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MODIS-based analysis of interannual snow-cover variability on the Tibetan Plateau and its climate-forcing

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The unique location of the Tibetan Plateau, the direct influence on the hydrological cycle and their apparent particular sensibility to anthropogenic Global Change leave the glaciers on the Tibetan Plateau and the estimation of their future dynamic response to climate change as a challenging research field. However within the remote areas of the Tibetan Plateau no measured glaciological as well as meteorological and hydrological data are available so that improved methods on variations in energy and mass balance components of glaciers are necessary for a better understanding of atmosphere-cryosphere interactions. The shift of the equilibrium line altitude of a glacier can be used as an indication of mass balance variations. As a proxy for the equilibrium line altitude of the glaciers on the Tibetan Plateau the end-of-summer snowline in areas where glaciers are present derived from daily MODIS data is used.

For ten selected study regions we present an analysis of interannual snow-cover changes based on remote sensing data. The locations of the study regions are heterogeneously distributed along an east west transect between the NamCo lake in the east and the Gurla Mandhata mountain in the west of the Tibetan Plateau in order to account for varying influences of monsoon and westerlies. The study regions comprise both lake catchments and mountain ranges and thus cover the entire elevation range present in the respective area. We use datasets of the MODIS snow product over a one-decade period to infer intra- and interannual snowline variabilities and to derive regional equilibrium line altitudes. Based on this analysis we present correlations between transient snowline altitudes and lake-level changes. Furthermore, we investigate and present relations between snowline and the general atmospheric circulation.