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VARIATIONAL CHARACTERISTICS OF THE SEISMOMAGNETIC EFFECT (SME) DURING THE SAATLY-SABIRABAD BOUNDARY EARTHQUAKE THAT OCCURRED IN THE MIDDLE KURA DEPRESSION

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ABSTRACT

The article studies data on anomalous changes in the geomagnetic field stress near the earthquake source. The nature of the seismomagnetic effect is determined by the geomagnetic regime in the source. The spatio-temporal distribution of the geomagnetic field stress gradient reflects the geodynamic regime in the Middle Kura depression.

Key words: SME-seismomagnetic effect, nTl-nanotesla, earthquake source mechanism, geomagnetic regime, geomagnetic field stress, ml-magnet.

Вариационные характеристики сейсмомагнитного эффекта (СМЕ) при Саатлинско-Сабирабадском пограничном землетрясении, произошедшем в Средне-Куринской впадине.

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АННОТАЦИЯ

В статье изучены сведения об аномальных изменениях напряжения геомагнитного поля вблизи очага землетрясения. Характер сейсмомагнитного эффекта определяется геомагнитным режимом в очаге. Пространственно-временное распределение градиента напряжения геомагнитного поля отражает геодинамический режим во впадине Средней Куры.

Ключевые слова: SME-сейсмомагнитный эффект, nTl-нанотесла, механизм очага землетрясения, геомагнитный режим, напряжение геомагнитного поля, ml-магнит.

Orta Kür Çökəkliyində baş vermiş Saatlı-Sabirabad sərhəddi zəlzələsində Seysmomaqnit effektin (SME) dəyişmə xüsusiyyətləri.

ANNOTASIYA

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Məqalədə zəlzələ ocağının yaxınlığında geomaqnit sahə gərginliyinin anomal dəyişmələri haqqında məlumatlar öyrənilir. Seysmo maqnit effektin yaranma xarakteri ocaqda gedən geomaqnit rejimlə təyin olunur. Geomaqnit sahəsinin gərginlik qradientinin məkan-zamana görə paylanması Orta Kür çökəkliyində gedən geodinamik rejimini əks etdirir.

Açar sözlər: SME- seysmomaqnit effekt, nTl -nanotesla, zəlzələ ocağının mexanizmi, geomaqnit rejim, geomaqnit sahə gərginliyi, ml-maqnituda

The Republican Center of Seismological Service has been studying temporal variations of seismomagnetic impact in individual local areas for over 35 years. From time to time,

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anomalous changes caused by strong earthquakes occurring in areas with high seismic risk and geodynamic activity are observed. The accumulation of stress-strain energy at different depths of the Earth is associated with internal and cosmogenic factors. Mechanical, physicochemical and other properties of the environment change with characteristic indicators in the Middle and Lower Kura depressions, the north-south foothills of the Greater Caucasus and the Azerbaijani sector of the Caspian Sea, where anomalous stress-strain energy accumulates. The influence of such active processes on the earth's surface is studied in seismically active regions of the world as anomalous changes in geophysical fields: gravitational, electrical, magnetic and geochemical, earthquake warning factors. Below is a map of epicenters that occurred in the Sredne-Kura Depression and adjacent areas in 2004-2024 (Fig. 1).

