National Academy of Sciences of Belarus
Centre of Geophysical Monitoring

Seismological monitoring in the area of the Belarusian NPP location site

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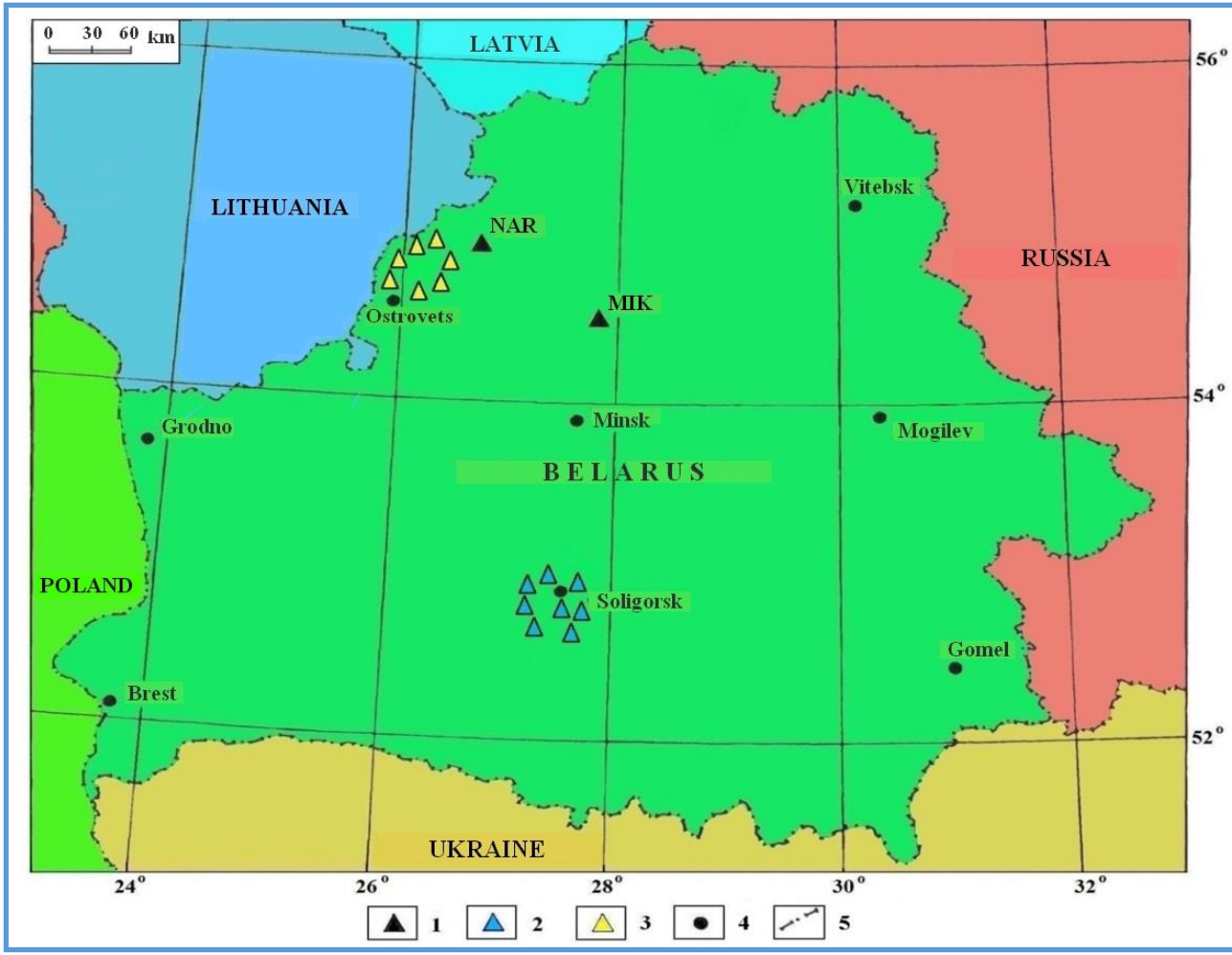
- Careful continuous seismological observations in the area of the Belarusian NPP location site (Ostrovets District, Grodno Region) started at the stage of the investments validation in 2008-2010. The observations had been carried out by 4 - 6 seismic observation stations (number of observation stations varied in different periods). Since June 1, 2012 till 2020 the regime seismic observations were realized by a local network of 7 observation stations, and one more station located within the Oshmyany fault nearby the geographical epicentre of the Gudogaj earthquake,1908 was added in 2021. At present the local network consists of 8 observation stations. To increase the reliability, quality and efficiency of the seismic situation assessment the data of the local network of regime observations are complemented with data obtained by a broadband seismic station of the “Naroch” geophysical observatory located 45 km northwest of the NPP site.

