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computation of the salt depth based upon the data of gravity survey. From confronting of single discrepancies we can compute the average quadratic error of determination of the salt depth, namely $\varepsilon = \pm 12$ m. None of the 14 borings is contrary to evidence furnished by gravity survey, which is the best argument in favour of application of gravitational method of prospecting in the Solikamsk District.

It is very important to point out, that the coefficient b connected on account of formula (2) with difference of densities δ, is almost equal for all the three districts and yields for density difference numbers $\delta = 0.33$; $\delta = 0.34$ and $\delta = 0.38$ or in average the density of salt is on 0.35 lower than that of overlaying rocks. The stability of the coefficient b throughout the whole area enables us to compute the salt depth but from the evidence or one single boring. However, we must bear in mind that the sphere of action of a given boring is limited, because the gravity variation at great distance will not only occur on account of variation of salt depth, but it depends upon "deep geology", which in exceptional cases only can be estimated by means of pendulum observations, the use of formula (1) being thus possible in limited areas only.

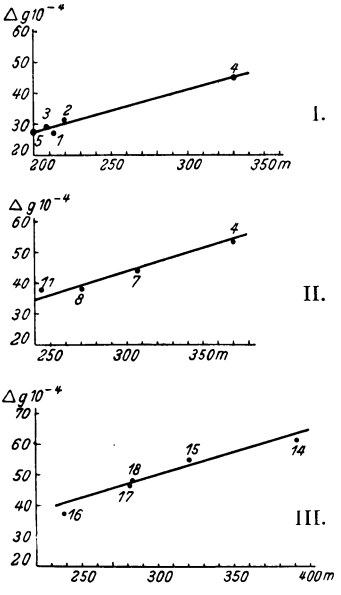

fig. 4.

Depence between the anomaly of gravity Δg (0.0001 cm sec^{-2}) and the depth of salt h (meters): Figurs at the points are numbers of the wells.

I. North of Solikamsk. II. South of Solikamsk. III. Near Berezniaky.

A natural continuation of the above works would be the gravity survey along the railway from Berezniaky to Solikamsk. The result of such survey would be a map in isogams, which, as is seen from experience, can be with certainty recognized as the underground salt relief.

Results of Gravity Observations of 1928 near Lake Baskunchak.

By **B. Numerov.** — (With one Illustration.)

With the developement in recent years of geophysical methods for the investigation of the inner structure of the nearest strata of the earth, special attention has been given to gravity observations: the determination of gravity by means of pendulums and the study of certain qualities of the potential of

attraction with the aid of the Eötvös torsion-balance. Up to the present we jugded of gravity anomalies (departures from the normal law of distribution) all over the surface of the European and Asiatic part of the Union by a small number of gravitational points (to 1921 about 500), mostly some tens and hundreds of kilometers apart*). Till late there was no clear conception about the distribution of the gravity anomaly and it was believed that a general survey of every 100 or 50 km will be entirely sufficient to define the

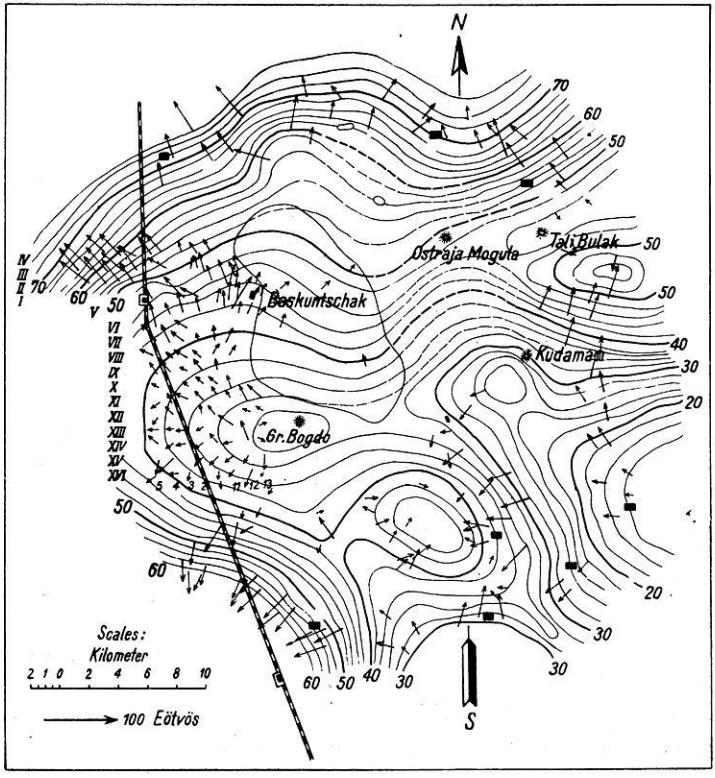

fig. 1. Anomaly of gravity near Lake Baskunchak 1928.

general character of the distribution of gravity. But a whole set of works of the last decade, when geologists and industrial undertakings began to take interest in gravity observations and these were limited to small areas or profiles, disclosed a complex picture in the rate of the gravity anomaly, which by no means may be detected by a small number of points widely apart.

