



Modelling the impact of ice mélange on fjord circulation and glacier submarine melt rate using a new subgrid-scale parameterisation for ice mélange

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The melting of icebergs within ice mélange is a large source of liquid freshwater in iceberg-choked glacial fjords, which may have important implications for local and regional ocean water properties and circulation, as well as glacier submarine melt rates. However, the spatial and temporal variability of iceberg freshwater fluxes and their impact on fjord circulation and glacier submarine melt rates are largely unknown. Here, we develop a new parameterisation for ice mélange within the Massachusetts Institute of Technology General Circulation Model (MITgcm), allowing three-dimensional simulation of ice mélange in large glacial fjords on annual time scales and the interaction of ice mélange with drivers of fjord circulation, including glacial runoff plumes, winds and tides. We assess the impact of variations in iceberg depth, spacing, extent and persistence, in summer and winter settings, on iceberg freshwater flux, fjord circulation and glacier submarine melt rate.