1∶4 000 000
中国及毗邻海区航空磁力异常图
技术说明书

TECHNICAL DESCRIPTION

FOR THE 1∶4 000 000 AEROMAGNETIC ANOMALY MAP

OF CHINA AND ADJACENT SEA AREAS

中华人民共和国地质矿产部
航空物探总队编

COMPILED BY

AERO GEOPHYSICAL SURVEY (AGS)

MINISTRY OF GEOLOGY AND MINERAL RESOURCES(MGMR)

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前言

我国各种比例尺的航空磁力测量工作三十年来已覆盖陆地的80%以上和部份毗邻海域，使用的仪器有各种型号的磁饱和（磁通门）式磁力仪、质子旋进式磁力仪、光泵式磁力仪。测线间距有500m，1000—2000m，直至5—20km。飞行高度相对地表有100—200m，300—600m，西部山地局部地区达1000m以上。历年测量精度按重复测量的均方误差在5—50nT，部份地区作了基本磁场垂向梯度改正，一般采用偶极子场的垂向梯度值。

为统一调平历年各测区的磁场水平，由航空物探总队安排，使用质子旋进式磁力仪先后在东北、华北、华南、西南地区进行了四次控制网测量，用中国科学院地球物理研究所三阶泰勒级数多项式模式和球谐分析模式对历年各种比例尺测量结果进行磁场调平和长期改正，编制了1∶50万航空磁力异常图。出版了高斯投影底图的1∶100万中国航空磁力异常（△Ta）图。在此基础上编制1∶400万中国航空磁力异常图。

其基本要求是：

1. 宏观反映磁场特征和面貌。

2. 合理地滤去局部异常、但又不失局部异常延伸的走向。

3. 根据1∶50万航磁图按5km×5km网格进行离散采样建立有统一座标的数据组。磁场值内插精度±5nT，数据组适用于各位场转换方法，从而可充分发挥航磁数据在大地构造、成矿带分布及地壳深部结构研究中的作用。

4. 采用IGRF1980.0为基本磁场，便于和国外同类图件对比，有利于国际间交流。

编 图 方 法

本图在编制时采用了以往编制小比例尺航磁图未采用的某些方法，以保证编图质量。这些方法包括：将在高斯投影上采集的数据转换至等积园锥投影底图上；采用 IGRF1980.0 为基本磁场，研究了我国境内长波磁异常分布特征；使用园滑滤波和补偿园滑滤波方法处理数据，保证磁异常形态和强度畸变最小。

一、统一网格化数据座标投影的转换[1]。

1：50 万航磁图是高斯投影，根据此图采集磁场值时，要将各带拼接在一起，形成统一的座标。高斯投影的特点是地球表面微分线段投影后，经线方向和纬线方向长度变形相等。

1：400 万等积园锥投影则是两者长度变形互为倒数，因而在高斯投影底图上采集的数据要转绘在等积园锥投影底图上时，数据网格间距要求经线方向拉长，纬线方向缩短。

1：400 万比例尺，5km×5km 网格距应为：

经线方向：$0.125\times(1+0.010965793)$

$=0.126370724\text{cm}$

纬线方向：$0.125\times(1-0.010803729)$

$=0.123649533\text{cm}$

因计算机绘图仪赋值最小单位所限，实际绘图时使用值为：经线方向 0.126cm，纬线方向 0.124cm。

二、国际地磁参考场（IGRF）的计算。

国际地磁参考场（IGRF）是用球谐分析模式建立的。IGRF 1980.0 球谐系数共 120 个，借助于球谐级数表达式[4]：

$$V=a\sum_{n=1}^{10}\sum_{m=0}^{n}(a/r)^{n+1}(g_n^m\cos m\lambda+h_n^m\sin m\lambda)P_n^m(\cos\theta)$$

$$X=\frac{1}{r}\frac{\partial v}{\partial\theta}=\sum_{n=1}^{10}\sum_{m=0}^{n}(a/r)^{n+2}(g_n^m\cos m\lambda+h_n^m\sin m\lambda)\frac{dP_n^m(\cos\theta)}{d\theta}\quad\cdots\cdots ①$$

$$Y=\frac{-1}{r\sin\theta}\frac{\partial v}{\partial\lambda}=\sum_{n=1}^{10}\sum_{m=0}^{n}(a/r)^{n+2}\frac{-m}{\sin\theta}(-g_n^m\sin m\lambda+h_n^m\cos m\lambda)P_n^m(\cos\theta)$$

