https://doi.org/10.59849/2219-6641.2024.2.15

REFLECTION OF THE DYNAMICS OF THE FOCAL MECHANISM OF SHAMKIR AND ISMAYILLI EARTHQUAKES ON THE NATURE OF THE SEISMOMAGNETIC EFFECT (SME)

A.G. Rzayev[1], M.K. Mammadova[1], Sh.A. Ismailova[1]

azay_r@yahoo.com, mahire59@mail.ru,
sahranismayilova1990@mail.ru

Annotation

The article studies information about anomalous changes in the geomagnetic field voltage. The nature of the seismomagnetic effect is determined by the geomagnetic regime in the source. The analysis of the data of the area magnetic surveys allowed to study the stress deformation state of the geological environment in the Sheki-Shamakhi polygon and to evaluate the north-west migration of excess stresses in the earth's crust.

Key word: *SME – seismomagnetic effect, nTl – nanotesla. mechanism of the earthquake center, geodynamic mode, geomagnetic field stress, ml - in magnitude*

ŞƏMKIR VƏ İSMAYILLI ZƏLZƏLƏRININ OCAQ MEXANIZMI DINAMIKASININ SEYSMOMAQNIT EFEKTININ (SME) XARAKTERINDƏ ƏKS OLUNMASI

A.Q. Rzayev, M.K. Məmmədova, Ş.A. İsmayılova

Annotasiya

Məqalədə geomaqnit sahə gərginliyinin anomal dəyişmələri haqqında məlumatları öyrənir. Seysmomaqnit effektin yaranma xarakteri ocaqdakı geomaqnit rejimlə təyin olunur. Ərazi maqnit tədqiqatlarının məlumatlarının təhlili Şəki – Şamaxı poliqonunda geoloji mühitin gərginlik deformasiya vəziyyətini öyrənməyə və yer qabığında izafi gərginliklərin şimal – qərb istiqamətində miqrasiyanı qiymətləndirməyə imkan vermişdir.

Açar sözlər: *SME – seysmomaqnit effekt, nTl – nanotesla . zəlzələ ocağının mexanizmi, geodinamik rejim, geomaqnit sahə gərginliyi , ml – maqnituda*

ОТРАЖЕНИЕ ДИНАМИКИ ОЧАГОВОГО МЕХАНИЗМА ЗЕМЛЕТРЯСЕНИЙ В ШАМКИРЕ И ИСМАИЛЛЫ НА ХАРАКТЕРЕ СЕЙСМОМАГНИТНОГО ЭФФЕКТА (SME)

А.К. Рзаев, М.К. Мамедова, Ш.А. Исмаилова

Аннотация

В статье рассматриваются аномальные изменения напряженности геомагнитного поля перед Шамкирским и Исмаиллинским (ml=4.1, ml=4.2, 24.03.2023 года). Установлено что характер сейсмомагнитного эффекта определяется геодинамическим режимом в очаге. Анализ данных площадных сьемок позволил оценить напряженно-деформированное состояние геологической среды на Шеки-Шамахинском полигоне и миграцию избыточных напряжений в земной коре в северо-западном направлении.

Ключевые слова: *SME – сейсмомагнитный эффект, nTl – нанотесла, механизм источника землетрясения, геодинамический режим, напряжение геомагнитного поля,* ml- *в магнитуда*

[1] *Republican Seismic Survey Center of Azerbaijan National Academy of Sciences*

The magnetometric method is successfully applied not only to geologic mapping, tectonics, the state of fault lines, and the determination of boundaries of geological complexes, but also in seismoprognostic studies and in the study of geodynamic regimes in the epicenters of earthquakes.

This is due to the unique property of the geomagnetic field to record and remember the entire transformation process of the earth's crust. This explains the cause-and-effect relationships of many