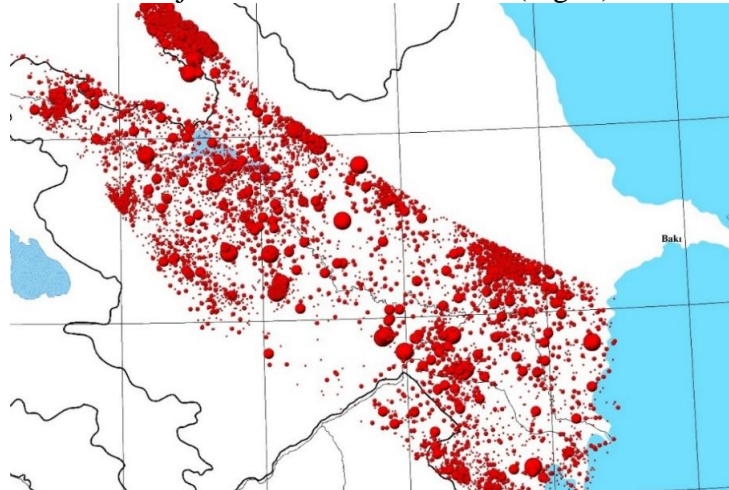


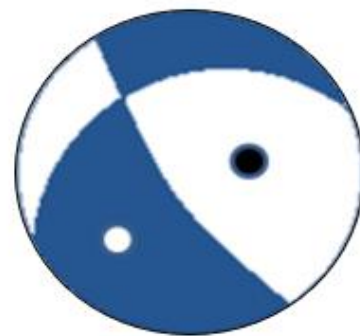
Figure 1. Map of earthquake epicenters that occurred in the Middle Kura Depression and nearby areas in 2004-2024. (Kazimova S.E.)

In the quarters of the Middle Kura basin, seismicity was above the background level. The epicenters of the border Saatly-Sabirabad earthquake and its aftershocks are located in the pan-Caucasian Kura and common Gabala-Chakhirly intersection zones.

In these parts of the Middle Kura Depression, the foci of the Sabirabad earthquakes are known. In 2024, the geodynamic activity of the Sabirabad zone was higher than in other regions. 01/19/2024 Lat =39.76 Lon= 46.68 H= 45 ML= 5.1 (Saatly-Sabirabad)



