

Mid-term earthquake prediction using the LURR method on Sakhalin Island: A summary of retrospective studies for 1997–2019 and new approaches

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Abstract. The work presents the results of a retrospective analysis of the seismicity of Sakhalin using the LURR method of mid-term earthquake prediction for 1997–2019. All previously performed computations are reduced to a single database of seismological data (catalogue) of the Sakhalin Branch of the Federal Research Center “United Geophysical Survey of RAS”. Similar to previous studies, the Sakhalin territory was scanned by applying computational areas in the form of circles with a radius of one degree; however, the resolution was increased. The entire territory was covered by such zones with a step of 0.5 degrees in latitude and longitude, with the grid being detailed down to 0.1 degrees in three most dangerous seismogenerating zones. As a result, the number of computational samples was increased, which allowed the omission of anomalies in the LURR parameter during computations to be avoided. Due to a reasonable binding of the lower bound of the magnitude for predicted events to the upper bound of the magnitude range of the computational sample ($M = 5$), the number of objects for the retrospective forecast was increased by 3 times for the study period. 323 computational samples (119 of which are basic and 204 ones are detailed) were processed on the territory of the island. 15 alarm periods were obtained, which geographically represent all zones of moderate and strong earthquake generation on Sakhalin Island. As a result, 17 out of 19 earthquakes with $M \geq 5$ occurred in the areas with anomalies during the alarm periods not exceeding three years. Out of 15 periods, 4 turned to be false. Thus, 75 % of the alarms predicted 89 % of the earthquakes.

Keywords:

seismicity, seismic events, LURR method, earthquake catalogue, anomaly, forecast (prediction)

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