

The Bering Plate from Elastic Block Modeling of GPS Data

O'Flaherty, J. N.¹, Gabsatarov, Y. V.², Steblov, G. M.^{3,2}, Frolov, D. I.⁴, Kogan, M. G.¹, Freymueller, J. T.⁵

1. Lamont-Doherty Earth Observatory of Columbia University, Palisades, NY, USA, 2. Geophysical Service RAS, Obninsk, Russian Federation, 3. Institute of Physics of the Earth RAS, Moscow, Russian Federation, 4. Ioffe Physico-Technical Institute RAS, St. Petersburg, Russian Federation, 5. Geophysical Institute and Dept of Geology and Geophysics, University of Alaska, Fairbanks, AK, USA

The Bering Sea region is bounded by the Aleutian Arc on the south, by Alaska on the east, and by Chukotka (Siberia) on the west. The northern boundary is where Alaska and Chukotka meet at the Bering Strait. Seismicity around the Bering Sea allowed Mackey et al. [1997] to discriminate the Bering plate (BERI) from the North American plate (NOAM), although the seismic belts are diffuse in Alaska and Chukotka. Cross and Freymueller [2008] found the clockwise rotation of BERI relative to NOAM from GPS velocities in western Alaska (the data before the Denali 2002 earthquake), on islands in the Bering Sea interior, and on the Aleutian Islands. Here we model BERI from GPS data in Chukotka (Siberia) collected in 2004-2009 and from the PBO Project GPS data in Alaska and the Bering Sea interior collected in 2006-2011. The survey in Chukotka and the PBO survey agree very well where they blend at the north. Of the PBO stations, we retained those that were insignificantly affected by the Denali earthquake. We inverted GPS velocities with respect to NOAM for the motion of BERI using the elastic block modeling code DEFNODE of R. McCaffrey, which takes into account the elastic deformation at plate boundaries. Consideration of such deformation is important because most of the data are collected over the margins of BERI. Judging from distribution of seismicity in Alaska and Chukotka, these margins appear to be a complicated networks of faults. Therefore we have some freedom in placing the boundaries of BERI on the east and on the west while modeling the plate motion. We tested several configurations of BERI in inversions for its rotation relative to NOAM, all producing quite similar estimates for the BERI-NOAM pole and angular velocity. Combining GPS velocities on Chukotka and Alaska constrains the clockwise rotation of BERI around a pole near the western margin of the Bering Sea as the velocities in Chukotka are much smaller than in Alaska.