…………………………………………………………………… ②

$$Z=\frac{\partial v}{\partial r}=\sum_{n=1}^{10}\sum_{m=0}^{n}-(n+1)(a/r)^{n+2}(g_n^m\cos m\lambda+h_n^m\sin m\lambda)P_n^m(\cos\theta)$$

…………………………………………………………………… ③

计算出地心座标系下的地磁分量。

其中：V 是地球磁位；

X. Y. Z 分别是地磁场北向分量、东向分量和垂向分量；

a＝6371.2km 地球半径；

r 是从地心到计算点的径向距离；

θ 是地心余纬；

λ 是经度；

g_n^m，h_n^m 是球谐系数；

$P_n^m(\cos\theta)$是 Schmidt 准归一化缔合 Legendre 函数，它与缔合 Legendre 函数 $P_{nm}(\cos\theta)$的关系为：

$$P_n^m(\cos\theta)=\begin{cases}P_{nm}(\cos\theta) & m=0\\ \sqrt{\frac{2(n-m)!}{(n+m)!}}\;P_{mn}(\cos\theta) & m\geqslant1\end{cases}$$

球谐分析是在地心座标系下进行的。在计算某点的 IGRF 值时要将该点的大地纬度变换为地心纬度，计算出该点在地心座标系下的地磁场值，再将此场值投影至大地座标系，最终得到大地座标系内的 IGRF 值。具体作法如下：

选定了参考椭球之后，地球表面任一点的位置可用直角座标，大地座标和地心座标这三种座标表示。三者之间的关系是：

$X=(N+h)\cos\Phi\cos\lambda=r\cos\varphi\cos\lambda$ ………………………… ④

$Y=(N+h)\cos\Phi\sin\lambda=r\cos\varphi\sin\lambda$ ………………………… ⑤

$Z=(\frac{b^2}{a^2}N+h)\sin\Phi=r\sin\varphi$ ……………………………… ⑥

其中：N 是参考椭球卯酉圈曲率半径；

h 是计算点的高程；

a，b 分别是参考椭球的长、短半轴；

Φ 是大地纬度；

φ 是地心纬度；

λ 是经度；

r 是地心到计算点的径向距离，因此 $r=\sqrt{X^2+Y^2+Z^2}$。

求出计算点的地心纬度及 r 之后，代入球谐级数表达式，可得到此点地心座标系下的地磁场三分量，然后按照：

$X'=X\cos(\Phi-\varphi)+Z\sin(\Phi-\varphi)$ …………………………… ⑦

$Y'=Y$ …………………………………………………… ⑧

$Z'=Z\cos(\Phi-\varphi)-X\sin(\Phi-\varphi)$ …………………………… ⑨

得到大地座标系下的 IGRF 值 X′、Y′、Z′。

三、航空磁力异常图基本磁场（背景场）改正准则的讨论及 1：400 万中国航空磁力异常图背景场的改正方法：

编制一个地区的磁场图时，在改过背景场之后，磁场调平的准则是：

$$\sum_{i}^{n}(\pm\triangle Ti)\approx 0$$

此概念来源于以下两点：

(1) $\iint \frac{\partial v}{\partial n}ds=\iint(F\cdot ds)=0$

这个式子意味着取自整个闭合表面的磁场强度的平均值等于零，亦即通过任一个不包含质量(m)的闭合面之场强矢量 F 的通量等于零[2]。（注意这里的 F 为垂直闭合面的矢量，通常所说的 Z 分量）。

(2)对位于地球表面附近磁性物体求$\frac{\partial v}{\partial n}$的平均值的时候，可以用对地球表面某一足够大的部分的积分（求和）来代替对地球整个表面的积分。这是因为离埋藏物体在地表投影中心很远的地方，该磁性物体产生的磁场已经小得可以忽略不计。

