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## GRAVIMETRIC MAPPING AND ITS DECISIVE ROLE FOR ACHIEVEMENT OF CERTAIN GOALS

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### ABSTRACT

Analysis of gravity field changes during mapping, studying anomalous zones, gradient zones of stress changes, as well as the possible presence of individual fault sections that could be associated with the profiles of the projected area. Drawing up an isoanomal map and a map of vectors reflecting the deep dynamics and strength of the gravitational field of the area by gravimetric reconnaissance, characterizing the change in this geodynamic stress.

**Key words:** Gravity field, gradient zones, isolines, tectonic faults, anomalous areas.

## QRAVİMETRİK XƏRİTƏALMA VƏ MÜƏYYƏN MƏQSƏDLƏRƏ ÇATMAQ ÜÇÜN ONUN HƏLLEDİCİ ROLU.

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### ANNOTASIYA

Xəritədə ağırlıq sahələrinin dəyişməsinin təhlili, anomalıyaların, qradiyent zonalarının, həmçinin layihələndirilən sahənin profillərində əlaqələndirilə bilən ayrı-ayrı qırılma sahələrinin mümkün mövcudluğunun öyrənilməsi. Qravimetrik kəşfiyyat üsulu ilə ərazinin qravitasiya sahəsinin gərginliyini və dərinlik dinamikasını əks etdirən, bu geodinamik gərginliyin dəyişməsinə səciyələndirən izoanomal xəritə və vektorlar xəritəsinin tərtib edilməsi.

**Açar sözlər:** Qravitasiya sahəsi, qradiyent zonaları, izolinyalar, tektonik pozğunluqlar, anomal ərazilər.

## ГРАВИМЕТРИЧЕСКИЕ КАРТИРОВАНИЕ И ЕГО РЕШАЮЩАЯ РОЛЬ ДЛЯ ДОСТИЖЕНИЯ ОПРЕДЕЛЕННЫХ ЦЕЛЕЙ

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### АННОТАЦИЯ

Анализ изменений поля силы тяжести при картировании, изучения аномальных зон, зон градиентов изменения напряженности, а также возможного наличия отдельных участков разломов, которыми могли быть связаны на профилях расположенном проектируемого площади. Составление изоаномальной карты и карты векторов, отражающих глубинную динамику и напряженность гравитационного поля местности методом гравиметрической разведки, характеризующих изменение этого геодинамического напряжения.

**Ключевые слова:** Гравитационное поле, зоны градиентов, изолинии, тектонические нарушения, аномальные области.

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Mapping is a tool for visualizing and analyzing material and information flows in the process of creating the value of the obtained data. Gravity maps are an extension of the field of geodynamics with a geographic or topographic basis on which the results of calculating gravity anomalies are displayed. At the points where gravity measurements were taken, the calculated values of the gravity anomaly based on the measurement results are plotted. Gravity anomaly maps show how much the actual gravitational field of the earth differs from the gravitational field of a homogeneous, featureless surface of the earth.

There are many ways of cartographic representation. In this article we will consider two methods of cartography, conducted research:

- Method of isolines and pseudo-isolines
- Method of signs of movement

The method of isolines and pseudo-isolines is intended to show continuous and gradually changing phenomena in space. The main tool is isolines and pseudo-isolines. More important are not individual isolines, but their pattern (height, depth, gradient zones, anomalous zones, etc.).

The method of movement signs is used to show spatial movements. With the help of movement signs, it is possible to show the path, the method, direction and speed of movement, the quality, power and structure of flows. The main graphic tools are vectors and tapes (the direction of gradient zones, the allocation of gravity, etc.).



Figure 1. CG-5 AutoGrav Gravimeter

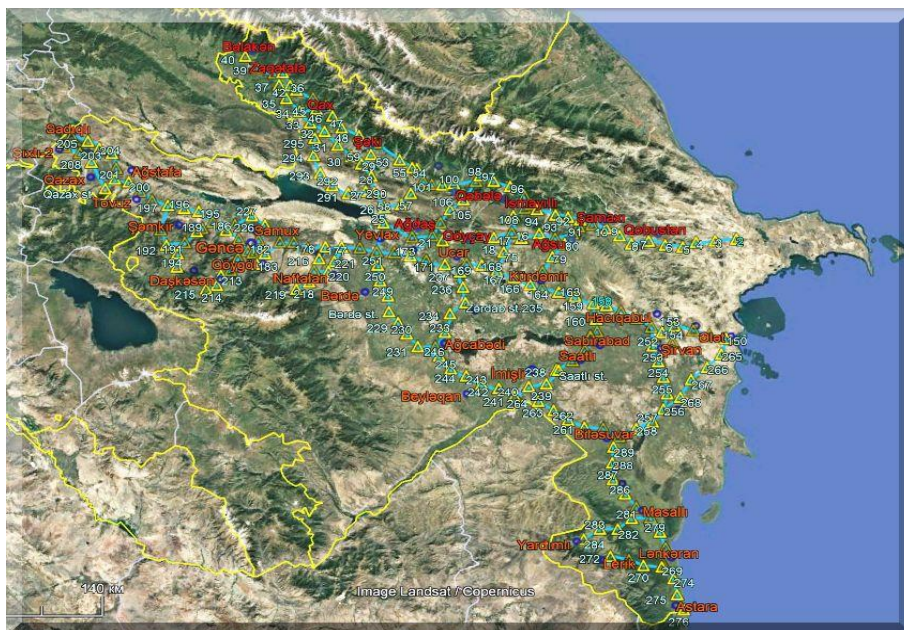


Figure 2. Layout of observation and support points of 4 existing geodynamic polygons