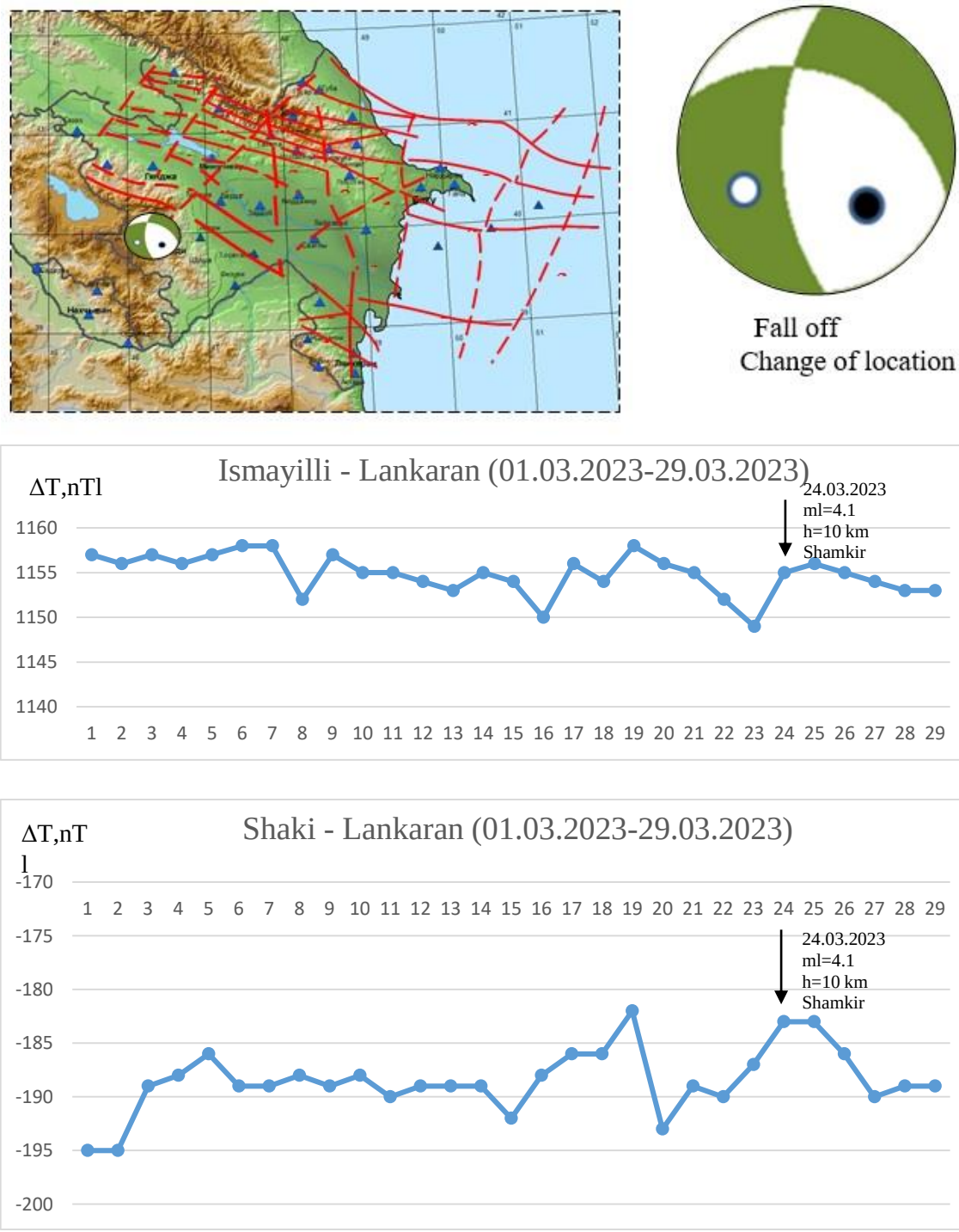

Figure 1. Reflection of the dynamics of the focal mechanism of the Shamkir earthquake (24.03.2023, ml=4.1, h= 10 km) in the nature of the Seismomagnetic effect (SME 10-12 nTl)

