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Glacial Isostatic Adjustment of the British Isles and North West Europe

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The British and Irish Ice sheet (BIIS) may have been one of the smaller marine-based ice sheets that grew during the Last Glacial cycle, but it is by far the world's best empirically constrained with the completion of the BRITICE-CHRONO project. Despite its small size (contributing less than 2m to global sea level rise), the ongoing Glacial isostatic adjustment (GIA) driven crustal motion plays an important role in controlling rates of sea level rise across the North West Coast of Europe. Unravelling this complex GIA signal is important not only for ongoing and future sea level projections, but also in understanding marine-based ice sheet dynamics.

The pattern of relative sea level (RSL) and GIA across this region is spatially variable and highly non-monotonic. This is due to the temporally varying interplay between the regional GIA signal, driven by the BIIS and Fennoscandian Ice sheet (FIS) and the global signal, driven by the deglaciation of the larger global ice sheets, such as Antarctica and Laurentide. Although many previous GIA modelling studies were relatively successful in capturing the broad pattern of regional RSL change there are some major unresolved discrepancies and factors that were not considered which this study will address. Firstly, the models were not able to capture both the elevated RSL during the Late Devensian and the timing and magnitude of the Holocene highstand. Second, the spatial and temporal history of the BIIS is no longer consistent with the newer glaciological evidence of a more dynamic, spatially extensive ice sheet. Finally, the deglaciation of the grounded ice sheet and resulting RSL from the marine-based continental shelf regions was largely overlooked in previous studies due to a lack of observational data.

In this study, we utilise the recently updated regional sea-level database, which contains over 2100 data points, recording relative sea level (RSL) from 86 unique regions for the last 20 kyr. We will present an ensemble of simulations of the BIIS and FIS, generated from a 'plastic ice sheet' model that is constrained by the new geomorphological and geochronological data collated by the BRITICE-CHRONO consortium and the DATED -1 project. Combining these regional ice sheet histories into two different global GIA models, we will examine the predicted regional sea level patterns over the last 20 kyr and compare them with the sea-level database.