The SEAMOD methodology of GIA interpretation

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Interpretation of glacial isostatic adjustment is challenging because it requires the interaction of integrated models (ice history, earth rheology, and ocean temperature) with diverse data (emergence, tide gauge, GPS, eclipse). This poster briefly summarizes the approach taken under the Norwegian SEAMOD project. Briefly, changes in ice load during deglaciation are specified every 1000 years by the position of global ice margins. Voronoi analysis of them locates ice flow divides and flow paths in the glacier interiors. Ice thickness is determined from relative ice accumulation rates and basal shear stress (a function of subice surface lithology and whether the base is frozen).

Sea level at "dip stick" islands constrains the total ice mass over time. The ice load during glacial growth equals that at deglaciation for the same dip stick sea levels. Redistribution of the ocean water load by GIA changes in seafloor elevation and the ocean geoid drives a second GIA calculation, the results of which are added to the first. Additional iterations are possible. The ice load is modified to preserve the dip stick island melt water constraints, and to improve agreement with emergence data. The earth rheology model is that of Cathles (1975). It differs most strongly from other current models in having an adiabatic $\sim 10^{21}$ Pa s upper and lower mantle. But it also contains an elastic lithosphere and asthenosphere whose properties, as those of the mantle, can be freely varied vertically but not horizontally.

Steric changes in sea level are calculated from proscribed changes in the global radiative flux into a two-layer ocean model. Model predictions are stored in binary files which can be rapidly read for graphical comparison of model predictions and emergence data at 329 sites and relative sea level from the PSMSL data base at hundreds of sites. Higher resolution local GIA calculations tied to the sea level changes of the global model allow higher resolution analysis. The poster will illustrate the utility and significance of these methods.