24.03.2023 Lat=40.85 Lon=48.20 H=9 Ml=4.2

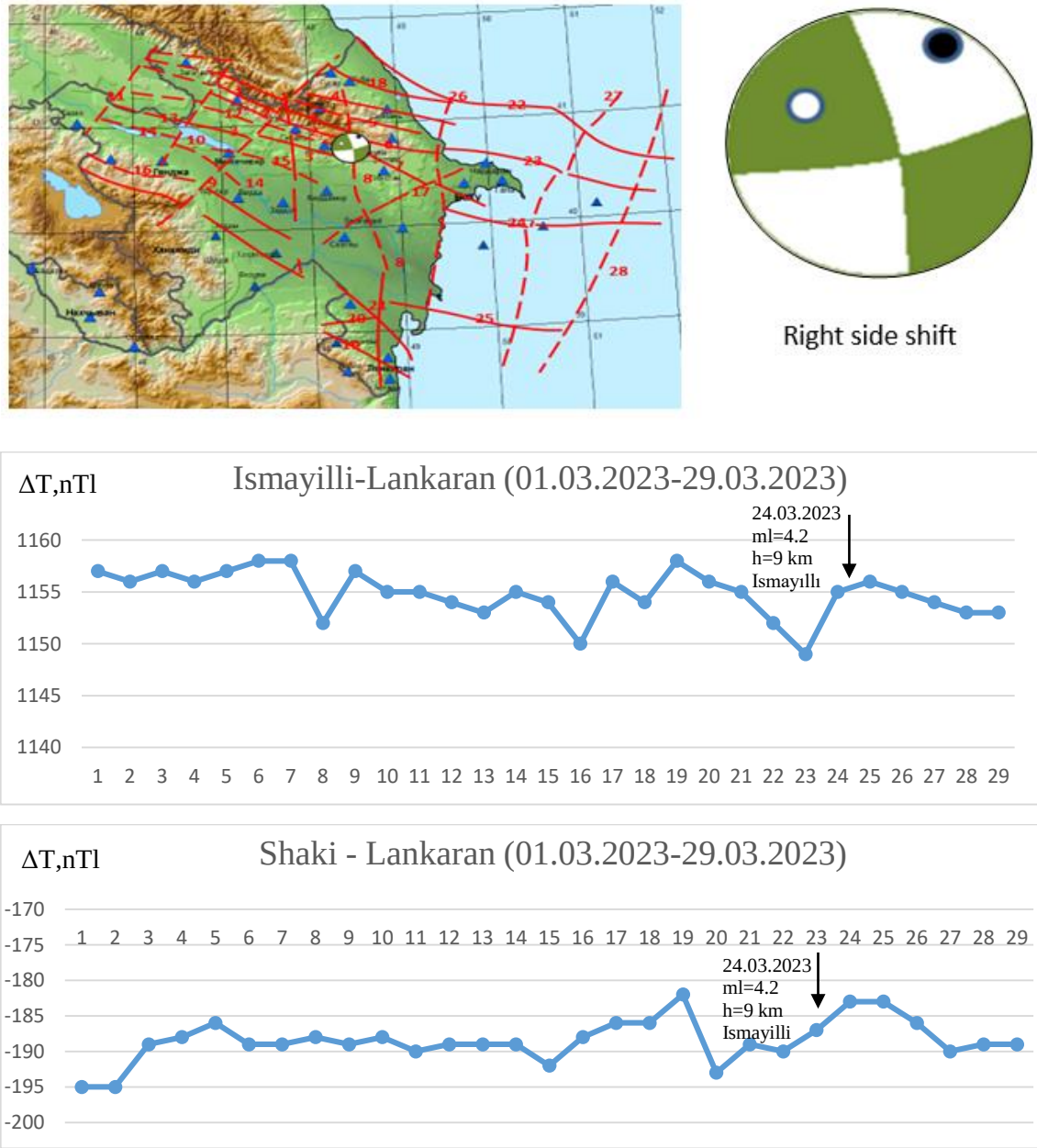

Figure 2. Ismailli earthquake (24.03.2023 ml=4.2, h=9 km) is reflected in the nature of the seismomagnetic effect (SME 10-12 nTl) of the dynamics of the furnace mechanism

geophysical processes that occur under conditions of accumulation of excess elastic stresses. The seismogenic zone is reflected in the formation of the seismomagnetic effect (SME) due to the fact that it is a zone of excess accumulation of elastic energy and frequent changes in the stress state. That is, SME can be considered as an indicator of the seismotectonic process consisting of horizontal and vertical movements of the earth's crust in seismogenic zones as components of the general geodynamic regime. The results of many years of research conducted in Azerbaijan's polygons made it possible to determine a number of characteristic features of the seismomagnetic effect and its dependence on the mechanism of the earthquake source.