Fault and dislocation



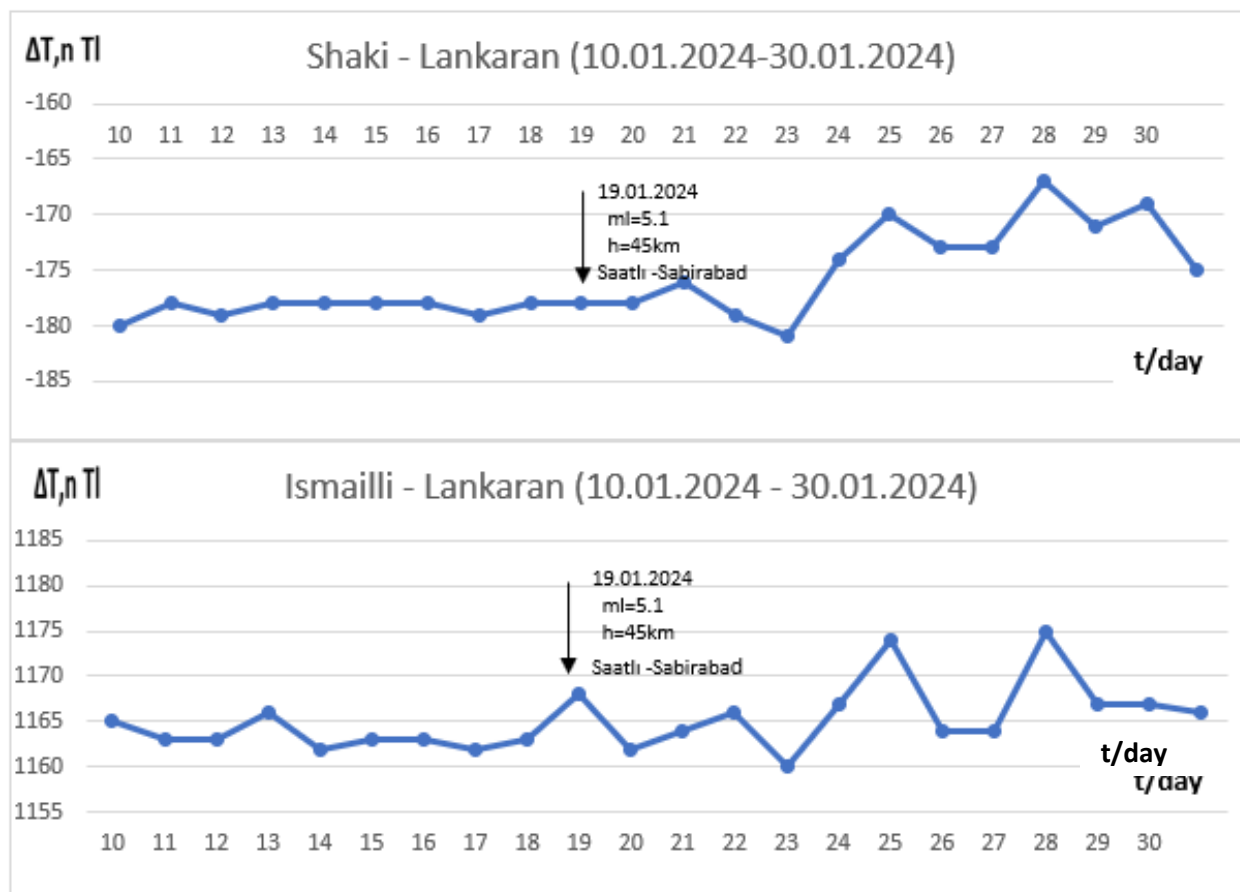


Figure 2. Seismomagnetic effect felt at Ismailly and Sheki stations during the Saatly-Sabirabad border earthquake.

Monitoring of geophysical fields allows us to record complex transformation processes in the earth's crust and draw conclusions about the accumulation and spread of excess stresses in earthquake preparation zones. The geomagnetic field has the ability to record all geological processes occurring in the earth's crust. Seismomagnetic prognostic studies conducted in geodynamic ranges show that the manifestation of the nature of the seismomagnetic effect and magnetometric data are of great importance in developing methods for short-term earthquake forecasting.

On January 19, 2024 (ML=5.1, H=45km) a strong earthquake occurred in the Saatly-Sabirabad border region. It is assumed that the earthquake influenced the activation of deep faults in the oil and gas fields of the Middle and Lower Kura depressions (Muradkhanly, Jafarly, Garaly, Kalmas Garadag, Musovdag, etc.). At this time, after the end of the stress deformation, the stress gradient of the geomagnetic field increased over time towards a positive value. The mechanism of the earthquake source is fault-thrust (fault), shear-extended (according to the RSSC ANAS). The seismomagnetic effect was observed on the curves constructed from the readings of magnetometers operating at the Ismailly and Sheki stations (Fig. 2).

The increasing gradient of the geomagnetic field stress, detected as a result of discrete geomagnetic observations, carries information about the tense situation in the seismogenic zones at the polygons.

Analysis of stress changes and increasing gradients of the geomagnetic field made it possible to identify stress-strain zones in the Middle-Kura Depression and nearby areas. These are the Saatly, Barda, Agdam, Ujar, Zardab zones of long-term stress-strain. Strong earthquakes

do not always occur in these areas, but they are considered seismic risk zones and seismomagnetic impact is observed with anomalous changes.

If we look at the 2D and 3D map showing the stress-strain state of the geological environment based on magnetic data in the Kura-Talysh geodynamic range in 2024, then in the regional plan, magnetic maxima are noted in the Jalilabad-Imishli-Kurdamir zone (Figure 3). It is noted that the geodynamic regime of the Middle Kura Depression is mainly associated with the movement of the Kura Depression blocks under the structures of the Greater Caucasus. The formation of a positive seismomagnetic effect in the source of the earthquake that occurred on the Saatly-Sabirabad border once again confirms the above facts.

