# Eurasia-North America plate motion and Glacial Isostatic Adjustment

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**Abstract**

There remains a frustrating discrepancy between the geodetic angular velocity for Eurasia (EU) - North America (NA) and that indicated by seismotectonic observations of the transition from extension to compression along their common boundary in the Siberian Far East. Here we show that this issue stems from the way "stable North America" (and Eurasia, to a lesser extend) is defined in most geodetic plate motion estimations, that select a geographically-limited subset of sites supposedly 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 lower mantle viscosity is larger than 10ˆ22 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 10ˆ22 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 upper mantle viscosity of around 51020 Pa s and two preferred lower-mantle viscosities: _˜3x10ˆ21 Pa s for some authors, _˜2x10ˆ22 Pa s for others. The results exposed here indicate that the latter is more consistent with present-day horizontal velocities in North America and Fennoscandia. The preferred GIA model derived from this study implies horizontal velocities up to 2 mm/yr over most of the globe, including in areas that are classicaly considered devoid from GIA effects.

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