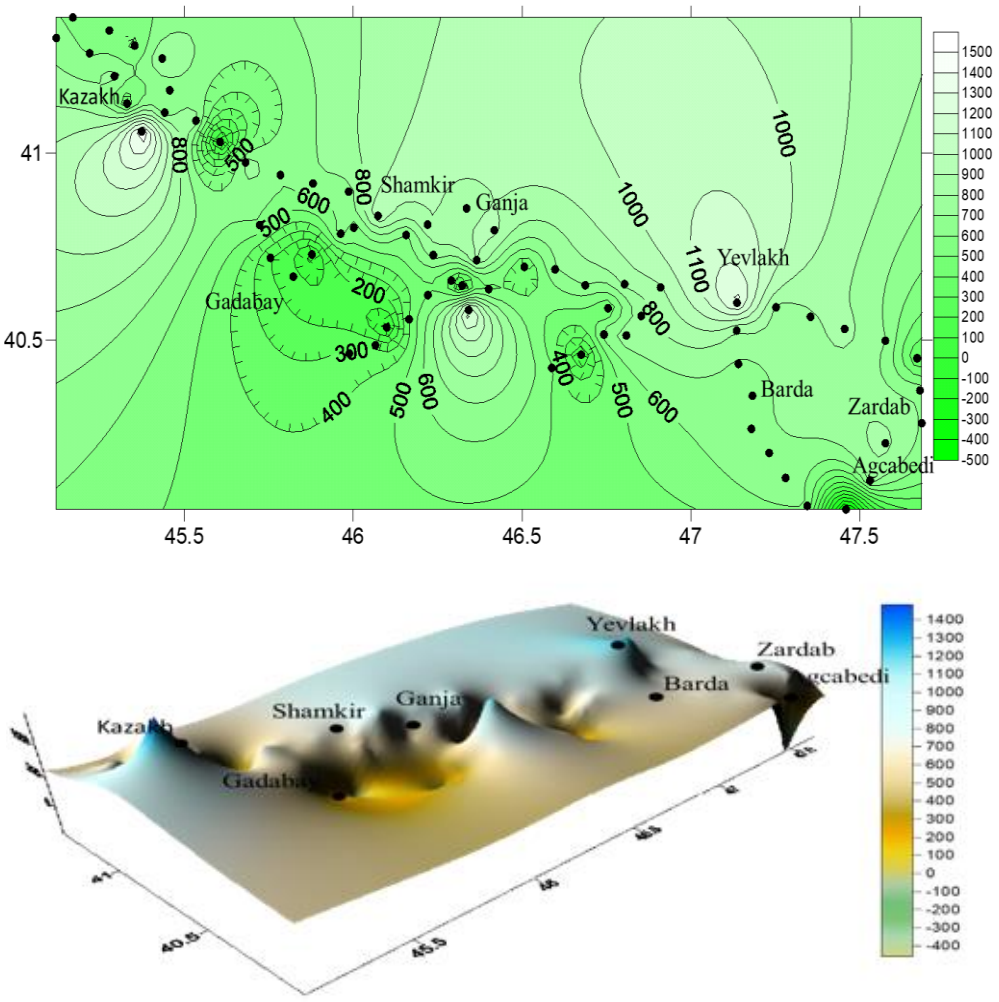

Figure 3. In 2023, the stress-strain state of the earth's crust in the Ganja-Gazakh geodynamic range in 3D format

Thus, in the case of compression of the earthquake center and the formation of reverse fault deformation, the seismomagnetic effect mainly manifests itself with a positive sign. When the tension mechanism is formed in the earthquake center and as a result of this, the fall-sliding deformation occurs, the Seismomagnetic effect is manifested with a negative sign before this seismotectonic process. [Rzayev, 2016]. In order to evaluate the energetic state of any seismogenic zone, the time-spatial growth method of the geomagnetic field voltage gradient was applied. [Rzayev, 2011].

On March 24, 2023, at 08.27.19, an earthquake of magnitude ml= 4.1 occurred in Shamkir region at a depth of h= 10 km. The earthquake occurred in the area where the Pan-Caucasus-oriented Kura and orthogonal Ganjachay-Alazan faults intersect. The earthquake occurred as a result of compressive stress and is characterized by faulting and uplift movements. Angle of incidence 54o-37o, Azimuth angle 88o-290o. The earthquake coincides with the Kura fault. The mechanism of the earthquake source is broken-up type. On the 24th of that date, at 07.09.57, an earthquake of magnitude h= 9 km, ml= 4.2 occurred in Ismayilli district. The earthquake is characterized by right-sided displacement, faulting elements. Dip angle Dip= 83o-81o. Azimuth angle (AZ=350o -82o).

