



Space geodesy validation of the “W-ward” lithospheric mainstream

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The Terrestrial Reference Frame (TRF) presents limitations in describing absolute plate motions relative to the mantle. However, independent lines of evidence support the existence of a global ordered flow of plate motions that is westerly polarized. We still do not know the precise trend of this tectonic flow and the velocity of the differential rotation. For these reasons we jointly estimated a new plate motion model and three different solutions of lithospheric net rotation. Considering the six major plate boundaries and variable source depths of the main Pacific hotspots, we adapted the TRF plate kinematics by global space geodesy to absolute plate motions models with respect to the mantle. Our results show that assuming faster Pacific motions as suggested by the hypothesis of an asthenospheric source of the hotspots, the best lithospheric net “W-ward” rotation estimate is 13.4 ± 0.7 cm/yr. This solution matches remarkably better with the geological constraints than those retrieved with slower Pacific motion and net rotation estimates. Assuming faster Pacific motion, it is showed that all plates move orderly “westward” along the tectonic mainstream at different velocities and the equator of the lithospheric net rotation lies inside the corresponding tectonic mainstream latitude band (about ± 7 degrees), defined by the 1 sigma confidence intervals.