Processes occurring in the internal structure of the Earth and periodically repeating themselves create various deformations in the upper layers of the earth's crust, data on which are regularly processed and used in various research works.

Existing on four geodynamic polygons and in the territories included in the research area, it is necessary to study non-tidal variations both from the point of view of their solution and from the point of view of their optimal geographical conditions in the specified regions. The main goal is to study the structure of the concentrated crust due to non-tidal variations of the gravitational field in seismically active zones of these regions and, on this basis, to restore geodynamic conditions during the formation of structures using a complex of geophysical data in this area. Gravity is considered one of the leading methods for detecting deformations, shifts, gradient zones, and deep faults occurring in the internal structure of the earth. This allows us to evaluate geological processes occurring in deeper layers of the earth's crust and comprehensively analyze their direct connection with seismic activity. This is what gravity maps are for.

Canadian-made CG-5 AutoGrav gravimeters were used to study the effect of gravity on the earth's crust in existing geodynamic testing sites (Fig. 1). These devices allow us to identify the nature of changes in gravity in research areas intended to determine time measurements. The work carried out in 2024 fully covers measurements using high-precision gravimeters at long-term observation points at research sites (Fig. 2).

In order to create a single gravimetric map of the republic's territory (according to the Bouguer anomalies), a new Shirvan-Kazakh geodynamic polygon was created in accordance with the project, where research work was also completed. Thus, during its existence, work was completed on the remaining three polygons and a map of anomalies (Fig. 3.) and a vector map (Fig. 4.) were compiled depending on the Bouguer anomaly of the gravitational field.

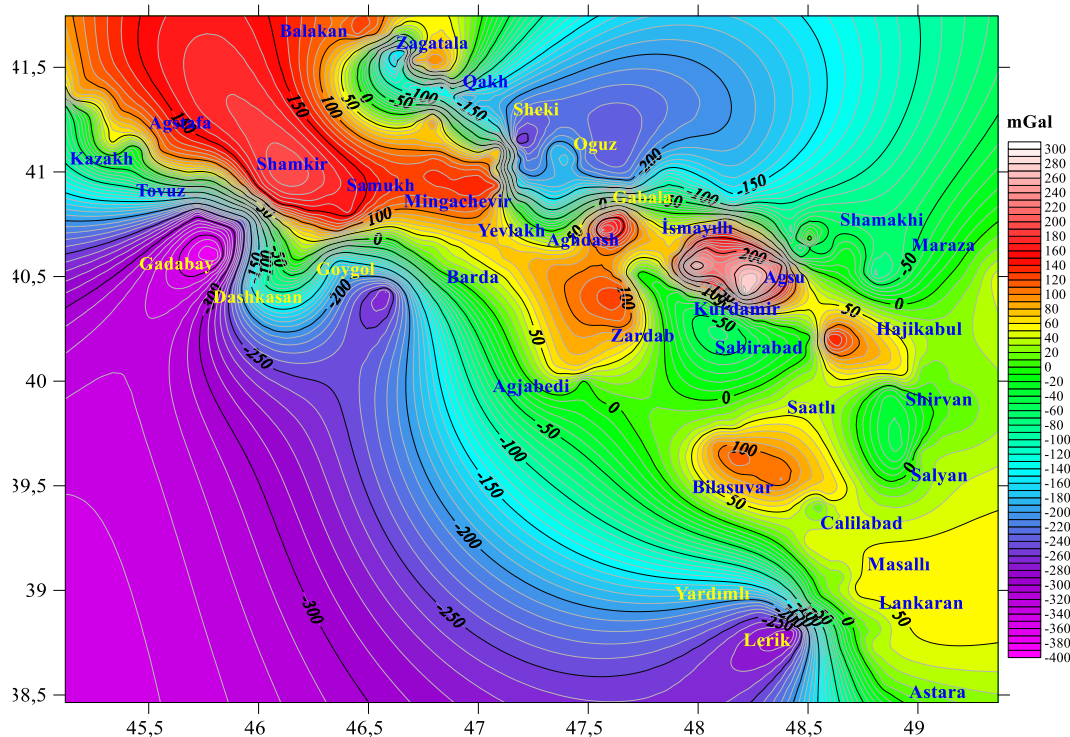


Figure 3. Map of gravity and anomalies along the Bouguer anomaly (2024)

The map of gravity and anomalies (Fig. 3) clearly shows the implementation of the first mapping method. Gradient zones, intense anomalous zones, minimum and maximum values of gravity, etc. are highlighted.

