Geophysical Research Abstracts
Vol. 13, EGU2011-13071, 2011
EGU General Assembly 2011

Short-term flood prediction and monitoring by combining GRACE and SAR measurements: case study Red River

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Floods along with obvious physical damages and casualties could contaminate the water supplies leaving disease and famine behind. Therefore, any observation that helps to predict and monitor flooding processes with high spatial and temporal resolution is of high demand. Penetrating the cloud cover and being sensitive to water, the Synthetic Aperture Radar (SAR) provides an optimal tool for flood monitoring. On the other hand, the usage of the Gravity Recovery And Climate Experience (GRACE) satellite mission for inland water changes is a relatively new concept. First studies prove its capability, but also show limitations in the resolution. Thus, this study aims to combine both methods for short-term flood prediction and monitoring of a higher accuracy.

We investigate the Red River of the North, which was and is the biggest flood threat for Canadian soil. The last Red River flooding occurred in spring 2009, which was observed by both RADARSAT-2 and GRACE. In this study, SAR data is overlayed on a digital elevation model and GRACE gravity variations are analysed to calculate the volume of the flood. Adequate de-striping filtering is applied on GRACE data of monthly and sub-monthly intervals. A magnitude of 15.8 Gt of water is determined. Peak values, location and temporal behaviour of the flood agree to ground observations. Therefore, we can show in a further study that the combined analysis of two space techniques could provide a successful and high-accurate monitoring tool, which can also be used for short-term flood prediction.