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FEATURES OF THE CHANGE OF SEISMOMAGNETIC EFFECT BEFORE THE LERIK EARTHQUAKE IN 2018

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***A**BSTRACT. Time-dependent variations of seismic effect in the area evaluated with high seismic risk and geodynamic activity are studied in the article. An analysis of geomagnetic field tensions in the Kura -Talish geodynamic polygons shows that the tension was equally distributed on the field.*
***Keywords:** Republican Seismic Survey Center – RSSC, Seismomagnetic affect – SMA, Nano Tesla – nTI*

The geodynamic effect with anomalous changes impact of strong earthquakes in seismically active areas is known by researchers. Such collected information is studied continuously with modern magnetometric devices in the geodynamic polygons of the world and in Azerbaijan as a warning factor of the earthquake.

The magnetometry method allows defining more precisely the boundaries of the geological structures, monitoring of the tectonic faults in the different depth intervals, effective separation of the tectonic blocks.

Experience of previous studies and comparative analysis of available information indicate to the perspectivity of the magnetometric observation method as one of the warning factors in the polygons established in other regions of the world – in China, Uzbekistan, Russia, Kyrgyzstan and Tajikistan.

The relevance of the topic: Geomagnetic field variations are studied in seismic regions of the Azerbaijan Republic since the late 1980 years. Magnetometric Variation Stations (MVS) operate in seismically active zones in Zagatala, Sheki, Ismayilli, Shamakhi, Absheron (Nardaran) and Lankaran, there have been conducted and carried out the observations non-stop continuos.

These devices are G-856 proton-type magnetometers manufactured by US – Kinemetrics, a modern and latest modification.

These high-precision devices (**Fig.1**) serve to measure the magnetic field tension continuously.

All dimensions of earth magnetic elements are associated with absolute and relative variations. The variations of the vertical organizer of tension are studied by relative selections.

Changes in the geomagnetic field are monitored every 15 minutes with installed magnetometers in the mentioned stations and the data is transmitted to the RSSC. The seismomagnetic effect of the time-dependent relative variations calculate analyzed data in detail and its graphs are built properly.

Abnormal changes mentioned in geomagnetic variations are directly related to formations of the intense deformation condition in the geological environment related to natural events occurring in active geodynamic zones of the Republic.

One of the main reasons for the anomalous changes in the are Earth's magnetic field is the occurrence of catastrophic earthquakes with strong vibrations.

The study of the age-old magnetic field changes in the crust has proven that strong and often occurring changes in this area occur mainly in places where the Earth's crust is weaker, accompanied by numerous faults and folded. Such zones are seismic areas and are frequently accompanied by earthquakes.

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One of such zones in our Republic is the Talısh Mountains and foothill areas of the Lesser Caucasus.

