Geophysical Research Abstracts
Vol. 19, EGU2017-8591, 2017
EGU General Assembly 2017

Observing anomalies in the deglaciation of Greenland by GRACE and GNET GPS

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Between the start of 2003 and the middle 2013, the total mass of ice in Greenland declined at an accelerating rate, and this rate increases nearly constantly of about 24 Gt per year. Then, a dramatic reversal occurred, and almost no additional ice mass was lost in the subsequent two years. In 2015 the melting had resumed reducing the ice mass in Greenland. We use observations from the Gravity Recovery and Climate Experiment (GRACE) and a network of Global Positioning System (GPS) receivers to study both the decade of accelerating ice loss, and the subsequent 'pause', focusing on the space-time structure of changes in ice mass. We use a spatial basis set of spherical Legendre polynomials, and assume that the temporal variation in mass can be expressed using a 4-term Fourier series (i.e. an annual cycle) superimposed on a polynomial in time (i.e. a trend). We show that the spatial pattern of the sustained, decade-long acceleration and of the mass anomaly associated with the melt anomalies are very similar, and so manifest the footprint of the ice sheet's sensitivity to climate change at the wavelengths resolved by GRACE.