Watanabe[1], Aki Yanagawa[2], Yukiko Hirabayashi[3], Satoshi Watanabe[4], Shinjiro Kanae[1]

1. Tokyo Institute of Technology, 2. Meisei University, 3. Shibaura Institute of Technology, 4. The University of Tokyo

Observed climate data used as input in glacier models are expected to differ among datasets particularly at high elevations. Differences among datasets have not yet been described as a cause of uncertainty in projections of future changes in glacier mass, although uncertainty caused by varying future climate projections among general circulation models (GCMs) has often been discussed. Differences among climate datasets are expected to propagate as uncertainty in future changes in glacier mass due to bias correction of GCMs and calibration of glacier models. We project ensemble future changes in the mass of glaciers in Asia through the year 2100 using a glacier model. A set of 18 combinations of inputs, including two observed past air temperature datasets, three observed past precipitation datasets, and future air temperature and precipitation projections from three GCMs were used. The uncertainty in projected changes in glacier mass was partitioned into three distinct sources: GCM uncertainty, observed past air temperature uncertainty, and observed past precipitation uncertainty. Our findings indicate that, in addition to the differences in climate projections among GCMs, differences among climate datasets can propagate uncertainty into projected changes in glacier mass. Significant differences in observed precipitation did not cause major uncertainty in projected changes in glacier mass.

Keywords: propagation of uncertainty, glacier model, bias correction, calibration, air temperature, precipitation