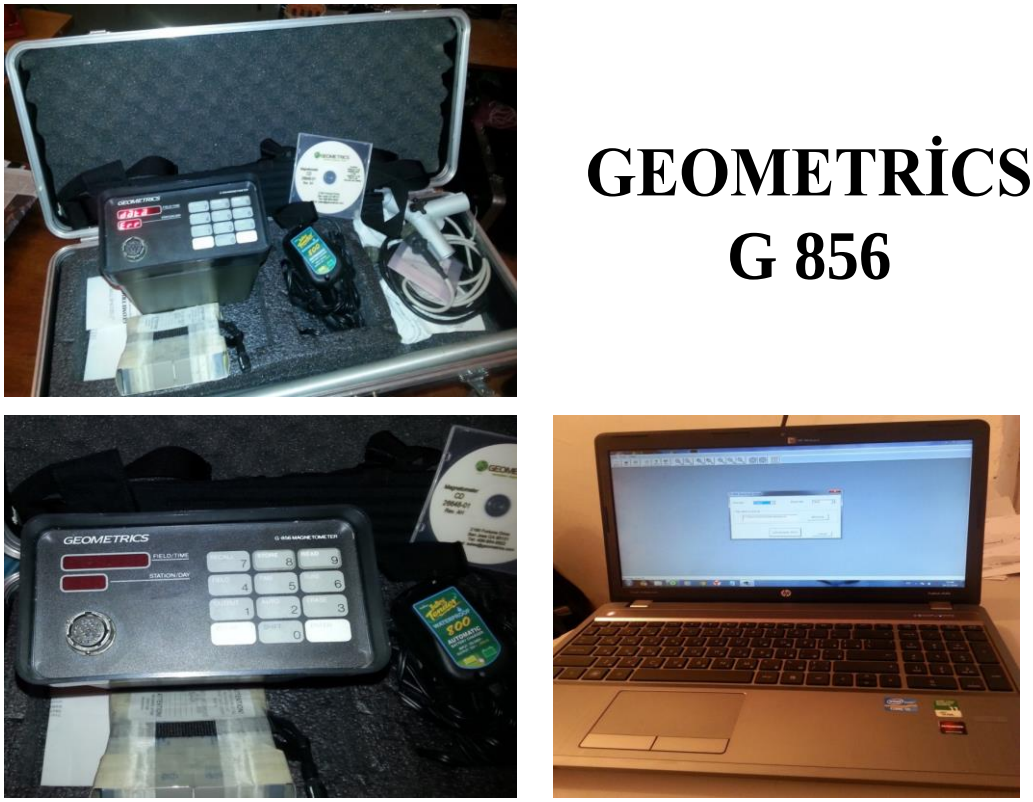

Figure 1. G 856 Memory-MAQ Proton Preccession Maqnetometer (Geometrics, USA)

Seismomagnitometric researches are conducted in two directions to determine seismomagnetic effect (SME) and to evaluate the tension-deformation condition of seismic zones.

The experience of many years has shown that the nature of the SME depends on the mechanism of the earthquake's source.

During the preparation and realization of earthquakes, the spreading area of the seismomagnetic effect calculated using the formula of $R=10^{0,5M-1,27}{}_{km}$. .

Here, statistical quantities are ρ = 0,87.This shows that cause-and-effect connection between seismomagnetic effect and earthquakes indicate the seismotectonically conditioned.

It was accepted that T tension is manifested itself in the normalized background in the form of the bay. The duration of the bay (long-term) abnormal changes is 120 ÷ 360 hours. The confident continuation is about 180 hours. SME amplitude increases by 20 ÷ 40 nTl. The radius of the SME detection zone is within the R = 100.5M-1.27km (Rzayev at al, 2013).

At the same time, confident intervals of SME short-term (peak) anomalies may take several hours.

Anomalous changes in SME may be positive or negative, depending on the mechanism of the earthquake source (compression and extension) (Rzayev, 2006).

There were two strong earthquakes in the Lerik region (26.06.2018 and 28.08.2018) around Talish and the Lesser Caucasus (**Fig.2)**.

For the first time in the territory of Lerik region, there was an earthquake in 26.06.2018 (ml = 4.5, h = 12 km). However, no seismo-abnormal variations are observed at any station.

Seismoprogn. Observ. Territ. Azerb. V.15, №1, 2018, pp.30-33

Figure 2. The epicenter of Lerik earthquake near Talish in 2004-2017.

An earthquake occurred again in the Lerik region 2 months later, on 28.08.2018 (ml = 5.1, h = 15km). Geomagnetic observation assessment has sharply changed in the stations before the occurrence of the earthquake. As you can see from the map, 30-40 nTI (nanotesla) decreasing to a minimum valuation are recorded 10-15 days before seismomagnetic effect (**Fig.3**).

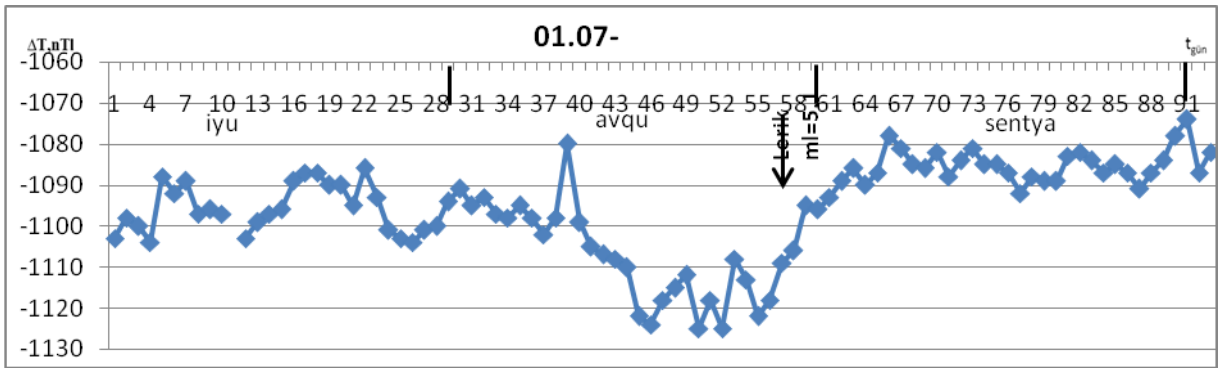

Figure 3. Seismic effect of the Lerik earthquake (ml = 5.1, 28.08.2018)

As can be seen from the created map, 15 days before the earthquake the value of the seismic effect is in the background, decrease to a minimum of 30-40 nTl during the earthquake and return to the background value after the earthquake.

