# Paleoclimate and complex basal thermal regime of the Haizishan ice cap on the southeastern Tibetan Plateau reconstructed by glacial modeling

Ping Fu[1, 2], Julien Seguinot[1], Arjen Stroeven[1], Jon Harbor[2], Jakob Heyman[2], Clas Hättestrand[1]

1. Department of Physical Geography and Quaternary Geology, Stockholm University, Stockholm, Sweden.
2. Department of Earth, Atmospheric, and Planetary Sciences, Purdue University, West Lafayette, IN, United States.

The Haizishan Plateau, a low-relief plateau at 4000-5000 m a.s.l. on the southeastern Tibetan Plateau, is surrounded by deeply-cut glacial and fluvial valleys and flanked by high mountain peaks. Using geomorphological mapping and 10Be exposure dating we have provided a detailed reconstruction of the Haizishan Plateau glacial history. An ice cap measuring almost 4 000 km2 formed at or before marine oxygen isotope stage 6 (with minimum ages at 102.3 ± 10.0 – 150.7 ± 14.2 ka), and during the global last glacial maximum (21.6 ± 2.0 ka). At its largest extent the ice cap covered the entire plateau and was drained by outlet glaciers in valleys on the plateau margin. Here we use the Parallel Ice Sheet Model (PISM) to simulate the growth and decay of the Haizishan ice cap and compare model results to the mapped distribution of landforms. The best-fit simulations show that to reproduce an ice cap of similar extent to that during the global last glacial maximum and the maximum glaciation limited cooling of only 3.6 and 3.8 °C, respectively, is required, if accompanied by a 35% reduction in precipitation. This suggests that glaciers and ice caps on the southeastern Tibetan Plateau are more sensitive to temperature variations than to precipitation change. Modeled ice velocities and basal temperatures show complex patterns, which are in accordance with the geomorphological imprint of a complex erosion pattern and patterns of bedrock erosion from $^{10}$Be dating. Our research using geomorphological, cosmogenic dating, and ice flow modeling techniques reveals that the former Haizishan ice cap had complex basal thermal regimes. This work provides new insights into the paleoclimatic setting and glacial landscape evolution of the southeastern Tibetan Plateau.