Present-day network of seismological observations in Belarus

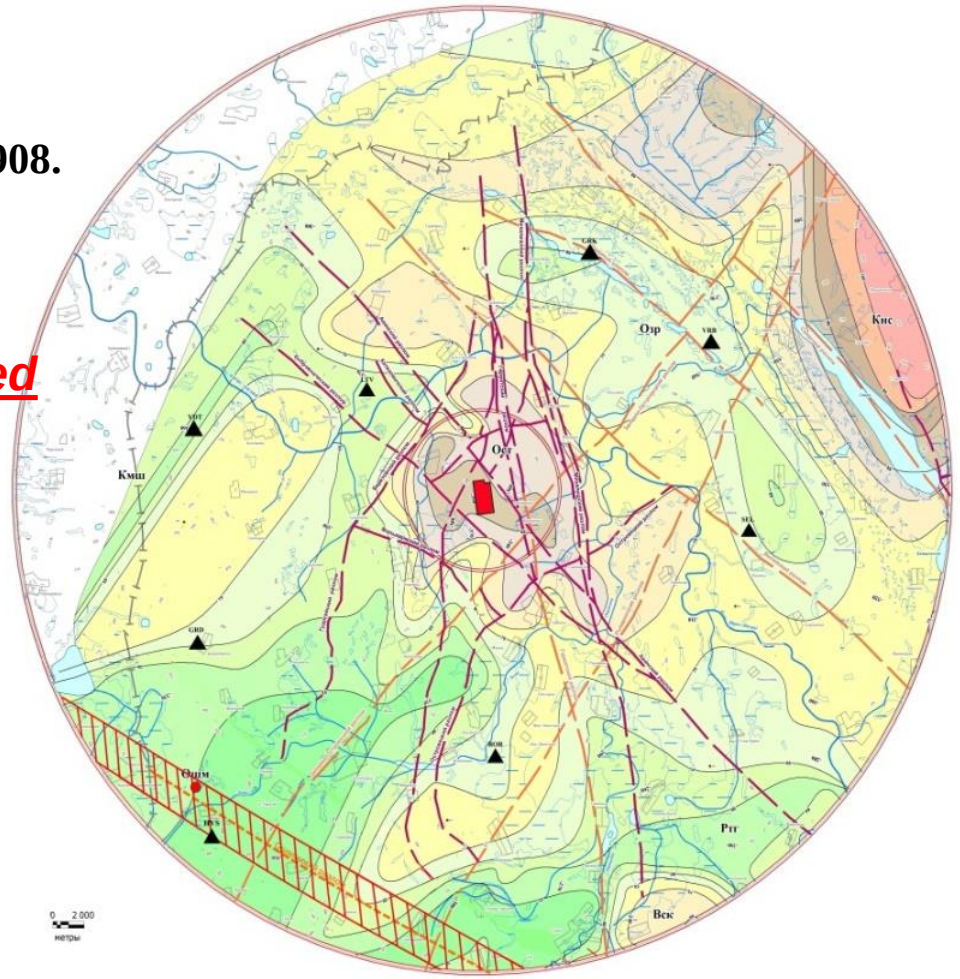
1 – geophysical observatories “Pleshchenitsy” - MIK and “Naroch” - NAR;
2 – observation stations of the Soligorsk local network;
3 – observation stations of the Belarusian NPP local network;
4 – towns;
5 – state frontiers



Local seismological observation network of the Belarusian NPP 30-km region, R=30 km

An additional station in the Oshmyany fault zone (observation station "Khutor Vesely" (HVS code) started its work in September 1, 2021 within the Oshmyany fault near the Gudogaj earthquake, 1908. The nearest Oshmyany *seismogenic* zone (*Mmax* 4,5) located at a distance of 23 km from the NPP site.

