

THE MAGNETIC FIELD AND MAGNETISM OF THE SAND IN THE BLACK SEA COASTLINE

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Summary: As a result of the geomagnetic studies in the Black Sea coastline (the river Natanebi, the boundary of the municipalities of Lanchkhuti and Poti) we determined the boundaries of the magnetic field and the limits of magnetic absorbability variation of the sand distributed on the territory. In the sand samples we defined the percent composition of ferromagnetic minerals. The results of the studies prove the assumption of the magnetic genesis of the Black Sea.

Key words: Geomagnetic, magnetic anomaly, magnetic absorbability.

In the 2015-2019 the group of the presenters of the report carries out detailed geomagnetic studies of the above described territory, Fig. 1.

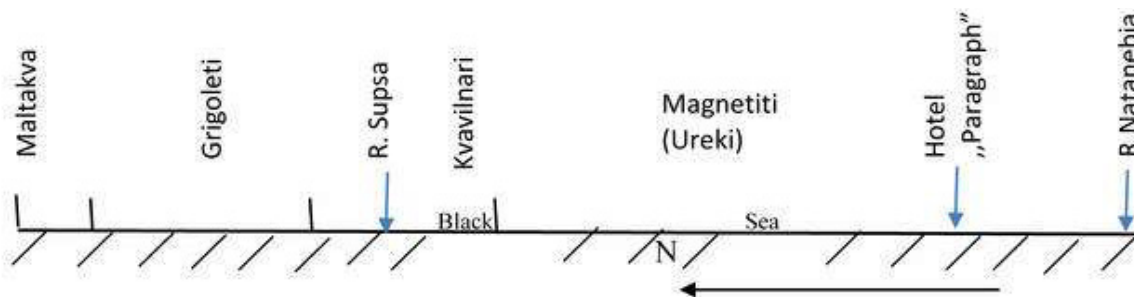


Fig. 1.

The magnetic field of the territory was investigated by means of a modern high definition digital proton magnetometer G856-Ax. The magnetic absorbability of the sand was determined by digital susceptimeter KM-7. Besides, the mineralogical composition of sand samples was studied in a laboratory.

The geomagnetic field investigations

We started planning of the study territory from the south, at the junction of the river Natanebi and the Black Sea. Fig. 2 shows the schemes of the variations of the anomalous magnetic field (a) and the magnetic absorbability of the sand (b) in the area of the river Natanebi – hotel “Paragraph”.

As seen in the schemes, the anomalous magnetic field of the area varies in the limits of 200-600 nT, though its mean rate is 350 nT. The same can be said about the magnetic absorbability of the sand, the mean values of which are $200 \cdot 10^{-4}$, and variation limits are $(800-600) \cdot 10^{-5}$.

The results of the investigations conducted in another area (Magnetiti) of the territory are shown in Fig. 3 a, b.

As seen in the schemes, in this area, like in Fig. 2, the anomalous magnetic field varies significantly between (200-650) nT. The mean value of the magnetic field is 400 nT. The magnetic absorbability of the sand is also high in the area. Its mean values are $10000 \cdot 10^{-5}$, whereas the variation limits is $(4000 - 20000) \cdot 10^{-5}$ - SI.

From the boundary of the municipalities of Ozurgeti and Lanchkhuti to the river Supsa (Kvavilnari) the limits of the magnetic field variation is 200 – 650 nT, whereas the mean value is 400 nT. The scope of the

magnetic absorbability of the sand is also wide and is equal to $(150-800) \cdot 10^{-3}$ - SI and the mean values are of $400 \cdot 10^{-3}$ - SI order.

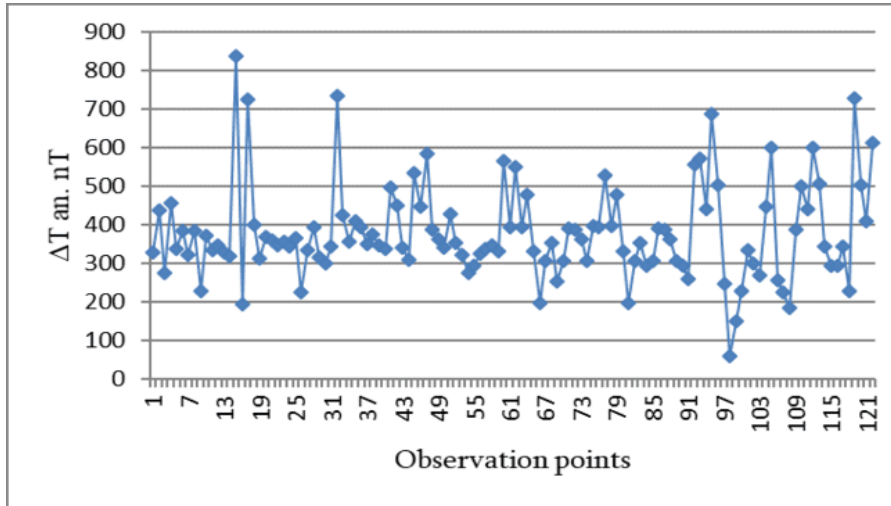


Fig. 2a. Anomalous magnet at the site river Natanebi - Paragraph hotel.

