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Numerical modelling of the British-Irish ice sheet

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Current geodynamical models used to reconstruct sea level for the British Isles are based on very crude approximations of the loading history from the British-Irish ice sheet, which may partly explain the discrepancy with local uplift records. This study aims to derive a more realistic ice sheet history by applying a standard numerical ice sheet flow model to the British Isles and Ireland. The model uses the day-degree ablation approximation and a parameterization of precipitation that is based on upwind topographic gradients. The model is forced using the recent estimate of northern-hemisphere mean air temperatures of Bintanja and others (2005, Nature). A simple, two-dimensional shallow ice flow model is employed, which is coupled to a standard model of the isostatic response of the underlying bedrock (flexure with local asthenospheric response). We deliberately employ models that have as few parameters as possible in order to make the model easier to calibrate automatically. The model also contains a simple algorithm allowing the distribution of erratics to be simulated. A calibration procedure is employed whereby at the end of each simulation of the last, Weichselian glacial cycle the model's predictions for trimline elevations, maximum moraine locations and erratic trains are compared with the recent BRITICE compilation (Clark and others 2004, Boreas). An iterative procedure is then employed to minimize a cost function based on the discrepancy between the model's predictions and the BRITICE record by tuning the parameter set employed by the model (typically 3 to 5 parameters are currently employed).