Geophysical Research Abstracts, Vol. 7, 10006, 2005
SRef-ID: 1607-7962/gra/EGU05-A-10006

On the Stability of the No-Net-Rotation Frame Realization

C. Kreemer (1), G. Blewitt (1), H.-P. Plag, and W.E. Holt (2)

(1) Nevada Bureau of Mines and Geology, and Seismological Laboratory, University of Nevada, Reno, USA [kreemer@unr.edu], (2) Department of Geosciences, State University of New York, Stony Brook, USA

The current ITRF is aligned to the no-net-rotation (NNR) condition as defined by Argus and Gordon (1991). Argus and Gordon realized an NNR frame by using a simplified global surface velocity field distribution in which all surface areas evaluated in the integral were considered to be plate-like. Currently there exist a couple of geodetically determined kinematic models (e.g., GSRM and APKIM) in which the surface velocity field within all plate boundary zones (both oceanic and continental) is parameterized through an estimation of the velocity gradient field between rigid plates. Because these models are constrained by geodetic velocity measurements on stable plates as well as within plate boundary zones, they provide a more correct model of horizontal surface velocities over the entire Earth. Therefore, a more accurate realization of an NNR frame may be obtained by evaluating the surface integral from such velocity models.

With the Global Strain Rate Model (GSRM) as a basis we aim to test the stability of the NNR frame by performing several (possibly hypothetical) variations in the global horizontal velocity field that has been used to derive the NNR frame. It has already been shown that the contribution of plate boundary zones to the surface integral are important in defining the NNR frame. The most dramatic change in future realizations of the NNR frame may come from having an increasing number of geodetic velocity measurements within plate boundary zones and these could potentially alter the inferred surface integral for these zones. To obtain a grasp on the significance of this potential effect, we compare the current NNR frame with one in which no geodetic velocities within plate boundary zone have been used, thereby constraining the plate boundary velocity fields to constant velocity gradients fixed by the motion

of the bounding plates. In another test we re-calculate (relative) angular velocities for stable plates (most notably the Eurasian and North American plates) after correcting observed horizontal velocities with predicted velocities from post-glacial rebound models. We quantify the effect of these improvements in plate motion predictions on the realization of the NNR frame. Given the outcome of these tests we wish to make some recommendations on the suitability for the use of an NNR frame, such as GSRM-NNR, in the definition of ITRF, particularly in light of competing models, such as a hotspot-fixed frame.