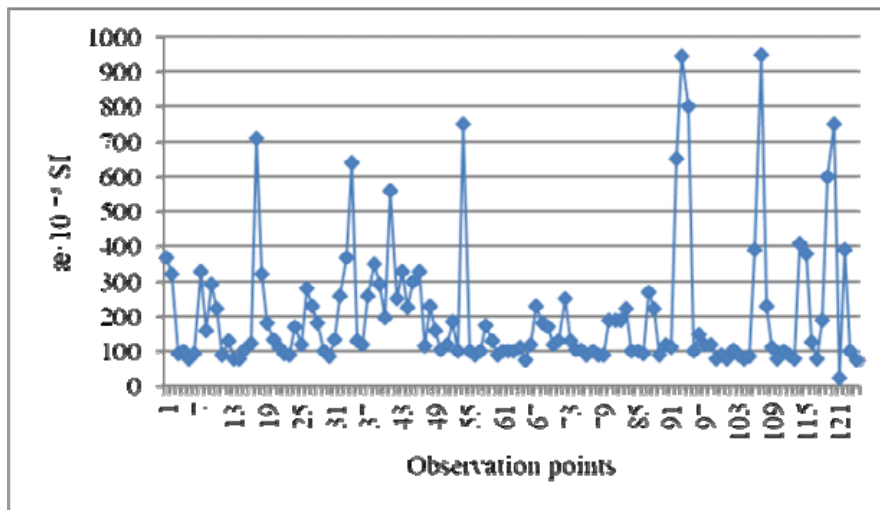


Fig. 2b. The magnetic absorbability variation limits at the site river Natanebi - Paragraph hotel.

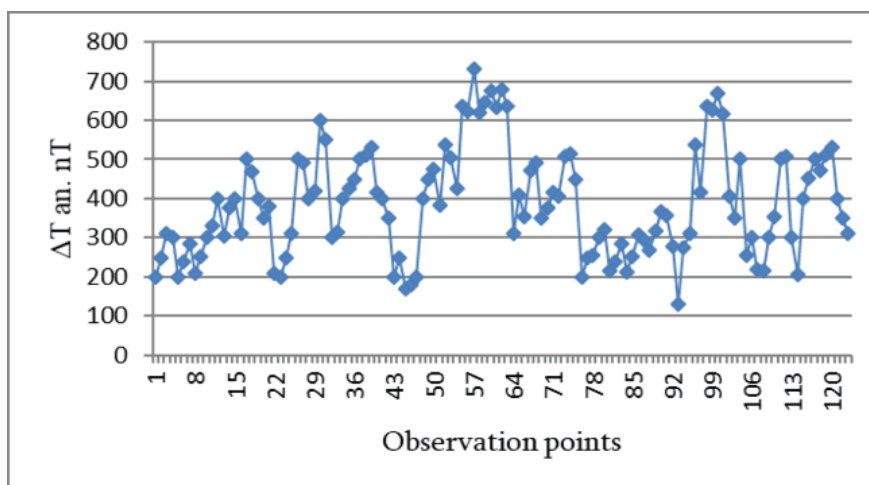


Fig. 3a. Anomalous magnet at the site Paragraph hotel- Magnetiti.

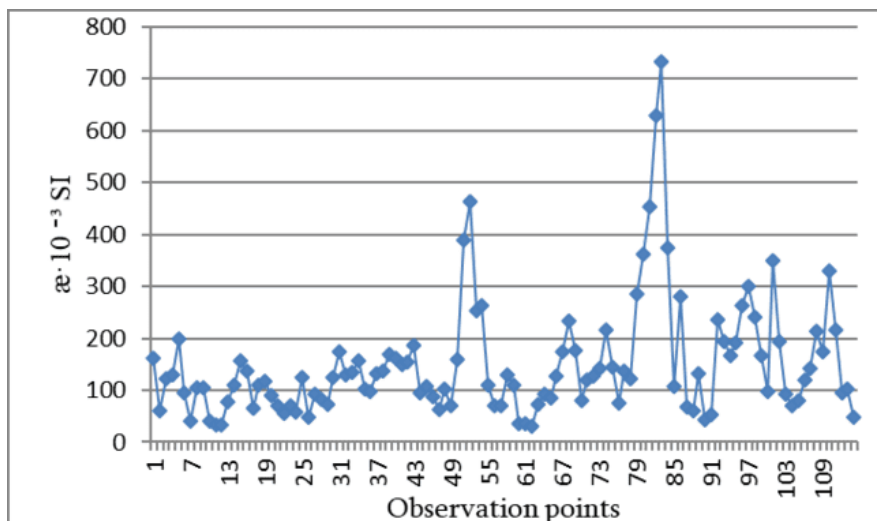


Fig. 3b. The magnetic absorbability variation limits at the site Paragraph hotel - Magnetiti.

