

Vertical Land Movements in the British Isles: Improving Constraints on Glacio-Isostatic Adjustment models

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In this study we investigate vertical land movement estimates from a recent processing that included data for the period from 1997 to 2008 from more than 100 continuous Global Positioning System (CGPS) stations in the British Isles. Not only was the CGPS network dramatically expanded from previous investigations by the authors, it now also includes, for the first time, stations in Northern Ireland, which will be interesting for defining the westerly extent of uplift associated with the glacio-isostatic adjustment (GIA) processes active in the region. In our processing strategy we apply a combination of re-analysed satellite orbit and Earth rotation products together with updated models for absolute satellite and receiver antenna phase centres and for the computation of atmospheric delays. Using a no-net rotation and no-scale minimal constraints approach we align our daily position estimates by use of a (at this stage) semi-global CGPS network (>50 stations) to ITRF2005. We assess the accuracy of our vertical rates along with their associated uncertainties, which were computed from a detailed stochastic model of the position time series, using independent estimates of vertical land movements from two absolute gravity stations and over fifty geological sites. Using the geodetic rates we produce a series of maps of vertical land movements over the last decade and compare these to our reference map based on Holocene sea level data. Detailed investigations of station-specific monumentation and underlying geology, and of results from a recent persistent scatterer interferometry (PSI) analysis, are used in support of separating crustal from other vertical movements at CGPS stations in order to improve the constraints on GIA models for the British Isles.