

Freshwater fluxes from Greenland into the ocean: A Case Study of Sermilik Fjord

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Mass loss from the Greenland Ice Sheet quadrupled from 1992 to 2011, discharging an additional 2700 cubic kilometers of freshwater into the Arctic and North Atlantic Oceans. Future projections are for continued and enhanced mass loss, implying an even larger freshwater discharge into the ocean. Given the potential impact of this additional freshwater on the regional circulation, dense water formation and the marine ecosystems, it is important to include it in past model reconstructions and future model projections. At present, studies investigating the impact of Greenland freshwater on the ocean largely assume that it enters the ocean as a distributed, surface freshwater flux. Observation and model studies, however, show that much of Greenland's freshwater discharge into the ocean occurs subsurface via the melting of deep icebergs and glaciers and through the injection of seasonal surface melt from the base of glaciers hundreds of meters below the surface. Spatially, the discharge is concentrated around the major glacier/fjord systems. Here, we develop a framework to account for the different components of Greenland's freshwater discharge (ice sheet and glacier runoff, non-glaciated margin runoff, and ice discharge from marine terminating glaciers) for the period 1958-2015 and apply it to Sermilik Fjord, southeast Greenland, where present day discharge estimates can be compared to extensive observations. This effort is led by the GRISO Research Coordination Network.