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即： $F=K\frac{m}{r^{3}}\vec{r}$； 当 $r\to\infty$ $F\to 0$

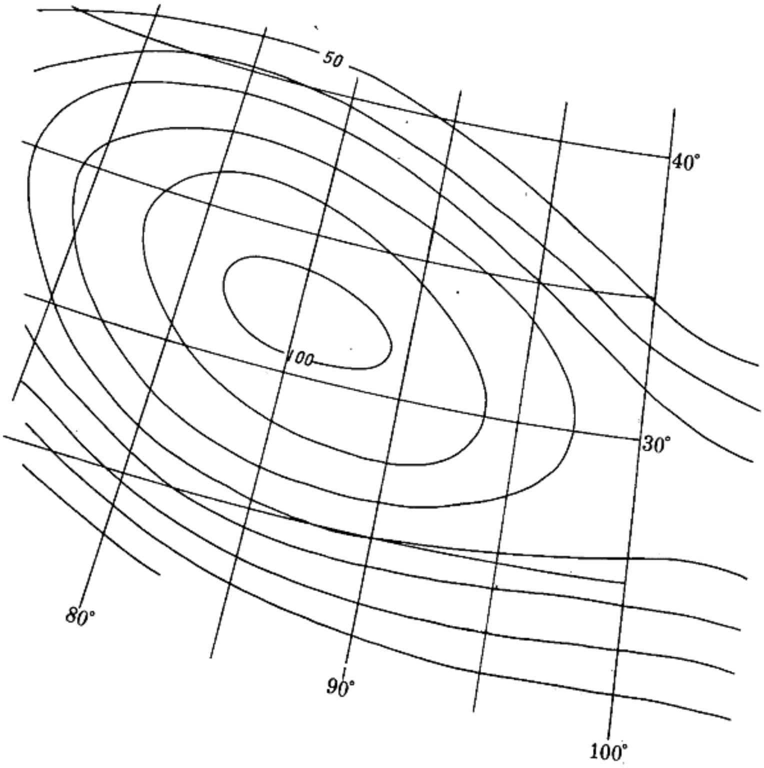
改换为我们实际工作中常讲的话，即在研究（编图）的面积内异常尺度和场强不包含与面积相匹配的背景场。即把这一级次的背景场减去，作为选择正常场合适与否的标志。这样就在所编图中丢掉了此一级场的特征和形态。

在1980年以前，航空物探总队各种比例尺的编图工作都使用三阶泰勒多项式模式。这个模式在大面积编图时暴露了它的某些弱点。除了地磁场各分量不满足数学物理关系这个固有的缺点之外，同时因在东北、西北、西南、海域使用的实测数据少，且分布不均匀，造成这些地区正常场特征的改变。另外它也很少使用国外台站的实测数据和卫星资料，使磁场图不便与国外比较。因此，1980年以后，我们采用国际地磁与高空物理协会（IAGA）推荐的IGRF球谐系数来计算中国境内的国际地磁参考场。

1∶400万中国航空磁力异常图以IGRF 1980.0为基本磁场进行背景场改正。图中青藏地区和东北地区情况比较特殊，现作如下说明：

1. 青藏地区背景场的改正方法

青藏高原具有区域背景场，这在MAGSAT异常图上有很清楚的显示。利用计算IGRF场的球谐系数，由十阶减八阶求得长波长磁异常。如图.可见青藏地区存在正100nT的正背景场，异常图则为一个区域负磁异常。80nT等值线封闭圈与青藏高原隆起范围基本吻合。此区域背景场可能是青藏地区近期构造岩浆活动剧烈，地壳增厚地势隆起所致。



青藏地区区域背景场

示 意 图

比例尺 1∶2800 万

在编制青藏高原 1∶100 万航磁图时,采用 430 个绝对磁场值建立了一个三阶泰勒级数模式,暂称为青藏模式、将它与 1970.0 西南地区泰勒多项式比较,在青藏东部二者方差 值为 21nT,将青藏模式与 IGRF 1980.0 比较,二者之间平均离差为 22.4nT,均方根值为 40.2nT,考虑到这些比较结果,将青藏模式的零磁场值加上 30nT,这样改过之后,青藏地区磁场值与中国东部及西北部磁场相接良好。

