Geophysical Research Abstracts
Vol. 20, EGU2018-10999, 2018
EGU General Assembly 2018

Eurasia-North America plate motion and Glacial Isostatic Adjustment

Eric Calais (1), Luce Fleitout (1), and Kurt Lambeck (2)

(1) Ecole Normale Supérieure, Department of Geosciences, Paris, France (eric.calais@ens.fr), (2) Research School of Earth Sciences, ANU, Canberra, Australia

There remains a frustrating discrepancy between the geodetic angular velocity for Eurasia (EU) - North America (NA) and that indicated by seismotectonic obser-vations of the transition from extension to compression along their common bound-ary in the Siberian Far East. Here we show that this issue stems from the way "sta-ble North America" (and Eurasia, to a lesser extend) is defined in most geodetic plate motion estimations, that select a geographically-limited subset of sites sup-posedly unaffected by Glacial Isostatic Adjustment (GIA).
We show that this discrepancy is alleviated by using geodetic sites over the whole NA plate, while correcting GPS velocities with a GIA model in which the low-er mantle viscosity is larger than 10^{22} Pa s. Furthermore, we show that a plate motion inversion in which a rigid rotation and a horizontal GIA deformation component are estimated jointly provides a NA-EU angular rotation consistent with the seismotectonic one and a "non rigid" velocity pattern in NA and EU consistent with GIA predictions that use a mantle viscosity of a few 10^{22} Pa s.
The mantle viscosity structure as derived from inversions of paleo-sea level data has long been a subject of debate, with solutions typically characterized by an up-per mantle viscosity of around 5×10^{20} Pa s and two preferred lower-mantle viscosities: $\sim3\times10^{21}$ Pa s for some authors, $\sim2\times10^{22}$ Pa s for others. The results exposed here indicate that present-day horizontal velocities in North America and Fennoscandia favor the latter.