Geophysical Research Abstracts
Vol. 20, EGU2018-3565, 2018
EGU General Assembly 2018

Glacial Isostatic Adjustment and its contribution to sea level changes and vertical land motion along the west coast of North America

maryam yousefi (1), Glenn Milne (1), Ryan Love (2), and Lev Tarasov (2)

(1) Department of Earth and Environmental Sciences, University of Ottawa, Ottawa, ON, K1N 6N5, Canada (myous023@uottawa.ca), (2) Department of Physics and Physical Oceangraphy, Memorial University of Newfoundland, St. John's, NL A1C 5S7, Canada.

We infer the glacial isostatic adjustment (GIA) signal and its uncertainty along the central Pacific coast of North America using 680 sea-level index points and over 14500 model runs sampling more than 500 (1-D) Earth viscosity models and 29 ice models. Due to the large spatial extent and different tectonic settings of the study area, we divided it into three sub-regions (northern, central and southern) for which model parameters were inferred separately. Also, given that this region is tectonically active, the influence of this process (as well as sediment isostatic adjustment) was accounted for where possible by removing it from the data using published estimates. Our results indicate that it is not possible to fit well all of the RSL data with a single set of model parameters, suggesting significant lateral variability in viscous structure. Specifically, very low viscosities (10^{18}-10^{19} Pas) are inferred in the upper mantle within the northern region (southwestern British Columbia and northwest Washington) compared to those inferred (2-5 x 10^{20} Pas) for the central and southern regions (extending from southern Washington to southern California). High quality model fits were obtained for all data except those from the northern region where no single parameter set was able to capture both the rapid and large RSL fall during the late glacial and the monotonic rise during the mid-to-late Holocene at all localities. This suggests the need for an Earth model that incorporates departures from a linear Maxwell rheology (as applied here) and/or lateral variations in viscosity structure. Following our 1D GIA analysis and using the optimal model parameters, two sets of model outputs are provided (with uncertainty): the contribution of GIA to sea level changes at 56 tide gauge stations; and present-day GIA-induced vertical land motion at 483 GPS stations. The (1-σ) range of estimated uncertainty varies from 0.11 to 0.78 mm/yr for predicated rates of RSL change and from 0.3 to 0.78 mm/yr for vertical land motion. Our model estimates can be used to remove the GIA signal from these data sets to better isolate that due to tectonic processes.