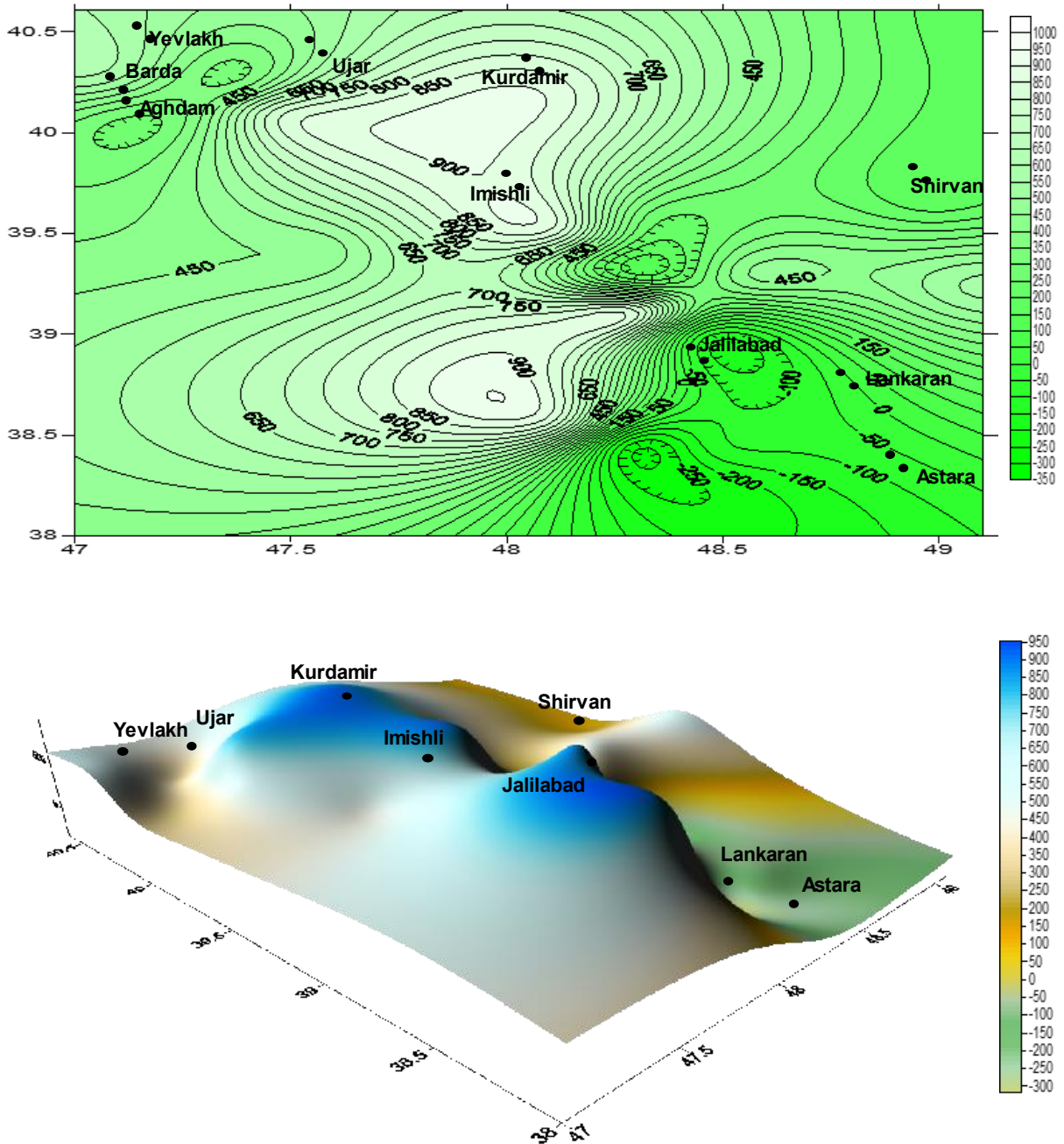


Figure 3. Stress-strain state of the geological environment according to magnetic data at the Kura-Talysh test site (in 2D, 3D format).

Conclusion

The geodynamic regime of the territory of Azerbaijan reflects the spatial and temporal change in the gradient of the geomagnetic field stress. The article studies and analyzes in detail the anomalous changes in the geomagnetic field in earthquake foci and nearby areas.

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