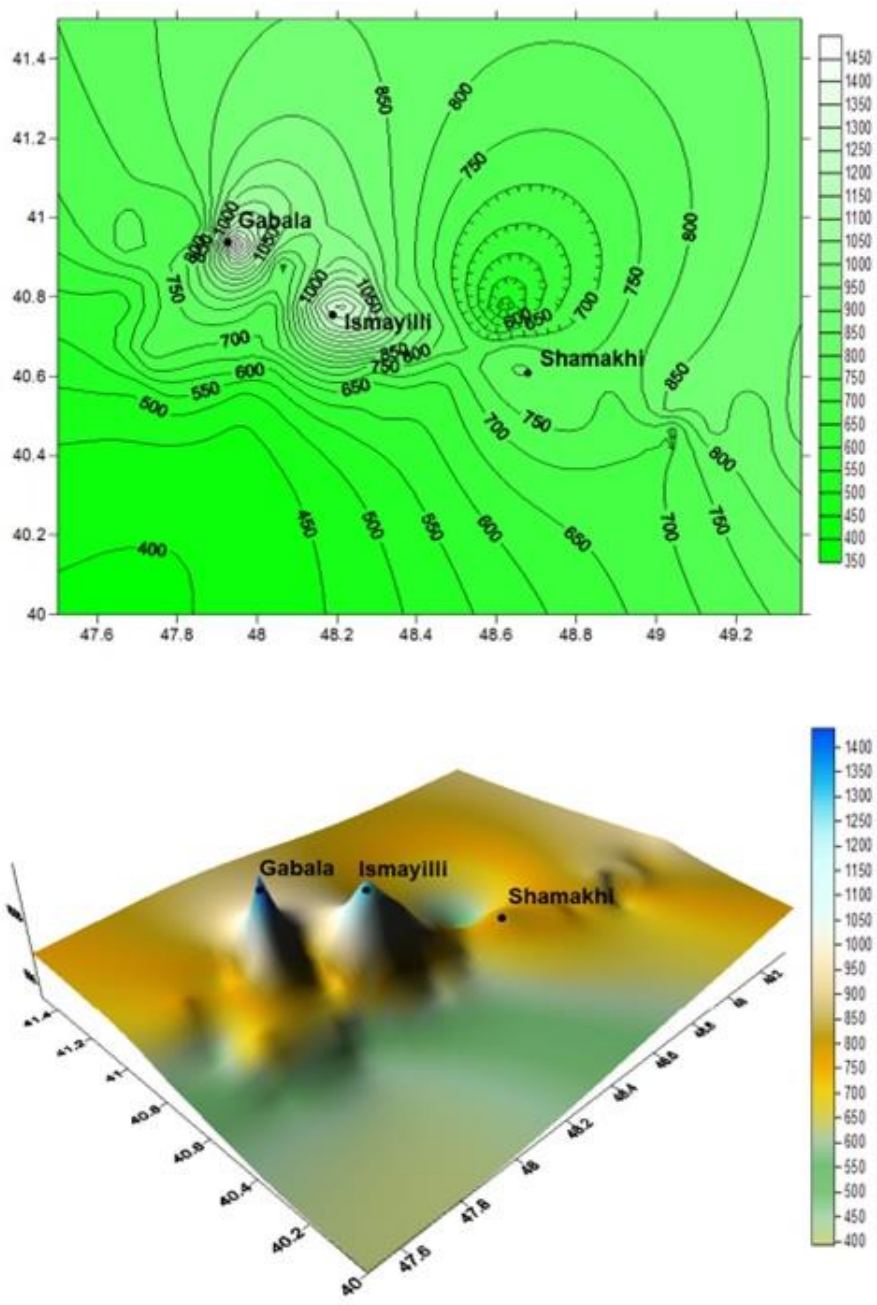

Figure 4. In 2023, the stress-strain state of the earth's crust in the area of the Northern geodynamic range in 3D form

At this time, it is noted that the Seismomagnetic effect (SME) felt at Ismayilli and Sheki stations was formed due to increases. [Figure 1], [Figure 2]. As can be seen from the pictures, the mechanism of the earthquake source, "Break-up" is completely reflected in the time formation of the SME and is confirmed by the nature of the transformations of the geomagnetic field stress.

Depending on the mechanism of the earthquake source, the tension-crisis state of the geomagnetic field $\Delta T \sim f(t)$ of the geological environment is reflected in the pre-earthquake formation of local anomalies with a positive or negative increase in the voltage ΔT

24.03.2023 Lat=40.97 Lon=46.08 H=10 Ml=4.1

As can be seen from Figures 3 and 4, stress-deformation zones against the background of normal distribution of geomagnetic field stress are characterized by a high (positive) gradient of geomagnetic field stress increase of more than -100 nTl km shows that earthquakes occurring within the zones on this background cause uplift faults to rupture in the foci.

Conclusion

Analysis of the time evolution of the voltage gradient of the geomagnetic field allows detection of the seismomagnetic effect (SME) up to 25 nTl. The nature of the SME formation reflects the geodynamic processes during its implementation and during the formation of the earthquake source.

The analysis of the data of the field magnetic surveys made it possible to study the stress-deformation state of the geological environment in the Sheki-Shamakhi landfill and to assess the migration of excess stresses in the earth's crust in the northwest direction.

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