

# Research of the Horizontal Crustal Motions, Based on Gps Data for the Territory of Bulgaria and the Balkans

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## SUMMARY

Since the launching, geodetic techniques for monitoring crustal motion, advanced satellite techniques and systems, including GPS, significantly simplified the procedure for determining the parameters of crustal motions since it allowed during a short period of time to receive precise of data that helped to determine with greater accuracy the parameters of crustal movement for definite time. The present study is focused on the used GPS data from free available GNSS stations on the territory of the Balkans. The ETRF horizontal velocity vectors are representative for the local station. They are obtained by using ETRF components of the Eurasia plate rotation pole to the obtained solution ITRF velocity vectors. Applying velocities  $v_x$ ,  $v_y$  and  $v_z$  and respective coordinates of the stations estimated from GPS data processing, it is possible to estimate the rotation Euler vector ( $\Omega_X$ ,  $\Omega_Y$  and  $\Omega_Z$ ) by Least Squares Method. For determination of Euler parameters the author accepts a set of GPS stations as stable. Several different rotation poles have been estimated in order to test the proposed kinematics model for Balkans. The analysis of the velocity field for the whole studied area leads to the hypothesis of continuous deformation to the detriment of local deformation at the borders of stable blocks. The presented velocity gradient clearly indicates the increase of the motion from north to south. A map representing the relative velocities changes on the territory of Bulgaria and the Balkans have been created. The investigation in the present publication is focused on the South Balkan extensional region using Global Positioning System (GPS) technique. The GPS derived velocity field from GPS stations covering the territory of Bulgaria has been analysed and discussed in the context of tectonic block models. The results show southward displacements between 2-10 mm/yr. This study presents the contemporary tectonics in the south Balkans region. The horizontal velocities in North Bulgaria, north of the Balkans Mountain, confirm the suggestion that North Bulgarian territory is part of the Eurasian plate. Our results show that the Southern Balkans do not belong to the Eurasian plate and seem to be dragged toward the south with the velocities relative to Eurasia gradually increase in N-S direction from 1-1.5 mm/yr in western Bulgaria to 10mm/yr in the Greece, leading to N-S directed extension along this area. The estimations agree very well with results from other investigations of this region.