

THE NATURE OF THE SEISMOMAGNETIC EFFECT BEFORE THE STRONG HADJIGABUL EARTHQUAKE IN 2014

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Researchers are well aware of the fact of an anomalous change in the intensity of the geomagnetic field under the influence of an earthquake, which is observed in seismically active zones. The predictive parameters of earthquakes in a magnetic field have been obtained at many international geodynamic testing sites. In Azerbaijan, these studies have also been carried out for many years on the basis of modern magnetic variation stations and confirm the seismic predictive properties of local changes in the geomagnetic field.

The accumulation of stress strains at different depths of the earth's crust is associated with both intracrustal processes and processes occurring in the ionosphere (cosmogenic factor).

Accumulation of excessive stress strains in source zones in the rocks of the lower and middle parts of the Kura depression, on the southern slope of the Greater Caucasus, Talysh and the Caspian Sea are characterized by different dynamics of the source zone and various physical, chemical and mechanical changes in the geological environment of seismogenic zones. These processes are reflected in local changes in geophysical fields (gravitational, magnetic, electrical, geochemical) and are seismic precursor factors that are studied at many world seismic prognostic sites [1].

High seismicity is observed in the southeastern subsidence of the Greater Caucasus. Earthquake epicenters migrate along faults of the general Caucasian direction. Starting from the Pirgulu region, the line of migration of sources is traced in a south-southeast direction, showing high seismicity in the Hadjigabul region.

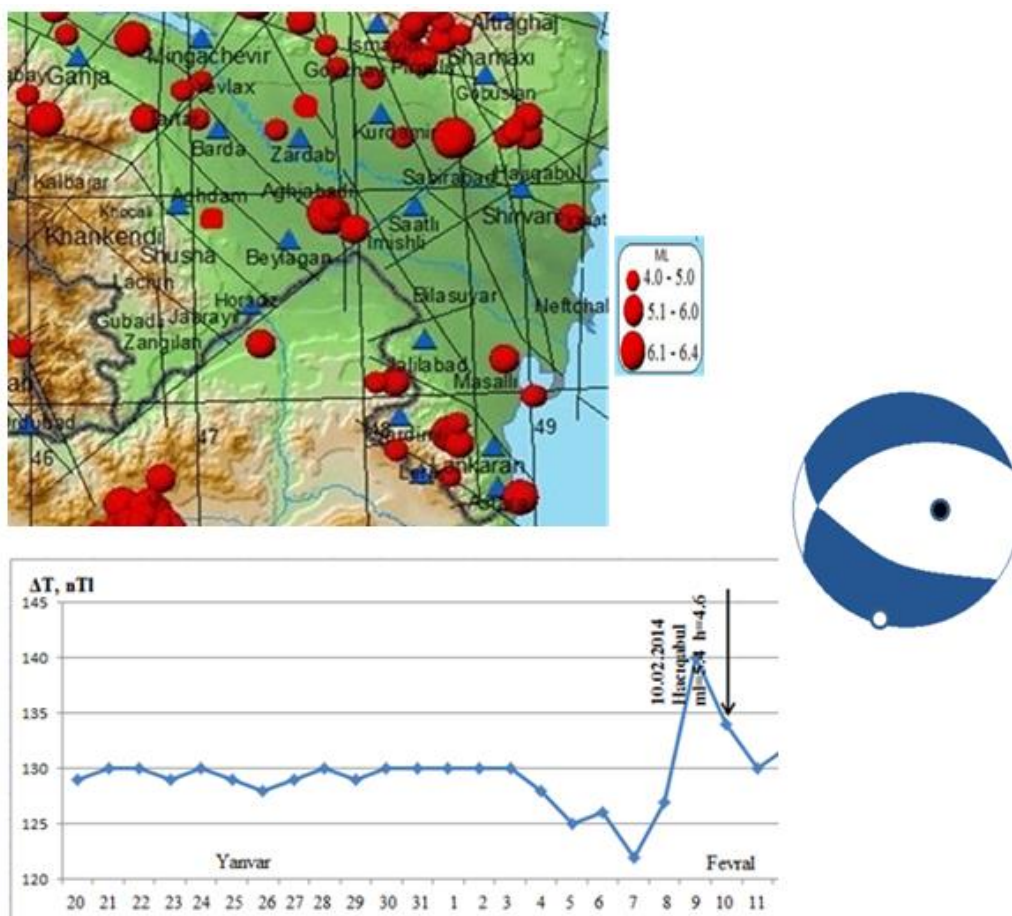


Figure 1. Seismomagnetic effect and source mechanism of the Hadjigabul earthquake (10.02.2014, ml=5.7)

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Here, in the first quarter of 2014, 2005 earthquakes were observed. The released seismic energy was $E=67.1 \cdot 10^{11} \text{C}$. The maximum magnitude was $m_l=5.7$. This earthquake occurred on 02/10/2014, time 12:06:47, at a distance of 41 km southwest of the city of Hajigabul. Coordinates $\varphi^\circ, N=40.25$, $\lambda^\circ, E=48.63$, $h=46$ km, $m_l=5.7$, $J_0=6$ points [2].

