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GPS velocity field across the Ossetia region of the Great Caucasus

Vadim Milyukov (1), Alexey Mironov (1), Grigory Steblov (3), Valery Drobishev (2), Hariton Hubaev (2), Anatoliy Kusraev (2), and Vladimir Shevchenko (3)

(1) Moscow State University, Sternberg Astronomical Institute, Moscow, Russian Federation (milyukov@sai.msu.ru, +7 495 9328841), (3) Institute of Physics of the Earth of Russian Academy of Science, Moscow, Russian Federation (steblov@ifz.ru), (2) Vladikavkaz Scientific Center of Russian Academy of Science, Vladikavkaz, Moscow, Russian Federation (noovnc@yandex.ru)

The Ossetia part of the Great Caucasus is located within the Trans-Caucasian uplift. According to modern understanding this large structure is the northern ending of the planetary-scale structure - the East-African-Trans-Caucasus rift zone. This region, being one of the most tectonically active regions of the Caucasus, was not covered by satellite geodetic measurements made in the Caucasus and surrounding areas since the early 1990s. This work presents results of the development of the network of survey-mode sites and GPS velocity field of this region, which is also part of the international project under leadership of R. Reilinger (MIT) for studying geodynamics of the eastern Mediterranean and Caucasus.

The network established during the campaigns of 2010-2013 crosses from north to south the main tectonic structures of the Ossetia part of the Great Caucasus: the northern and southern slopes of the Great Caucasus ridge, the Tibsky thrust fault, the Northern Caucasian step, the Orkhevsky thrust fault, the Georgian block. The main profile of the network is oriented from north-east to south-west. The other two profiles are transverse to the main one and are oriented from west to east. The first of them is located along the southern and northern borders of the Orkhevskii thrust fault, covering the area of the Racha 1991 earthquake, with release to the Gagra-Dzhava zone. The second of them passes along the northern slope of Great Caucasus Ridge.

The GPS data included 25 sites were processed using the GAMIT/GLOBK software. Velocity uncertainties for many sites are less then 1 mm/year. GPS velocities are presented in two reference systems: ITRF08 and fixed Eurasia.

In terrestrial system of coordinates ITRF08 the horizontal motions of Ossetia region are characterized by the steady north-east trend with velocities of 25-30 mm/year, that as a whole coincides with velocities estimation of modern movements of the North Caucasus. With respect to Eurasia one can note the prevalence of submeridional oriented motions, what is the result of pressure of the Arabian lithospheric plate on Eurasia. Nevertheless, there is noticeable spreading of the GPS-derived velocities, in value and direction, which reflects local features of tectonic structure of the region. The resulting velocities provide the first relatively complete and detailed pattern of modern horizontal displacements of some elements within the Caucasian mountain structure.

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