



## **Long-term mass changes of glaciers on the Tibetan plateau using time-variable gravity**

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The mass transfer from land ice to the oceans, particularly from glaciers and ice caps, is a major contributor to global sea-level rise. The glaciated regions of High Mountain Asia, in the Himalaya and Tibetan Plateau, have been shown to have significant interannual variability in their mass, which can affect mass change rates estimated over short time periods. In addition these glaciers represent a major source of fresh water for the population of the region. Here we estimate the ice mass change of these regions since 2003 using time-variable gravity data from the GRACE mission. We employ an estimation technique based on spherical Slepian localization functions. These Slepian functions

form a sparse set of orthogonal basis functions for a specific region and maximize the signal-to-noise levels of the gravity fields, making them excellent candidates to analyze regional data on the sphere.

Since 2003, mass has been decreasing in High Mountain Asia, however this change varies strongly in space. Specifically, mass loss has been concentrated in the Himalaya and in the Tien Shan regions. In contrast the Tibet/Qilian Shan region exhibits slight mass gain since 2003. Observed mass rates of change strongly depend on the time interval of study, and caution should be used when interpreting rates.