From the right bank of the river Supsa to village Grigoleti, along 400-500 m distance, the territory is littered with iron items that makes it very difficult to determine the real magnetic parameters of the territory. Further to the north the mean values of the magnetic field anomalies are of 600 nT order. The magnetic absorbability of the sand is also high. It varies between $(2000-13000) \cdot 10^{-5}$ - SI, whereas the average absorbability is $6000 \cdot 10^{-5}$ - SI.

At the north of the study territory to the boundary of the municipalities of Lanchkhuti and Poti (the area of Maltakva) the magnetic field of the territory usually varies between 500-550 nT, and the mean anomaly is 500 nT. The magnetic absorbability of the sand in this area varies between $(2000 - 12000) \cdot 10^{-5}$ - SI, whereas its mean value is $8000 \cdot 10^{-5}$ - SI.

The results of the laboratory studies of the sand samples of the Black Sea coastline

We took six sand samples from the study territory. Among them two were taken from the area of Maltakva, one – from the right bank and another one from the left bank of the river Supsa and two samples were taken from the Magnetiti area. The samples were studied at the complex laboratory of the Geologic Studies of Ivane Javakhishvili Institute of Geology.

We determined that the main ferromagnetic minerals of the sand are magnetite and titanomagnetite.

In the sand samples taken from the territory of Maltakva the magnetic content in one of them is 10% and in the other – 12%. The content of titanomagnetite in one of the samples is 3% and 4% - in another correspondingly. In the sample taken on the right bank of the river Supsa the content of magnetite is 4% and titanomagnetite is 2%, whereas the sample taken on the left bank contains 12% magnetite and 6% titanomagnetite, that is the highest content of magnetic minerals.

In one of the sand samples taken near sanatorium “Megobroba” the magnetite content is 6% and the titanomagnetite content is 4%, whereas these values in the other sample are correspondingly 8% and 5%.

The results of the study

As a result of the studies of the magnetic field, the magnetic absorbability of the sand and mineral composition of the coastline of the Black Sea we determined that the territory is significantly anomalous. According to the studied areas (the intensity of the magnetic field, magnetic absorbability and ferromagnetic mineral content) the image is given in the table:

Studied territories	Variation scope of the anomalous magnetic field ΔT an. nT.	Average intensity of the magnetic anomaly ΔT an. nT.	Magnetic absorbability (α) variation scope of the sand 10^{-5} -SI	Mean value of the magnetic absorbability of the sand 10^{-5} - SI	Total content of ferromagnetic minerals %
1.R. Natanebi – hotel “Paragraph”	200 – 600	350	800 – 6000	2000	
2. Magnetite	200 – 650	400	4000 – 20000	10000	10
3. Kvavilnari	200 – 650	400	15000 – 80000	40000	13.18
4. Grigoleti	500 – 700	600	2000 – 10000	6000	6
5. Maltakva	500 - 550	530	2000 - 12000	8000	13.16

Conclusion.

As a result of the geomagnetic studies carried out in the Black Sea coastline (the territory of the river Natanebi, the boundary of the municipalities of Lanchkhuti and Poti) we determined that the magnetic anomalies recorded on this territory, compared to other anomalies recorded on the territory of Georgia, are of moderate intensity [2]. The anomaly intensity increases towards the river Supsa from the south as well as from the north. The magnetic absorbability of the sand and percent contents of ferromagnetic minerals in the samples increase similarly. It strengthens the assumption that the source of the magnetic sands distributed on the territory is the river Supsa (together with other short rivers), which washes away the outcropped, distinguished with high magnetism, the middle Eocene volcanogenic rocks from the river gorges and takes them down to the sea [2].

References

1. Nodia M. The magnetic anomaly in Guria and some of its characteristics. // Bulletin of the Academy of Sciences of Georgian SSR, vol. 11, N5, 1941.
2. Gogua R. The magnetic field and magnetism of magmatic rocks. // M. Nodia Institute of Geophysics of Iv. Javakhishvili Tbilisi State University, Tbilisi, 2017.