The map of vectorial movement signs (Fig. 4) shows the second mapping method. As shown, the direction of gravity movement and gradient zones.

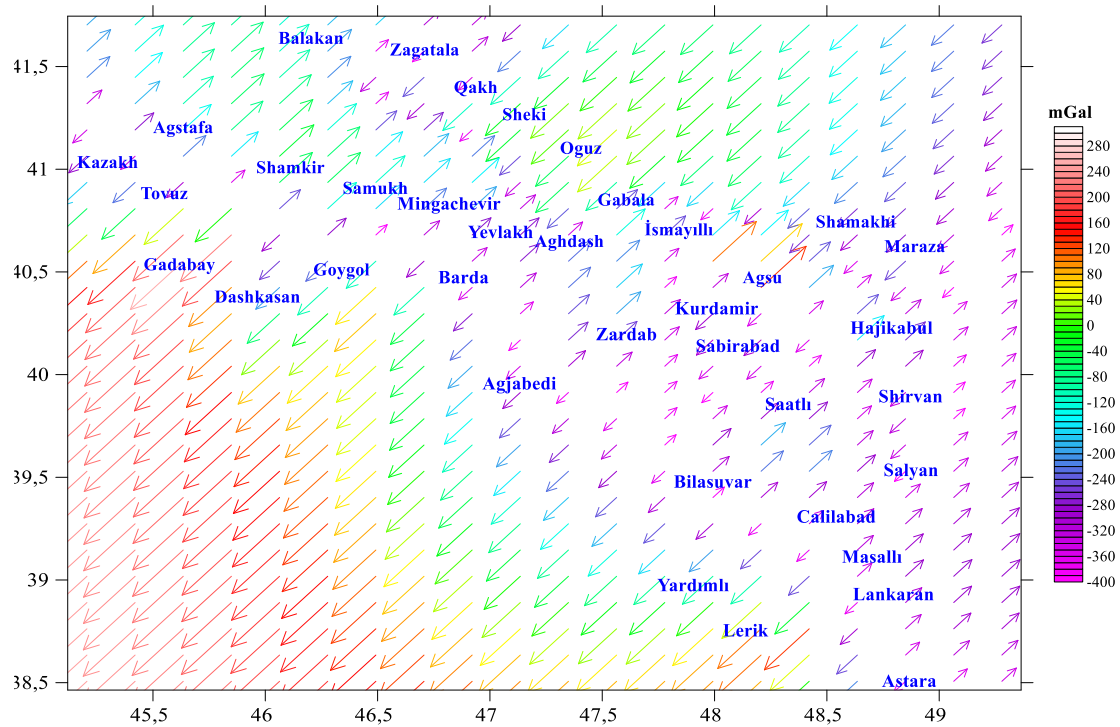


Figure 4. Map of spatial displacement signs

## Conclusion

From the conducted studies, it can be concluded that with the help of these mapping methods, it is possible to clearly, accurately and visually demonstrate all the necessary studied gravity data.

## REFERENCES

1. A.S.Dolgal. Gravimetry and magnetometry: solving inverse problems. Assembly method and additive technologies. Perm State National Research University, Perm, 2024, 120 pp., UDC: 550 (075.8), ISBN: 978-5-7944-4112-3 (original in Russian)
2. Dmitriyev V.I. Inverse problems of geophysics. Moscow, 2012, 340 p., UDC: 517.98:550.37, ISBN: 978-5-317-04151-9 (original in Russian)
3. Freedon W. [Decorrelative Mollifier gravimetry. Basics, ideas, concepts, and examples.](#) Birkhauser, 2021 г., 484 ср., ISBN: 978-3-030-69908-6.
4. Szelachowska, M. GDQM-PL13 – the new gravimetric quasigeoid model for Poland / M. Szelachowska, J. Kryński // Geoinformation Issues. – 2014. – Vol. 6. – № 1 (6). – P. 5–19.
5. Nepoklonov V.B., Moiseyeva V.S., Abakushina M.V.//News of universities. Geodesy and aerial photography. - 2016. - No. 4 (original in Russian)
6. N.Ya.Kunin, G.M.Geyshevik. Quantitative interpretation of gravitational anomalies. "Moscow" 1978, p.105 (original in Russian)
7. Berezkin V.M. Taking into account the terrain relief and the intermediate layer in gravity exploration. Moscow, "Nedra", 1967. Page 117 (original in Russian)
8. Zhdanov M.S., Shraibman V.I. Correlation method of separating geophysical anomalies. Moscow, "Nedra", 1973. Page 128 (original in Russian)

9. Bulakh E.G., Markova M.N. On the approximation approach to the description of the earth's surface relief in geodesy and gravimetry problems // Geophysical research. 2009. Vol. 10. No. 3. P. 25–37 (original in Russian)
10. Veselkova N.V., Pugin A.V. The problem of third-party sources in the practice of transformations of geopotential fields // Geophysics. 2010. No. 1. P. 69–73 (original in Russian).