It is supposed that the tension mechanism characteristic processes in the earthquake source according to the SME's abnormal changes have occurred. Looking at the Dynamics department's data, we see that there are tension characteristic processes in the source (Annual report of the Dynamics department of the RSSCof ANAS, Baku-2018) (**Fig. 2**).

An analysis of the geomagnetic field tension in the Kura side area - Talish geodynamic polygon shows that the tension in the mentioned polygon was distributed equally on the area.

Geomagnetic field full tension prices are almost gradually changed, with a range of 48900-49500 nTl. However, this feature is different in the Lerik-Lankaran-Astara districts of the Front Talish Zone. Thecondition of the observed high tension-deformation zone indicates that the increments of ΔT tension gradient are more than 100 nTI/km (I-zone).

II tension deformation zone located north of I zone is monitored there about high tension gradient ΔT 70 ÷ 100nTl in the Masalli-Jalilabad area.

The epicenter of the Lerik earthquake was recorded in the merging section of the above-mentioned tension zones. This territory is located in the intersection of Astara-Devechi transverse (Shabran) and the Talish lengthwise depth fault. The formation of the tension-deformation zone was discovered two or three years before the Lerik earthquake, as a result of discrete magnetometric observations.

At present, the tension of the zone continues to remain high and we would like to note that, the continuing process of re-accumulation of tension in the Talish zone despite the process of partly emptying the collected energy (**Fig.4).**

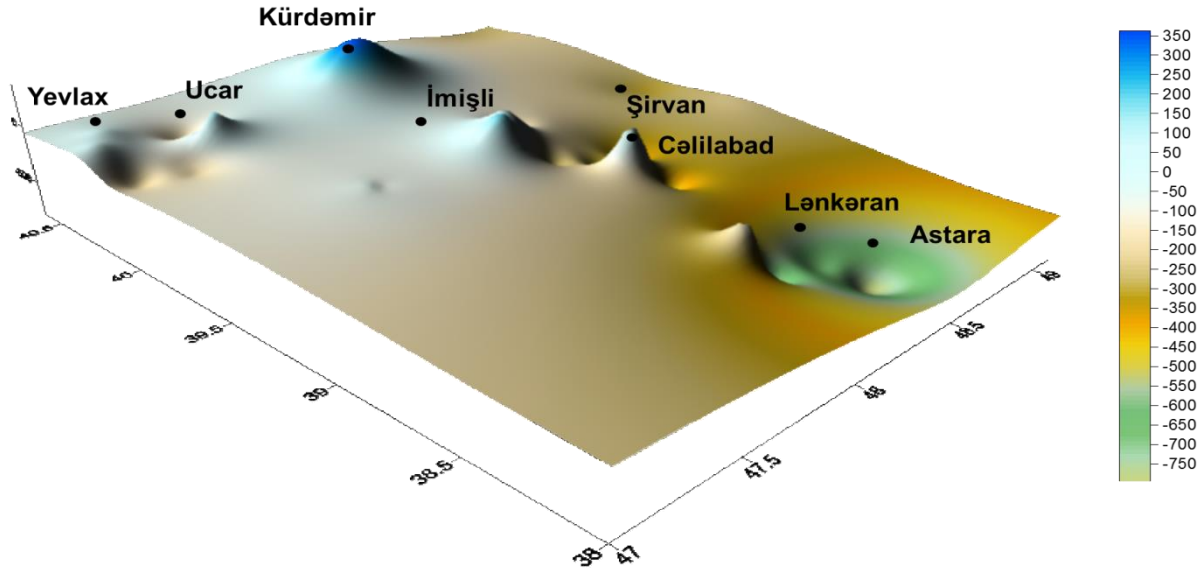

Figure 4. The tension-deformation condition of the geological environment based on magnetic data in the Kura side area-Talish polygon (3D format 2018).

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