During the whole period of instrumental observations no local earthquakes were recorded in 30-km zone around the Belarusian NPP site.



SYMBOLS:

Seismotectonic map of the near (30 km) region around the Belarusian NPP (on a scale of 1 : 50 000)

Faults manifested in:
- the crystalline basement
- the pre-Quaternary sedimentary cover

Oshmyany SSZ

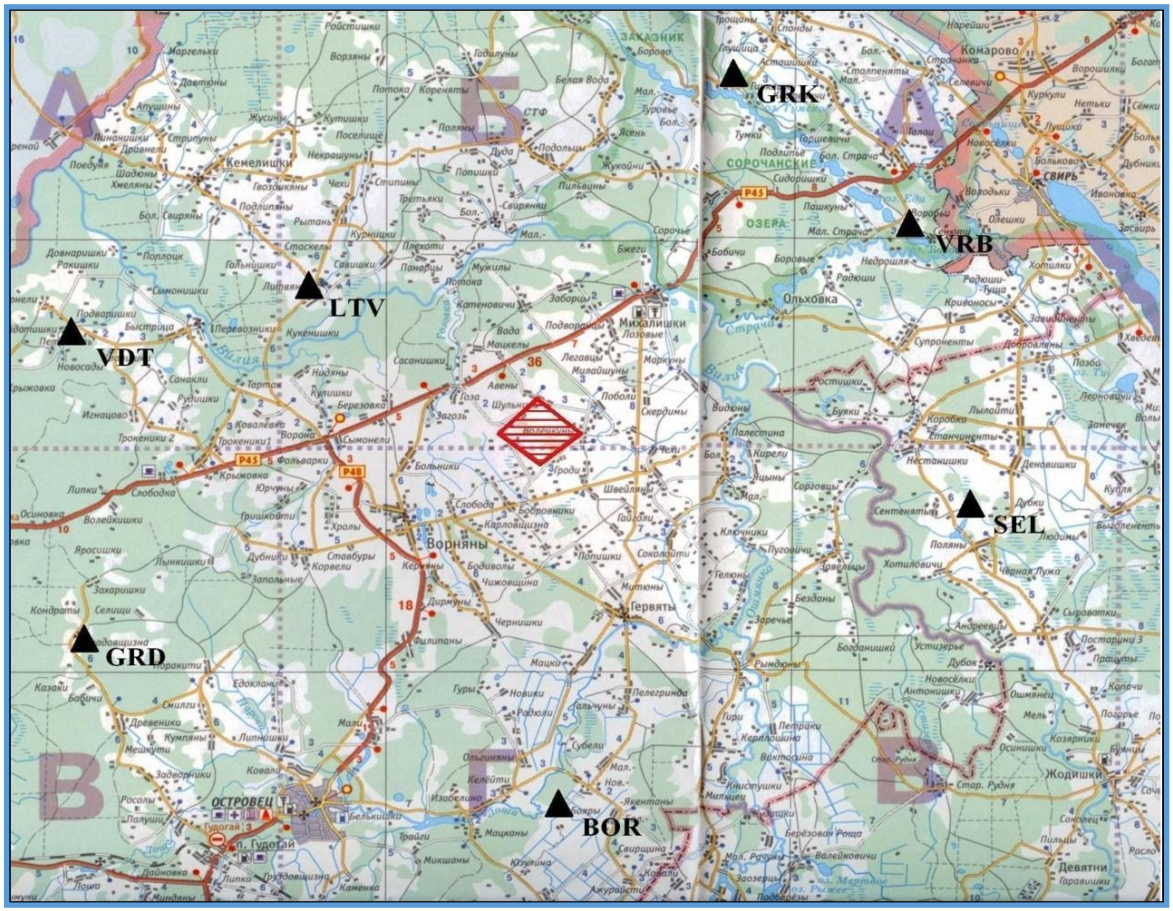
NPP site boundaries

Gudogaj earthquake epicenter

Scale of the amplitudes of overall neotectonic movements in meters

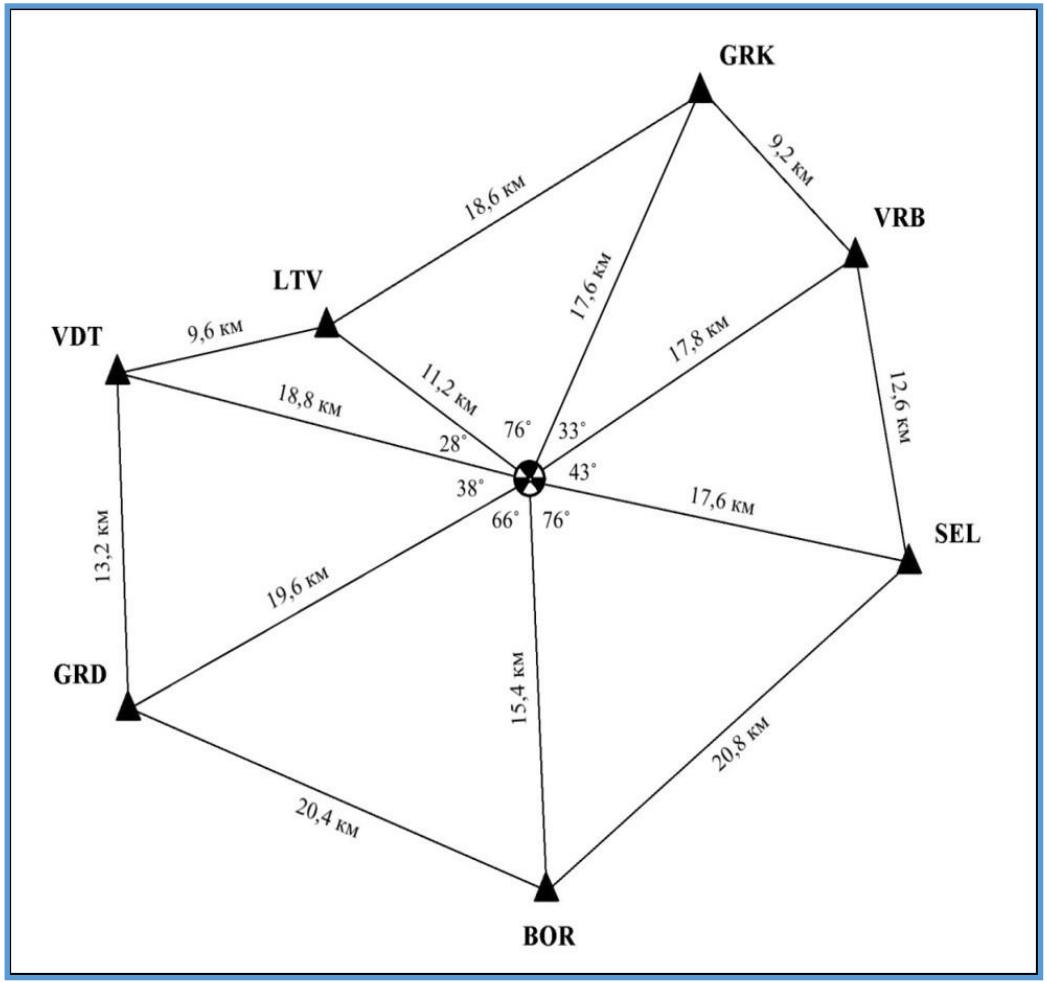
Representation of the observation stations of the local seismic network

▲– seismic stations: Boyary (BOR), Gradovshchizna (GRD), Vadatishki (VDT), Selishche (SEL), Vorob'y (VRB), Gornaya Kajmina (GRK), Litvyany (LTV), ◈ – NPP site boundary



Configuration pattern of the local network of seismological observations

average distance from the NPP site center to an observation station is 16.9 km; average distance between observation stations is 14.9 km; average value of a station-site-station angle is 51.4 degrees



- Seismic stations of the local network are equipped with equitype observation instruments including a short-period three-component seismometer “LE-3Dlite” (Lennartz Electronic, Germany), a 24-bit seismic recorder Delta-03 (“LogiS” LLC, Russia), an industrial computer with processor Intel Atom eBOX-530-820-FL1, and some supporting facilities.
- A recorder and an industrial computer connected by network communication are responsible for the operation control at the observation station. This permits a reliable transfer of the recorded data to the central server of data collection and processing of the local network and ensures protection from the information loss in cases of failures or emergency situations.

