Geosystems of Transition Zones, 2020, vol. 4, N 2, p. 169–177
Геосистемы переходных зон, 2020, т. 4, № 2, с. 169–177
https://doi.org/10.30730/gtrz.2020.4.2.160-168.169-177

Full text ENG PDF RUS PDF
https://elibrary.ru/title_about.asp?id=64191

Mid-term assessments of seismic hazards on Sakhalin Island using the LURR method: new results

Aleksander S. Zakupin*
Nataliya V. Boginskaya

Institute of Marine Geology and Geophysics, FEB RAS, Yuzhno-Sakhalinsk, Russia
**E-mail: a.zakupin@imgg.ru*

Abstract Резюме RUS

A retrospective analysis of seismic regime in the central part of Sakhalin Island within the period from 1997 to 2005 by the LURR (load/unload response ratio) method is presented. Estimates were not earlier conducted for the outlined period due to a lack of data in the rated sampling of this part of the island. In the present work, additional information from two independent catalogues is adduced. Seismicity behaviour prior to the Uglegorsk earthquake of 4 August 2000 (Mw = 6.7) was considered according to the LURR method. This earthquake was up till now considered as a missed target in the series of 7 predictive assessments of Sakhalin earthquakes having a magnitude above 5.5. The computation results revealed the LURR parameter anomaly to be a precursor, on which basis the location and time of the conditionally predictable event were accurately determined. The LURR parameter anomaly was noted in the rated area in the February of 2000, 6 months prior to the earthquake's occurrence.

Keywords

seismicity, seismic events, LURR method, earthquake precursor, retrospective analysis

For citation: Zakupin A.S., Boginskaya N.V. Mid-term assessments of seismic hazards on Sakhalin Island using the LURR method: new results. *Geosistemy perekhodnykh zon = Geosystems of Transition Zones*, 2020, vol. 4, no. 2, pp. 169–177. (In Engl.). https://doi.org/10.30730/gtrz.2020.4.2.160-168.169-177

Для цитирования: Закупин А.С., Богинская Н.В. Среднесрочные оценки сейсмической опасности на о. Сахалин методом LURR: новые результаты. *Геосистемы переходных зон*, 2020, т. 4, № 2, с. 160–168. https://doi.org/10.30730/gtrz.2020.4.2.160-168.169-177

References

1. Chebrov V.N., Saltykov V.A., Serafimova Iu.K. **2013**. Identifying the precursors of large (M ≥ 6.0) earthquakes in Kamchatka based on data from the Kamchatka Branch of the Russian expert council on earthquake prediction: 1998–2011. *J. of Volcanology and Seismology*, 7(1): 76–85.
2. Fokina T.A., Safonov D.A., Kostylev D.V., Mikhailov V.I. **2019**. Sakhalin. In: *Zemletriaseniia Severnoi Evrazii* [*Earthquakes in Northern Eurasia*], 22(2013): 173–183. (In Russ.). doi:10.35540/1818-6254.2019.22.15
3. Gusev A.A. **1974**. [Earthquakes prediction by the seismicity statistics]. In: *Seismichnost' i seismicheskii prognoz, svoistva verkhnei mantii i ikh sviaz's vulkanizmom na Kamchatke* [*Seismicity and seismic prediction, properties of the upper mantle and their relation to volcanism in Kamchatka*]. Novosibirsk: Nauka, 109–119. (In Russ.).
4. Poplavskaya L.N., Ivashchenko A.I., Oskorbin L.S., Nagornykh T.V., Permikin Yu.Yu., Poplavskii A.A., Fokina T.A., Kim Ch.U., Kraeva N.V., Rudik M.I. et al. **2006**. [*Regional catalog of Sakhalin Island earthquakes, 1905–2005*]. Iuzhno-Sakhalinsk: IMGiG DVO RAN [Yuzhno-Sakhalinsk: IMGG FEB RAS], 103 p. (In Russ.).

5. Stepnov A.A., Gavrilov A.V., Konovalov A.V., Ottemöller L. **2014.** New architecture of an automated system for acquisition, storage, and processing of seismic data. *Seismic Instruments*, 50(1): 67–74. https://doi.org/10.3103/s0747923914010083
6. Yangde F., Ji G., Wenkai C. **2012**. Parallel computing for LURR of earthquake prediction. *International J. of Geophysics*, 2012: Article ID 567293, 3 p. https://doi.org/10.1155/2012/567293
7. Yin X., Yin C. **1991.** The precursor of instability for nonlinear system and its application to earthquake prediction. *Science in China*, 34: 977–986.
8. Yin X.C., Chen X.Z., Song Z.-P., Yin C. **1995**. A new approach to earthquake prediction: The Load/Unload Response Ratio (LURR) theory. In: *Mechanics problems in geodynamics*, pt 1: 701–715. https://doi.org/10.1007/978-3-0348-9065-6_17
9. Yin X.C., Wang Y.C., Peng K.Y., Bai Y.L., Wang H.T., Yin X.F. **2000.** Development of a new approach to earthquake prediction: The Load/Unload Response Ratio (LURR) theory. *Pure and Applied Geophysics*, 157(11/12): 2365–2383. https://doi.org/10.1007/978-3-0348-7695-7_29
10. Zakupin A.S., Boginskaia N.V. **2019.** Modern seismicity in the area of the Central Sakhalin fault (south of Sakhalin Island): false alarm or postponed prediction? *Geosistemy perekhodnykh zon = Geosystems of Transition Zones*, 3(1): 27–34. (In Russ.). doi.org/10.30730/2541-8912.2019.3.1.027-034
11. Zakupin A.S., Kamenev P.A. **2017.** Space-time localization probability of enhanced seismic hazard in LURR medium-term prediction technique as applied to New Zealand territory. *Geosistemy perekhodnykh zon = Geosystems of Transition Zones*, (3): 40–49. doi.org/10.30730/2541-8912.2017.1.3.040-049.
12. Zakupin A.S., Semenova E.P. **2018**. Study of the process of preparation of strong earthquakes (Mw > 5) on Sakhalin using the LURR method. *Vestnik KRAUNTs. Fiz.-mat. nauki = Bulletin KRASEC. Physical and Mathematical Sciences*, 5: 83–98. (In Russ.). https://doi.org/10.18454/2079-6641-2018-25-5-83-98
13. Zakupin A.S., Zherdeva O.A. **2017.** Retrospective evaluation of applicability for medium-range prediction of earthquakes within the Northern Sakhalin region. *Vestnik DVO RAN = Vestnik of the Far East Branch of RAS*, 1: 18–25.
14. Zakupin A.S., Levin Yu.N., Boginskaya N.V., Zherdeva O.A. **2018**. Development of medium-term prediction methods: A case study of the August 14, 2016 Onor (M = 5.8) earthquake on Sakhalin. *Russian Geology and Geophysics*, 59(11): 1526–1532. https://doi.org/10.1016/j.rgg.2018.10.012
15. Zakupin A.S., Bogomolov L.M., Boginskaya N.V. **2020.** Application of methods of analysis of seismic sequences SDP and LURR for earthquake prediction on Sakhalin. *Geophysical Processes and Biosphere*, 19(1): 66–78. https://doi.org/10.21455/GPB2020.1-4