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Using new geochronological data to elucidate controls on patterns and rates of deglaciation within two marine-based ice-streams of the former British-Irish Ice Sheet.

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Constraining the evolution of former ice sheets, and the ice streams that drained them, provides important empirical evidence about the interactions between ice sheets and climate. To fully understand past behaviour requires integration of glacial geomorphology, Quaternary geology and geochronology to constrain both patterns and rates of change. High-resolution reconstructions can provide important testing grounds for numerical models that are able to make predictions about future ice-sheet and sea-level change.

To this end a large consortium of Quaternary geomorphologists, glaciologists and geochronologists have been collecting and analysing new data to reveal the timing and rate of evolution during deglaciation of the ice sheet that once covered the British Isles (the BIIS). In this contribution we outline two examples where a combination of new geochronological data and existing geomorphological interpretation has allowed us to elucidate specific behaviours of the two largest marine-based ice streams to drain the former BIIS during overall deglaciation. A suite of 21 cosmogenic exposure ages from the Hebrides Ice Stream, northwest Scotland, reveal that deglaciation was well progressed by 21 ka and had been focussed along over-deepened submarine troughs, in a process akin to the Marine Ice Sheet Instability hypothesis. Further deglaciation was characterised by a change from unconstrained ice streaming to topographically constrained flow by 17.5 ka. In the Irish Sea Ice Stream a Bayesian integration of 23 new cosmogenic and luminescence ages reveals distinct changes in the overall rate of deglaciation in the period 25-20 ka that is reflected in previously interpreted landform and sediment assemblages. This new geochronological data allows us to link these changes to changes in external and internal forcings to elucidate their relative importance in controlling deglaciation. Overall, these examples highlight the potential of the palaeo-record to provide specific information that can be used to test numerical models.