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Estimating glacier mass changes by GRACE satellite gravimetry in the Pamir and Tien-Shan mountains

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In 2002, the Gravity Recovery and Climate Experiment (GRACE) satellite mission was launched, to obtain more information about the Earth's geoid and gravity field. The satellites measure the changes of the Earth's gravity field on a monthly basis until today. These data can be used to estimate glacier mass balance. Previous studies have mainly focused on the large ice sheets and glaciers of Greenland and Antarctica. In recent years, the GRACE data was also applied to mountain glaciers, e.g. in the St Elias Mountains in Alaska (Arendt et al. 2008) and in the Himalayas (Muskett 2010). In this study, the mass change data of GRACE are applied to the Pamir and Tien-Shan mountains. Mass balance measurements, mass balance and volume estimations, and other data are used to compare and verify the results of the GRACE estimates. Obstacles in this area are especially the inadequate glacier mass balance data, their representativeness, the availability of data, the time coverage, the insufficient spatial mapping, and the influence of other mass changing signals in the area (e.g. lake Issyk-Kul). Therefore, much attention is given to specify the corresponding uncertainties. The results of this study are rough estimations of the mass change development sine 2002, but give a good assessment of the usability of GRACE in this area.

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Muskett, R.R. (2010): Water Mass Loss of the Himalayas from GRACE, ICESat and SRTM. EGU 2010, Number 20101037.