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Amery Ice Shelf Grounding line detection using Cryosat-2 and Landsat8 data fusion

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We propose a grounding line detection algorithm for Amery Ice Shelf (AIS) using Cryosat-2 altimetry and Landsat8 optical data. The Grounding line represents the area where ice sheet separates from Antarctic ice cap and extends into the ocean, which is the key indicator of the inland ice sheet instability and the boundary conditions of numerical model for ice velocity calculation. Many studies focus on grounding line retrieval using altimetry data or remote sensing data either with lower spatial resolution or discontinuous, which makes it difficult for large scale and long-terms analysis. In this abstract, Bayesian MAP (Maximum a posteriori probability criterion) based Cryosat-2 altimetry and Landsat8 optical data fusion algorithm is proposed for grounding line extraction in AIS, Antarctic. For Cryosat-2 data, the along track based slope analysis is used to calculate the Gaussian curvature and mean curvature, where the area with largest slope variance is defined as the grounding points, which will act as the control points in the fusion framework. For the Landsat8 imagery with the spatial resolution of 30m, we first generate the 1km grid using cubic Hermite method. Based on the similarity measurement between texture feature and grounding line area, where the area with largest variance of mean value and standard deviation is defined as the grounding line in Landsat8 data. For the MAP based fusion grounding line extraction step, the optimal procedure is to find the minimum distance between the Cryosat-2 grounding points and Landsat8 grounding line within a given area, so as to maintain the smoothness and discontinuous where the optical data is missing or the texture feature is not obvious. In the experiment part, the proposed result is compared with MODIS grounding line products, and the results indicate that the mean value is similar with Landsat8 result and standard deviation is lower. Moreover, since the Cryosat-2 data is not obstacle by cloud, it can provide continuous observation for AIS grounding line. Besides, the time series analysis shows that from 2016-2018, the grounding line did not change so much, which means that the AIS is stable with lower expansion rate.