需要强调指出的是青藏高原 地区在做全区航磁测量之前,其区域背景场不易较好地反映出来。现在青藏地区磁场只在东部及东北部与邻区相接, 目前这种作法,实为权宜之计。

青藏地区地势陡峭,高差悬殊,使用大型飞机做运载工具,只能

缓起伏飞行。在观测高度较高时，近地表的局部异常实际已被部份的衰减，同时因磁场平缓，不宜与东部地区采取相同的等值线间距。青藏高原地区等值线，在 100nT 以下以 25nT 为间距绘制。

2. 东北地区（北纬 42°以北）背景场的改正

将三阶泰勒多项式模式与 IGRF 1980.0 模式计算结果对比，可见二者在东北地区和西北地区相差较大，西北地区 1：100 万航磁编图时，已使用 IGRF1980.0 为背景场，故勿需改正。

东北地区磁场水平统一到 IGRF1980.0 的方法如下：

令 T_{oi} 为 IGRF 1980.0 计算值；

T_{ot} 为三阶泰勒级数模式计算值；

$\triangle T_i$ 为以 IGRF1980.0 背景场的异常值；

$\triangle T_t$ 为以三阶泰勒多项式模式的异常值；

$\triangle T_{ch}$ 为 T_{oi} 减去 T_{ot} 的差值；

T 为磁场总强度的实测值，

则有：

$$\begin{aligned}\triangle T_i &= T - T_{oi} = T - (T_{ot} + \triangle T_{ch}) \\ &= T - T_{ot} - \triangle T_{ch} \\ &= \triangle T_t - \triangle T_{ch}\end{aligned}$$

实际改正时，对东北地区逐点计算出 $\triangle T_{ch}$ 再对 $\triangle T_t$ 进行逐点改正。即得到以 IGRF1980.0 为背景场的异常值。

四、数据处理

5km×5km 网格采样的数据密度在 1：400 万图面上达到 64 点/平方厘米。为保证磁场特征不畸变又不至于等值线图面负担过重。采用园滑滤波和补偿园滑滤波方法处理数据。

1，园滑滤波

设观测场 $f(x,y)$，经园滑滤波后得到的场值为 $f\varphi(x,y)$，则原始观测场与园滑滤波场之差为： $\triangle f(x,y) = f(x,y) - f\varphi(x,y)$

$\triangle f(x,y)$为原始观测场损失部份。为减少损失采用双向加数园滑滤波。本图的东北地区西北地区和青藏地区采用。

2，补偿园滑滤波：*

因$\triangle f(x,y)=f(x,y)-f\varphi(x,y)$为损失部份，它含有三种成份，①高频干扰；②有用高频成份；③有用低频成份。这第三部份应补偿回观测场。本图采用参考文献[6]方法进行补偿园滑，其参数为$\beta=100$，$n=35$。相当于压制了波长小于20km/周的异常。本图的华北、华南地区采用。

1∶400万中国航空磁力异常图是我国航空物探工作三十余年成果的积累，由于历史原因使用的资料精度参差不齐，所以此图不尽实意的地方在所难免、但它毕竟为地质、地球物理、地震地质等学科的研究工作提供了一份全面系统的资料图件和数据。使得各项研究工作向数据化、定量化方向发展，尤其是统一网格化数据，已提供使用并获得很好的社会和经济效益。这组数据也为此图日后的修改补充工作提供了方便。

编图工作责任人员

·本图是航空物探总队1954年以来开始航空磁力测量以来多年工作的汇集。参加本图编辑出版的工作人员：

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·在编图中得到地矿部北京计算中心的协助，他们参加了部份数据处理工作，特别是提供了补偿圆滑滤波方法及有关软件。有关责任人员：

方法原理	侯重初

数据处理　李　燕
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· 参加作为本图采集数据工作基础的 1∶100 万中国航空磁力异常(△Ta)图编制工作的人员有:中国东部地区编图组杨重恩等;青藏地区编图组杨华、任瑞等;西北地区编图组吴文书等。