*) Catalogue of gravitational points compiled in 1921 by P. I. Savkjevich and A. M. Gishitsky upon the request of Astro-Geodetical Institute (now Astronomical) and published by the Russian Astronomical Society.

Therefore the publication of hitherto obtained results of gravity distribution in different regions becomes of great importance. The present paper contains the data of gravity observations near Lake Baskunchak, situated 250 km to the North of Astrakan. The country around the lake is a level step, stretching for many hundreds of kilometers. The observations were conducted under the auspices of the Geological Committee*) upon request of the Baskunchak Salt Trust and embraced an area of about 1600 square kilometers. In total, 268 points were obtained with two small torsion-balances of system Schweydar-Bamberg (No. 533 and 562). The points were situated 500 m apart, but when it appeared that we have to deal with a region of strong anomaly, steadily developing over a vast area, we started a route survey, spacing the points from 3 to 5 km. In fig. 1 the vectors of gravitational variation $\frac{\partial g}{\partial s}$ showing the value and direction of the greatest change in a horizontal plane of the given point, are marked by arrows. The vector of variation of gravity $\frac{\partial g}{\partial s}$ demonstrates the behavior of heavy or light masses, underlying the surface of the earth. The heavy masses rise in the direction of the vector. Presuming the upper surface of the heavy masses to represent a plane with an inclination ε we may write, that the vector of gravitation is equal to:

$$\frac{\partial g}{\partial s} = 2\pi k^2 \delta \varepsilon, \quad M = 419 E.\delta.\varepsilon.M^{**}) \quad \ldots\ldots\ldots \quad (1)$$

where δ is the difference of densities, $k^2 = 667.10^{-10}$ (C. G. S.) — the constant of attraction, and value

$$M = 1 - \frac{3}{2}\frac{J}{(l^2+J^2)^{1/2}} + \frac{1}{2}\frac{J}{(l^2+J^2)^{3/2}} \quad \ldots\ldots\ldots \quad (2)$$

depends on J — the height of torsion-balance above the stratum and the radius l of stratum.

Issuing from an arbitrary zero, the values of gravity for all points of observation were found by means of numerical integration and isogams or lines of equal gravitational anomalies drawn through 2γ***).

Remarking on the map thus obtained, we see some maxima and minima, the greatest difference in the anomaly reaching $60\gamma''$ and the greatest gradient of anomaly variation amounting to 8γ in the South on 1 km.

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*) On the suggestion of the geologists V. K. Katulsky, P. I. Preobrashensky, Semikhatov the task was executed by N. N. Samsonov, T. N. Bogoslovsky, V. N. Numerova, V. N. Stepanova, under the general leadership of B. V. Numerov.

**) $\gamma = 0.001$ cm sec^{-2} and $E = 10^{-9}$ (C. G. S.).

***) B. V. Numerov: Reduction of observations with gravitational variometer for topography. Bull. of Astr. Inst. 1927, No. 17.

The lake lies in the region of minimum, though the principal minimum is situated outside the plan in south-eastern direction. From S-West, North and Northeast we have the maximum zone, surrounding the lake like a ring and stretching farther.

The observed anomaly cannot be explained by corrections for isostasy and depends entirely on the geological structure of the nearest earth strata (to 10 km in thickness). Supposing we have to deal with a simple case of a contact surface, dividing less dense surface masses from deeper and more dense masses, the gravity anomaly Δg and depth h to contact surface are related by the approximate correlation:

$$\Delta g = a + bh = a + 2\pi k^2 \delta h = a + 40\gamma\delta h_{\text{km}},$$

where a is a certain adopted mark for the isogam.

Thus to explain the observed anomaly of 60γ at a difference in densities $\delta = 0.5$ we must have a depression and an uplift in the underground relief h within the limits to 3 km. With other words, we must accept that near Buskunchak we are dealing with a great dislocation of masses, capped with sediments of later deposition.

In conclusion, we would like to draw attention to the necessity of pursuing gravitational works and of widening the area, but this, of course, is connected with the problem of a general gravitational survey, which should be conducted by means of pendulums, the details to be perfected by torsion-balances.

Unfortunately the problem as to a general survey hat not yet been settled and we can only accidentally and on small areas look into the complex picture of gravity distribution, which, aside of a deep geophysical interest possesses an ever growing practical value.

Results of the General Gravity Survey in the Emba District.

By **B. Numerov.** — (With one Illustration.)

The paper contains the results of the general gravity survey executed within the area of petroliferous deposits Dossor and Iskiné, Emba District, near the northeast coast of the Caspian Sea*).

*) The gravity observations in the Emba District began since 1925. In 1925 profiles were drawn by the Geological Committee at Dossor (18 stations) and Iskiné (26 stations). In 1926, the Trust Emba-Oil carried out the investigation of an area of 325 sq. km at Novobogatinsk (541 stations) and drew 2 profiles at Karaton[1]) (249 stations) and one at Akat-Kulé (30 stations). Finally, in 1928 an area of 6 sq. km was surveyed at Bek-Bek (61 stations), about 2 sq. km at Baychoonas (22 stations) and a route survey executed between Dossor, Iskiné and Baychoonas (62 stations).