PERSPECTIVES OF GNSS-TECHNIQUES APPLICATION FOR EARLY TSUNAMI WARNING IN THE KURIL-KAMCHATKA REGION

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Kuril-Kamchatka subduction zone is the region that generate strong tsunamigenic earthquakes. The Great 1952 Kamchatka earthquake Mw=9.0 is one of the strongest events of the 20th century. Tsunami invoked by this earthquake caused more than 2000 casualties in Severo-Kurilsk. Tsunami problem is very important in the Kuril-Kamchatka region, but existing tsunami early warning systems (TEWS) are not highly-efficient and false alarms happen quite often. Current TEWS are based mainly on seismic methods that have some disadvantages, for example, magnitude underestimation, focal-mechanism and source slip distribution ambiguity just after the mainshock. However, there are geodetic techniques, that are able to overcome these problems. Several GNSS-based earthquake- and tsunami early warning systems were developed (for example, REGARD in Japan, G-larmS and G-FAST in USA). These systems use onshore GNSS-stations' data and able to determine magnitude of event and other source parameters.

The main goal of this work is exploration of perspectives of GNSS-based TEWS application in the Kuril-Kamchatka region based on the coseismic displacements modeling generated by historical tsunamigenic earthquakes. We calculated coseismic offset fields of Kamchatka (1923, 1952, 1969, 1971, 1997) and Kuril (1963, 1969, 1994, 2006 and 2007) earthquakes. We used STATIC1D program for obtaining of displacements considering Earth sphericity and stratification. Our results revealed that the strong earthquakes (M ≥ 7.7) which regularly occur along the Kuril-Kamchatka subduction zone cause horizontal coseismic displacements greater than 5 cm along the eastern coast and southern part of Kamchatka Peninsula and all Kuril Islands. Sakhalin Island undergoes offsets ranging from 1 to 5 cm. Such displacement values can be detected by GNSS-techniques in real-time mode and used for tsunami early warning generation. Thus, GNSS-based TEWS could be successfully employed in Kamchatka and Kuril Islands. These regions and Sakhalin Island GNSS-networks could be used for this end.

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