

Systematization of the results of seismic process studies by the LURR (load-unload response ratio) method on Sakhalin

Zakupin A.S.

Institute of Marine Geology and Geophysics Far Eastern Branch Russian Academy of Science,
Yuzhno-Sakhalinsk, Russia

e-mail: dikii79@mail.ru

Approach for medium-term seismic hazard prediction LURR (load/unload response ratio) [Yin et al., 1995], which was previously not used in Russian practice, has been tested on Sakhalin since 2014. Over the past four years, the results were obtained, which in 2018 could be systematized, and thus, to obtain data on the effectiveness of the method, both in retrospect and in the operational format [Zakupin et al., 2018]. The method allows identify the danger of a strong seismic event in the local area (up to 300 km) a few years before the earthquake with a magnitude of not less than 5. A retrospective analysis was performed for strong earthquakes that occurred since 1988 till 2015. Such earthquakes on Sakhalin were analyzed five (Nevel'skoe, Gornozavodskoe, Uangskoe, Piltunskoe and Neftegorskoe), of which the first two were in the South and the rest North. In IMGIG a specialized software package Seis-ASZ was developed to work with LURR in 2015. Analysis of seismicity of Sakhalin was carried out according to few seismic catalogues (based in general on data from the GS FRC UGS RAS) for the analysis of earthquakes from 1906 to 2015. Using different catalogues for retrospective analysis is justified by the fact that it is possible to reach the maximum number of strong earthquakes in Sakhalin. Retrospective estimates gave a good agreement on the time (up to two years) and place for all strong earthquakes in Sakhalin during the period under consideration. Also on Sakhalin since 2015, the LURR method has gave three anomalies in the operational mode. For real-time analysis from 2015 we used local seismic catalog. On two predictions are closed, on the third anomaly as of February 2019 there is a status "pending". The first two anomalies allowed us to form predictions Onorskogo 14.08.2016 (MW=5.8) and Krilonskogo 23.04.2017 (MW=5.0) earthquake, which were adopted at the meetings of the Sakhalin branch of the Russian expert Council on emergencies (Protocol №3 from 11.05.2016, Protocol №2 from 16.03.2017). The analysis of seismic data of 2015-2017 in the southern part of Sakhalin showed the anomaly LURR which is reflected in a fairly localized zone. The zone is localized in the area of the Tim-Poronai and Aprelovski faults. Potential in this seismogenic zone is estimated to MW=6. To implement a short-term seismic prediction and localize the focus of a possible earthquake in June 2018, the deployment of geophysical monitoring systems at the Petropavlovsk geophysical observatory located in the dangerous zone was started. The test site is equipped with additional seismic monitoring facilities (including innovative seismic sensors and molecular-electronic hydrophones), radon station.

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2. Yin X.C., Xuezhong C., Ziping S., and Can Y. A new approach to Earthquake Prediction: The Load/Unload Response Ratio (LURR) Theory, Pure Appl. Geophys., 145 No.3/4. 1995. 701-715.