Postglacial relative sea-level change and the deglaciation of northwest Iceland

Martin D. Brader

Department of Geography, Durham University, email: m.d.brader@durham.ac.uk

Project Aim and Objectives

This research project aims to resolve the current debates surrounding the Last Glacial Maximum (LGM) Icelandic Ice Sheet (IIS) using new and existing relative sea-level (RSL) data to test models of glacio-isostatic adjustment (GIA). The project involves the collection of a suite of RSL (isolation basin and marine limit) data across northwest (NW) Iceland, palaeoenvironmental reconstruction from isolation basin sediment samples, the analysis of spatial differences in RSL changes and GIA modelling. There are currently two contrasting hypotheses of the LGM glaciation of Iceland – maximum and minimum – which have the potential for very different patterns of postglacial RSL change. Robust assessment of these two scenarios may allow the determination of likely ice loading patterns and Earth characteristics, which is important given the differing implications for global thermohaline circulation under the contrasting ice loading scenarios (Hubbard *et al*., 2006).

Methodology

Isolation basin sediment samples were extracted in six research locations in NW Iceland along two perpendicular transects (Fig. 1), allowing the assessment of RSL changes across and away from proposed former ice loading centres. In addition, raised shorelines and the marine limit were surveyed in each research location (Fig. 2). Diatom analysis of isolation basin sediment cores has allowed the establishment of a series of new sea-level index points (SLIPs). A RSL database has been constructed using these RSL data to test GIA model outputs produced using SELEN (Spada and Stocchi, 2007).

Principal research findings

Analysis of isolation basin and marine limit data has allowed the generation of a suite of new RSL curves for NW Iceland (e.g. Brader *et al*., submitted). Differences in the rates and patterns of RSL change are evident within the region, demonstrating the impact of ice retreat and advance in particular locations, particularly during the Younger Dryas. There are distinct differences in the elevation of the marine limit along the research transects, with higher marine limits recorded closer to the proposed ice loading centre. GIA modelling has allowed the assessment of ice loading scenarios and the determination of preferred rheological characteristics.

Impact of funding

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References

Brader, M. D.; Lloyd, J. M.; Bentley, M. J. and Newton, A. J. (submitted) Lateglacial to Holocene relative sea level change in Stykkishólmur, northern Snæfellsnes, Iceland *Journal of Quaternary Science*

Hubbard, A.; Sugden, D.; Dugmore, A.; Norðdahl, H. and Pétursson, H. (2006) A modelling insight into the Icelandic Last Glacial Maximum ice sheet *Quaternary Science Reviews Vol. 25 Pg. 2283-2296*

Spada, G. and Stocchi, P. (2007) SELEN: a Fortran 90 program for solving the 'sea-level equation' *Computers and Geosciences Vol. 33 Pg. 538-562*

Figure 1 – Lake basins and local marine limit in Hornstrandir.