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ST-GM-10-611 END

MAGNETIC CHART OF THE BRAZILIAN ANOMALY

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(USSR)

N 67-27658
(ACCESSION NUMBER)
(THRU)
10 4R512
(PAGES)
1
(CODE)
CR-84489
(NASA CR OR TMX OR AD NUMBER)
13
(CATEGORY)
FACILITY FORM 602

CR-84489

23 MAY 1967

ST-GM-10611

MAGNETIC CHART OF THE BRAZILIAN ANOMALY*

Geomagnetizm i Aeronomiya
Tom 7, No.2, 394-5,
Izdatel'stvo "NAUKA", 1967.

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SUMMARY

A magnetic chart of the Brazilian anomaly has been drawn on the basis of magnetic field measurements by proton magnetometers installed on AES Kosmos-49 and Kosmos-26

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* *

The measurements of the magnetic field by proton magnetometers installed on AES Kosmos-49 and -26 were conducted as a part of the program of world magnetic survey [1]. The region of the Brazilian anomaly was found to be covered by a dense net of measurements which were precisely utilized for the construction of the chart of the magnetic anomaly. Only recently did a communication appear [2], giving account of geomagnetic field measurements at 1000 km above the Brazilian anomaly on AES Alouette (October-December 1964). The geomagnetic field was determined by ionogram gyrofrequencies; two centers of field intensity minimum were revealed.

The requirement for the construction of such a chart was caused by the interest in the anomaly in connection with ascertaining of the existence near the Brazilian coast of a region with increased radiation intensity [3], of which the study offers interest for the theory of radiation belts [4 - 6].

The central part of the anomaly $\phi = 5-40°S$; $\lambda = 20-70°W$ was selected for the construction of the chart.

The results of field measurements by convolutions were reduced to two average altitudes H = 350 and 450 km, for which theoretical vertical gradients $\Delta T / \Delta h$, obtained according to the tables of field values in tens of gammas at altitudes H = 300 and 400 km, were utilized; these values were computed by the coefficients g and h for the 1960 epoch in ref.[7].

5* MAGNITNAYA KARTA BRAZIL'SKOY ANOMALII 6

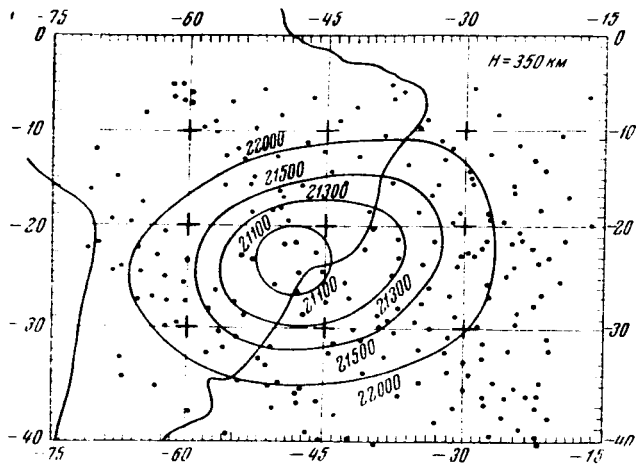

Fig.1

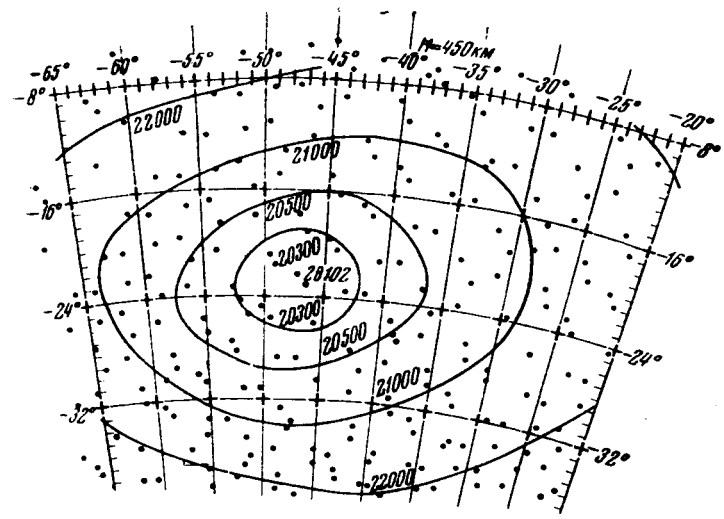

Fig.2

In order to verify the agreement of the computed gradient $\Delta T / \Delta h$ values obtained above with the experiment, a table was compiled of experimental vertical gradients obtained as follows. For a pair of "coinciding" convolutions the difference of field values at each point is

$$\Delta T = \Delta T_{\Delta h} + (\Delta T_{\Delta\varphi} + \Delta T_{\Delta\lambda}),$$

where $\Delta T_{\Delta h}$ is the difference in field values fitting Δh km; $\Delta T_{\Delta\varphi}$ and $\Delta T_{\Delta\lambda}$ are corrections for $\Delta\phi$ and $\Delta\lambda$. Each value of the correction at the point (ϕ, λ) is

$$\Delta T_{\Delta\varphi}^{(\varphi,\lambda)} = (\Delta T / \Delta\varphi)^{(\varphi,\lambda)} \Delta\varphi,$$

where $\Delta\phi$ is the difference by latitude between two "coinciding" convolutions and the values of horizontal gradients $\Delta T / \Delta\phi$ and $\Delta T / \Delta\lambda$ are computed for each point by the tables of ref.[7]. Now

$$\Delta T_{\Delta h} = \Delta T - (\Delta T_{\Delta\varphi} + \Delta T_{\Delta\lambda}),$$

whence it is easy to obtain the values $\Delta T_{\Delta h} / \Delta h$ of experimental gradients for the table.

TABLE 1

№	φ°	λ°	ΔT/Δh	№	φ°	λ°	ΔT/Δh
1	—6	—37	10,9	5	—27	—42	8,7
2	—9	—35	10,4	6	—37	—29	7,7
3	—16	—53	9,9	7	—32	—43	8,4
4	—18	—50	9,3	8	—6	—51	10,3

The computed values of experimental gradients agree well with theoretical gradients.

The values of the magnetic field reduced to two altitudes were then utilized for the construction of the charts. Such a chart of magnetic field values reduced to H = 350 km is shown in Fig.1. The curves run smoothly, pointing to the existence at 350 km of only one minimum at anomaly center $20900\ \gamma < T < 21100\ \gamma$ with coordinates ϕ = 23°S and λ = 47°W.

An analogous chart is constructed for H = 450 km (Fig.2). Inasmuch as the distance from the center of the Earth is greater, the curves show a still smoother course and also establish the existence at H = 450 km of a unique minimum at anomaly center $20100\ \gamma < T > 20300\ \gamma$ in the region $\varphi \approx 23°$S and $\lambda \approx 47°$W.

The authors are grateful to Sh. Sh. Dolginov for the submission of the theme and to E. E, Kanonidi et al for their aid in the work.

*** THE END ***

IZMIRAN

Received on 17 June 1966

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VOLT TECHNICAL CORPORATION

Translated by ANDRE L. BRICHANT

on 23 May 1967

Distribution same as for ST--612