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Geodynamic GNSS observations on the Kuril Islands

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Abstract. The network of geodynamic GNSS observations was deployed in 2006 throughout the Kuril island arc from Japan to Kamchatka. The network includes 11 stations of continuous and periodic registration. The article provides information on the organization of the network and its current status. The creation of the GNSS network provided extensive material for studying the modern geodynamic processes in the Kuril segment of the subduction zone of the North American (Okhotsk) and Pacific lithospheric plates. The performed observations made it possible to obtain the first information on the modern geodynamics of the region. The article presents an overview of the results of the previous years obtained by the authors together with other researchers. The source models of the largest seismic events are constructed on the basis of the instrumental data: the 2006 Mw 8.3 and 2007 Mw 8.1 Simushir earthquake doublet and the 2013 Mw 8.3 deep-focus Okhotsk earthquake. At the initial stage of the post-seismic process in the epicentral zone of the Simushir earthquakes, the dependence of the asthenosphere viscosity on the observed post-seismic displacement velocity of the Earth's surface was found. The results obtained earlier were supplemented by new data on the changes in the geodynamic setting in the subduction zone. The dynamics of the transient decaying post-seismic process in the central part of the island arc is studied. Stress relaxation in the Earth's crust at various stages of this process could be the trigger of powerful volcanic eruptions occurred in 2009–2019 on the central Kuril Islands. The seismic potential of various segments of the Kuril subduction zone has been clarified on the basis of the modeling of current mechanical coupling of lithospheric plates. It contributes to a more accurate assessment of the seismic hazard of the region together with other methods. The continuation of the GNSS observations on the Kuril Islands in the future will allow us to study in detail the features of the modern geodynamics of the region.

Keywords:

modern geodynamics, GNSS observations, earthquake, modeling

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