

Constraining the late Holocene retreat and possible readvance in the SW Weddell Sea, Antarctica

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Abstract

The deglaciation history of the Weddell Sea embayment is relatively unknown. Because there are no surface rock exposures in the central embayment it is difficult to provide geological evidence of retreat history in this area and so most evidence is confined to the margins or inland parts of the embayment. However, some glaciological observations can be used, such as surface features and radar layering, and GPS observations can provide insight into past ice loading history. Current rates of uplift can be best explained by a late Holocene readvance of the grounding line, which is contrary to expectation of retreat due to the negative-sloping marine bedrock many of the grounding lines throughout this region are situated on. To further understand Holocene deglacial history we summarise some new observations of ice rises in the Weddell Sea that inform the timing of grounding line movement. We have investigated the grounding line motion throughout the region using the Parallel Ice Sheet Model with a particular focus on the dynamics which control the position of the grounding line through time such as: Sea level change, local uplift of the bedrock, changes in ice shelf buttressing, basal friction and ice flow parameters. Understanding the ice loading change through this region for the recent Holocene will allow for improved estimates of current mass loss through gravity measurements.

Keywords: Glacial Isostatic Adjustment, Ice Sheet Model, Deglaciation, Ice Loading History