Geophysical Research Abstracts
Vol. 15, EGU2013-5422, 2013
EGU General Assembly 2013

Confronting GIA models to a probabilistic surface reconstruction of relative sea-level rise

Gael Choblet (1), Laurent Husson (1), Thomas Bodin (2), and Yann Capdeville (1)
(1) CNRS - Université de Nantes, Nantes, France (gael.choblet@univ-nantes.fr), (2) UC berkeley - USA

Since the first formulation of the 'sea-level equation' in the late 1960s, GIA modelling of sea-level change amounts now to a rich litterature. The most recent observations of the time variations of the Earth's gravity field by the GRACE experiment as well as the latest modelling efforts for the viscoelastic response of the Earth's mantle to the collapse of the Pleistocene ice sheet (e.g. including lateral viscosity variations) tend however to indicate that further progress is still required in this field, with a more precise description of the history of ice sheets since the last glacial maximum and of the viscous rheology of the mantle.

A complementary approach to the modelling efforts is the observation of relative sea-level rise. Thanks to relatively long records at specific locations, tide gauges represent the only mean to monitor secular sea-level rise at present-day. In addition, altimetry based measurements of high quality also exist since the satellite era (since the 1990s) that provide sea-level trends partly affected by shorter-term fluctuations. We propose here a global surface reconstruction of relative sea level from tide gauge records using a probabilistic scheme based on the reversible jump Markov chain Monte Carlo algorithm (as described by Bodin et al., JGR, 2012 for the example of the Australian Moho). This method allows to infer both model and parameter space so that not only the functions within the model but also the number of functions itself are free to vary. This is particulalry interesting in the case of tide gauges observations that are unevenly distributed on the surface of the Earth (very sparse in the Southern hemisphere) and whose records are associated to stronlgy varying lengths (and thus varying uncertainties on the local sea level trend).

While measurements of time variations of the Earth's gravity field by the GRACE mission are considered to witness both the GIA phenomenon and the signal associated to ongoing water exchange between continents and oceans (both of which probably correspond to similar amplitudes), the direct comparison of our probabilistic reconstruction of sea-level rise with the prediction of GIA models highlights coastal locations where a good agreement is observed while other regions exhibit sea-level trend distributions that do not match the GIA predictions given their uncertainty. The latter disagreement either reveals regions where GIA modelling is not satisfactory and requires further efforts or locations where phenomena other than GIA contribute to sea-level change.