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Constraining the Evolution of the British Isles Ice Sheet Using Observations of Sea-Level Changes and 3D Crustal Motions

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The Glacial Isostatic Adjustment (GIA) of the British Isles has been investigated in a number of previous modelling studies to derive constraints on local and regional ice sheet histories, earth viscosity structure and the rate and magnitude of glacial melt water input to the oceans during the Holocene [e.g. *Lambeck G.J.I., 118; 1993b, Peltier et al., G.J.I., 148*, 2002]. The models derived in these previous studies provided a good fit to the majority of the sea-level observations; however, significant misfit could not be accounted for in specific localities. Furthermore, the optimal earth/ice models resulting from these studies show significant discrepancies. We revisit this problem to incorporate new data constraints and to examine why previous studies are in disagreement. In particular, we extend previous work by incorporating new geomorphological constraints on the evolution of the British and Irish ice sheets during the most recent glacial cycle. In addition, we have tested the model using GPS observations of present-day crustal motion as well as an updated sea-level database that merges observations from the UK and Ireland. The GPS data provide a useful, independent test of the GIA model that complements the constraints provided by the sea-level observations. Our revised British Isles ice model is significantly more extensive along the east and west margins compared to previous models and includes a coalescence of the British Isles and Fennoscandian ice sheets in the North Sea prior to the last glacial maximum.