The axis of compression in the source (P) has a vertical direction (PL=61), the axis of extension (T) is close to horizontal (PL=8). The type of the first nodal plane (DP=59) is falling, the second nodal plane (DP=44) is falling. The assessment of movement in the source (SLIP=-57(-132)) is defined as a break-fall and shows the predominance of this type of movement in the source (Fig. 1) [2].

2014.10.02 Lat=40.05 Lon=48.63 h=46 $m_l=5.7$

The seismomagnetic effect of the Hajigabul earthquake was registered by the magnetometric station of the region based on modern technology. The dynamics of the earthquake source is characterized by alternating processes of concentration of tensile and compressive stresses. This is clearly seen in the graph $\Delta T \sim f(t)$, where the concentration of tensile stresses is reflected in a decrease in the increment of the geomagnetic field strength by 10 nT in the period from 02/03/2014 to 02/07/2014. Then, three days before the main seismic shock, there is a sharp increase in compressive stresses in the source, an increase in the local field strength ΔT by 15 nT, and the formation of a seismomagnetic effect. This nature of the formation of the seismomagnetic effect corresponds to the dynamics of the mechanism of the earthquake focus "stretch-rupture-fault".

In 2014, a magnetic survey was carried out in the area of the Near Kura-Talysh geodynamic test site in order to assess the stress-strain state of the geological environment. The survey results are presented on the maps of the increment of the strength gradient $\Delta T \sim f(t)$ of the geomagnetic field in 2D and 3D formats (Fig. 2).

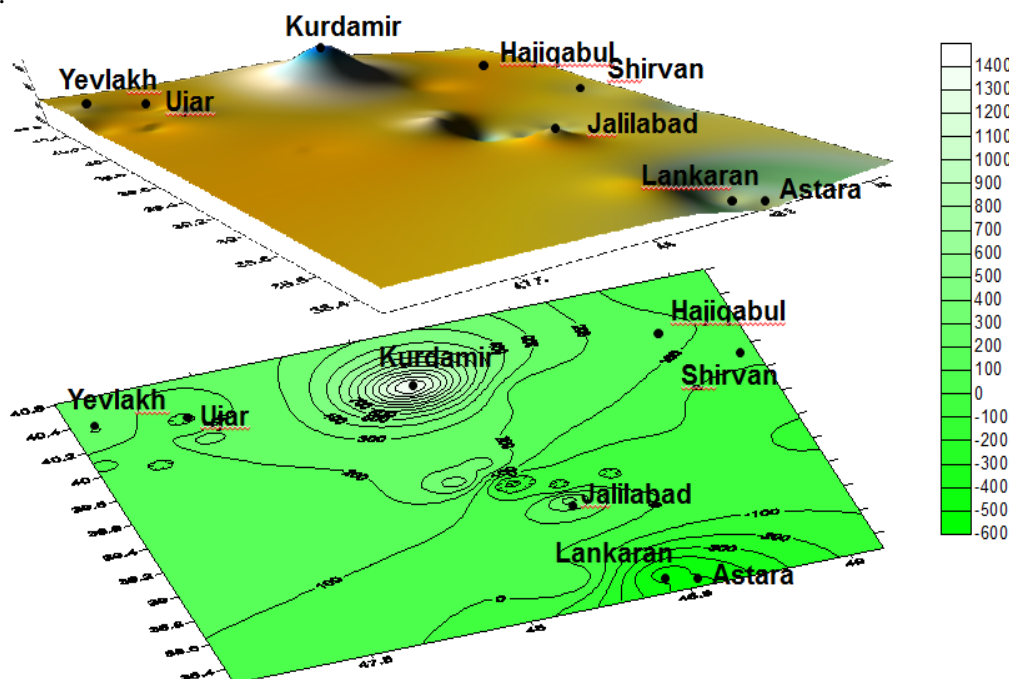


Figure 2. Stress-strain state of the geological environment at the Near Kura-Talysh geodynamic test site according to magnetic data in 2D and 3D format

Analysis of the maps indicates the presence of stressed zones in the area of the polygon, reflected in local positive and negative anomalies of the geomagnetic field strength along the Djalilabad-Imishli-Hadjigabul-Kurdamir line (Fig. 2).

The Hajigabul earthquake is a consequence of the geodynamic regime in the Kura-Talysh zone, which is reflected in the maps of the stress-strain state of the environment according to magnetic data.

The dynamics of the Lower Kura depression is expressed in the subduction of its blocks under the structures of the Greater Caucasus, which are moving southward [3,4].

As a result of these two counter motions, excess elastic stresses accumulate at the junction boundary between the Kura and Caucasian structures. An additional example of this can be the Hadjigabul earthquake, which is reflected in the formation of the seismomagnetic effect of tension-compression and the dynamics of the source of which is fully consistent with the data of magnetic observations.

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