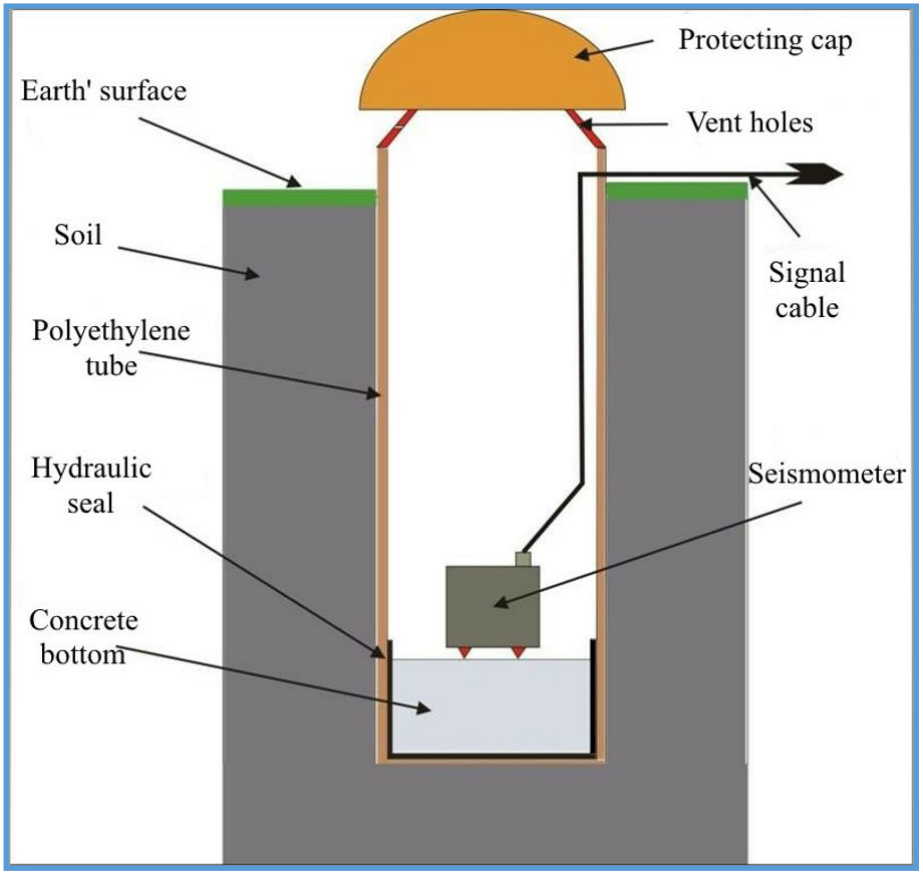
Overall view of a recording station housing

Delta-03 24-bit seismic signal recorder
(LogiS LLC, Russia)

Design of a buried seismometer installation

Common view of the site of a buried seismometer installation

3-component seismometer "LE-3Dlite" (Lennartz Electronic, Germany)



Overall view of the recording equipment and a sensor in the observation station

The calculations performed provided the following estimates:

1. The minimum magnitude of the seismic event detection within the local network aperture with the minimum noise level in the night-time is M = - 0.5; the minimum representative magnitude is M = 0.

2. The minimum magnitude of the seismic event detection with the average daily seismic noise level is M = 0; the minimum representative magnitude is M = 0.5.

In practice, the local network within the NPP area permits recording near earthquakes with magnitude M = 1.0 that occur in the region of the Starobin potassium salt deposit at a distance of approximately 250 km.

