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Three-dimensional ice flow in the Greenland Ice Sheet and its evolution from past and present satellite and airborne missions

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Climate warming over the 20th century has forced dramatic changes of the Greenland Ice Sheet (GrIS). These changes have led to a reduction in the mass of the GrIS and a consequent rise in global sea level. Satellite observations have revealed increased flow of the glaciers to the sea [Rignot et al., 2008], increased surface melting [Steffen et al., 2004], lowering of the Ice Sheet surface [Zwally and Giovinetto, 2001], retreat of the glaciers' fronts [Box et al., 2006], and gravity anomaly related to ice mass loss [Velicogna and Wahr, 2006]. Recent airborne and satellite missions have allowed significant improvement in measuring the third component of the Cryosphere and its temporal changes. Here we use datasets from the CryoSAT-2 and Ice bridge missions in conjunction with past and present ERS1, ERS2, ENVISAT and ALOS datasets to construct time steps of 3-dimensional flow maps of selected outlet glaciers of the Greenland Ice Sheet. This dataset is used to explore the relationship between flow patterns, its temporal evolution and the GrIS mass balance.