

Rates of glacio-isostatic uplift as an age modelling tool

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The relatively rapid reduction of contemporary glaciers in Iceland and subsequent glacio-isostatic uplift has been observed to be progressing at rates as high as +35 mm a⁻¹. Earlier on, during the late Weichselian deglaciation of Iceland, the coastal areas were uplifted at rates between +34 mm a⁻¹ (Preboreal) and at least +159 mm a⁻¹ (Bølling). The rates of uplift were also contemporaneously different within an area and, thus, with time they produced uplifted shorelines and ice-lake strandlines with different gradients of different age, due to variable rates of glacio-isostatic uplift.

It has been recognized that a decrease of strandline gradients towards the end of uplift is preferably described with an exponential expression:

$$\delta g = \delta g_0 \cdot e^{-k \cdot t_0}$$

where δg is a change in gradient over a known period of time; δg_0 is a reference level (0.01 m km⁻¹); k is a litho- and asthenospheric dependent constant; t_0 is duration of uplift. Solving the equation for Iceland returns $k = 2.1810^{-3}$. Applying this equation to uplifted ice-lake strandlines in East Iceland shows that a strandline gradient of 0.7 m km⁻¹ was produced during a period of 1,955 years prior to the end of glacio-isostatic uplift at about 9,500 cal BP.