Monitoring results

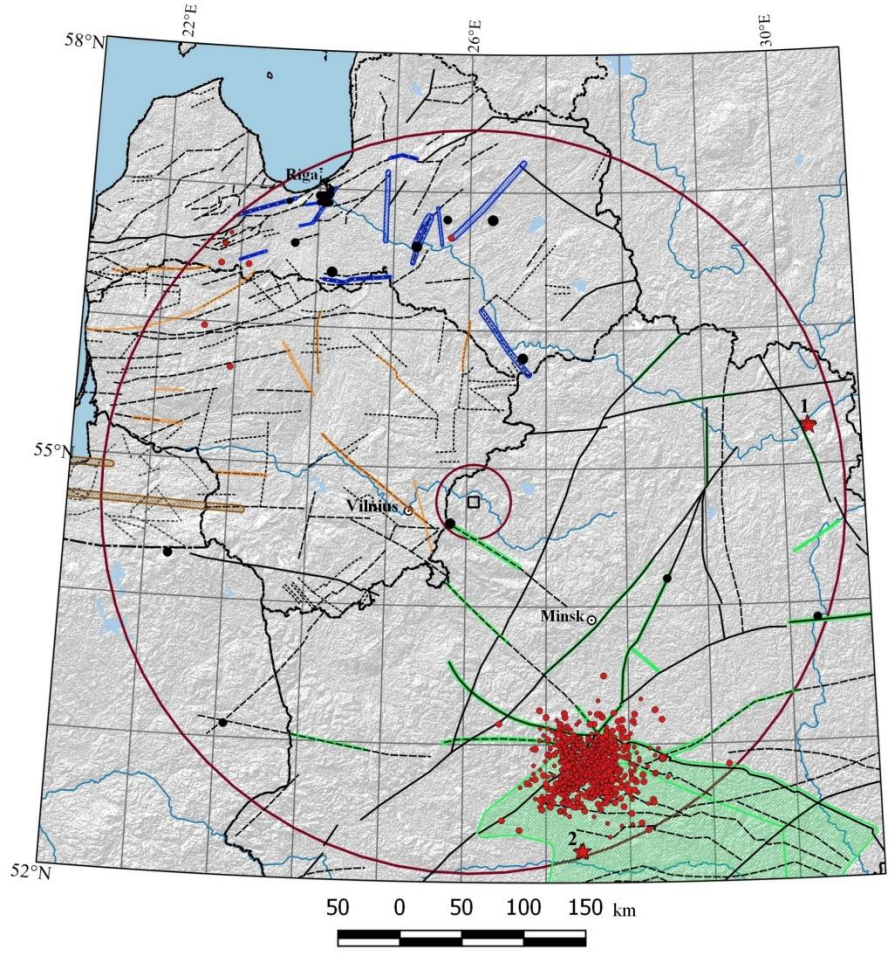
A catalogue of instrumentally recorded seismicity with magnitude M ≥ 1.0 within an area 300 km away from the Belarusian NPP location site in the period since May 10, 1978 till May 31, 2012 include information about 817 events;

A Catalogue of earthquakes instrumentally recorded by the seismic stations of the local network within an area of 300 km away from the Belarusian NPP location site in the period since June 1, 2012 till the present time include information about 370 events.

A Catalogue of induced seismic events (explosions) recorded by the seismic stations of the local network within an area of 300 km away from the Belarusian NPP location site since June 1, 2012 till the present time include information about 481 events.

No local earthquakes were recorded within a 30-km zone around the Belarusian NPP location site during the whole period of instrumental observations.

Seismotectonic map of the Belarusian NPP location region (300 km) with seismic event epicenters (on a scale of 1 : 500 000)



MAP LEGEND

Faults:
- Superregional
- Regional
- Sub-regional

Seismic source zones:
- Source zone of Belarus
- Source zone of Lithuania
- Source zone of Latvian
- Source zone of Kaliningrad (Russia)

Seismic historical event epicenters (1616 - 1910)
- 2.10 - 3.00
- 3.10 - 4.00
- 4.10 - 5.00

Seismic event epicenters to according of the data catalogues (since 1978 to 2020)
- M<=1
- 1.10 - 2.00
- 2.10 - 3.00
- 3.10 - 4.00

Tehnogenic events:
- 1 - Ruba
- 2 - Mikashevichi

OTHER
- Belarusian NPP location
- The territory of 30 km and 300 km radius
- Localities
- Borders of States

THANK YOU FOR YOUR ATTENTION!