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An integrated approach to assessing the geodynamic activity of the Earth's crust in the low seismic East Baltic region

Valerijs Nikulins
Latvian Environment, Geology and Meteorology Center, Subsoil Department, Riga, Latvia (valerijs.nikulins@lvgmc.lv)

The East Baltic region (EBR), located on the ancient Precambrian East European Craton, is characterized by low seismic and deformational activity. The EBR is located at a distance of about 2000 km from the divergent zone in the North Atlantic and from the convergent zone in the Mediterranean Sea.

Nevertheless, historical and modern earthquakes have occurred in the EBR. Historical earthquakes occurred in 1616 (*Bauska*, Latvia, VI), 1670 (*Pärnu*, Estonia, VI), 1821 (*Koknese*, Latvia, VI), 1823 (*Võrtsjärv*, Estonia, VI), 1857 (*Irbe*, Latvia, VI), 1896 (*Jelgava*, Latvia, V), and modern earthquakes occurred on 10/25/1976 (*Osmussaar*, Estonia, M 4.7), 09/21/2004 (*Kaliningrad* region, Russia, Mw 5.2).

The study of slow (tectonic creep) and fast (earthquakes) deformations is practical importance in EBR for safety of energy facilities - *Plavinas* HPP, *Baltic* (Kaliningrad region of Russia) NPP and *Ostrovets* (Belarus) NPP.

In the central part of the territory of Latvia, signs of geodynamic activity of the Earth's crust have been identified. A characteristic feature is the trans-regional *Olaine-Inčukalns* tectonic fault, which crosses the Riga agglomeration. The fault is traced in the *Caledonian* structural complex.

Previous studies on seismic hazard assessment in Latvia (Safronovs & Nikulins, 1999; Nikulins, 2011) were based on combination of seismic, geophysical, geodetic and geological data. These studies made it possible to assess the seismotectonic potential of the Earth's crust, parameters of seismogenic zones and to state a very low seismic activity.

A sparse seismic network and poor seismic-geological conditions affect the effectiveness of seismological monitoring in EBR. To understand of driving mechanisms for earthquakes, results of remote sensing (*Persistent Scatterer Interferometry - PSI*) of surface (1992 - 2000), studies of radon anomalies (2014), and macroseismic data (2010) were used.

PSI method made it possible to reveal the anomalous vertical velocity (25.4 mm/year) of opposite sides of fault, adjacent to the *Olaine-Inčukalns* fault in the southwest of Riga. The average vertical velocity does not exceed 1.03 mm/year. The study of the radon field in northeast of the *Olaine-Inčukalns* fault revealed an intense (140000 Bq/m^3) radon anomaly (Nikulins, 2014).

In addition, on 22.11.2010, population of Riga and its environs felt shaking. Mechanism of the *Olaine-Inčukalns* fault is predominately *thrust faulting* with a *strike-slip* component, whereas mechanisms of most other faults in Latvia are *normal faulting* type.

These signs indicate the activation of the *Olaine-Inčukalns* tectonic fault. Thus, on the EBR, under conditions of slow deformation of the Earth's crust, a comprehensive analysis of various geological, geophysical and deformation parameters has justified itself.

Literature

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