



Glacial history of the Haizishan Plateau reconstructed from geomorphology, exposure dating and numerical modelling

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The Haizishan Plateau is a low-relief formerly glaciated highland located at a crossroads of continental climate on the Tibetan Plateau and the south-west Asian monsoon. It is surrounded by deeply-cut glacial and fluvial valleys on its flanks, deep basins, and high mountain peaks. Using geomorphological mapping, ^{10}Be exposure dating, and numerical glacier modelling we provide a detailed reconstruction of the Haizishan Plateau glacial history. An ice cap measuring almost $4\ 000\ \text{km}^2$ formed at or before marine oxygen isotope stage 6 (with minimum ages of $102.3 \pm 10.0 - 183.6 \pm 17.0\ \text{ka}$), and, with a slightly smaller extent, during the global last glacial maximum ($21.6 \pm 2.0\ \text{ka}$). The dating results are consistent with geomorphology in showing a pattern of patchy glacial erosion on the Haizishan Plateau. Modelling results also support this inference through a patchy pattern of basal temperatures on the plateau surface, and warm-based ice at outlet valleys. Finally, our simulations show that only ca. $3\ ^\circ\text{C}$ of cooling is required for glacial inception and expansion of the ice cap to its geomorphologically inferred maximum extent, which is consistent with glacial modelling results obtained at other locations on the Tibetan Plateau and consistent with climate modelling.