参考文献

[1]数学制图学　胡毓钜编著　中国工业出版社

[2]地磁学　Б. M. 扬诺夫斯基　刘洪学、周烑秀译　地质出版社

[3]地球基本磁场的分析方法　安振昌　中国科学院地球物理研究所

[4]IGRF1980.0—CHARTS AND VALUES　IAGA　BULLETIN $N_0$47

[5]IGRF1980.0 的检验　徐元芳、王月华、安振昌　中国科学院地球物理研究所

[6]补偿园滑滤波方法　侯重初　地质计算技术　第四期

[7]双向加权园滑滤波　SEL32/57 引进软件

Technical Description for the 1 : 4 000 000 Aeromagnetic Anomaly Map of China and Adjacent Sea Areas

Preface

In the past thirty years, more than 80% of the land areas and a considerable part of the territorial sea areas of China have been covered by aeromagnetic surveys of various scales. The instruments used included flux-gate magnetometers, proton precession magnetometers and optically pumped magnetometers, with traverse line spacing varying from 500, 1 000-2 000 m to as large as 5—20km, and with ground clearances from 100—200m to 300—600m, and sometimes to more than 1 000m in some local areas in the western mountains. The survey accuracy attained over the years ranged between 5—50nT according to the rms errors of reflights. Some of the areas have been corrected for vertical gradient using in most cases the vertical gradient values of the dipole magnetic field.

In order to adjust the magnetic level for the individual areas surveyed through the years, four control-net surveys were conducted under the arrangement by Aero Geophysical Survey in the northeast China, North China, South China, and Southwest China, using proton magnetometers. After magnetic adjustment and corrections for secular variations were made to the surveyed results at various scales obtained over the years by using the spherical harmonic model and the polynomial model of three-order Taylor series provided by the Geophysical Institute of Chinese Academy of Sciences, an aeromagnetic anomaly map at the scale of 1 : 500 000 was compiled. Meanwhile, an aeromagnetic anomaly Ta map of China compiled at the scale of 1 : 1 000 000 using the Gaussian projection as the base map was also published. It was based on these maps that the 1 : 4 000 000 aeromagnetic anomaly map of China and its adjacent sea areas was compiled.

Basic requirements for 1 : 4 000 000 aeromagnetic anomaly map are as follows:

1) To reflect the macroscopic characteristics and main features of the magnetic field.

2) To have the local anomalies reasonably filtered out, without losing track of their general extension.

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3) To create a data set with unified coordinate system from the 1 : 500 000 aeromagnetic map by using a 5km × 5km discrete sampling meshsize. The accuracy of interpolation for the magnetic field values is ±5nT. The data set should be applicable to any of the methods for potential field transformation, so as to bring into full play the role of aeromagnetic data in the studies of tectonics, distribution of metallogenic belts, and deepseated crustal structures.

4) IGRF 1980.0 should be used as the main magnetic field, so as to compare easily with similar maps from other parts of the world.

Compilation Methods

To ensure the required quality of compilation, some of the methods that were never used in the past for compiling small-scaled aeromagnetic maps have been used. These methods include: conversion of data sampled on the Gaussian projection onto a base map of equal-area conic projection; analysis of the distribution characteristics of the long-wavelength magnetic anomalies within the country by using the IGRF 1980.0 as the main magnetic field; and processing of data by using the Smooth Filter and the Compensation Smooth Filter techniques, so as to minimize shape and intensity distortions of the magnetic anomalies.

1. Conversion of coordinate projection of gridded data [1]

The 1 : 500 000 aeromagnetic map is a Gaussian projection map. When sampling the magnetic data from the map, we had to merge the data from each projection zone to form a unified coordinate system. The Gaussian projection is chatacterized by the equal deformation length of the projected differential line segments on the earth's surface along longitudinal and latitudinal directions.

For the 1 : 4 000 000 equal-area conic projection, the two deformations are the reciprocal of each other. Hence, when the data sampled from the Gaussian projection were to be converted to the equal-area conic projection base map it was required that the grid spacing be elongated in the longitudinal direction and be shortened in the latitudinal direction.

For the scale of 1 : 4 000 000 the grid size of 5km × 5km should be:

$0.125\times(1+0.010965793)=0.126370724$cm in the longitudinal direction, and

$0.125\times(1-0.010803729)=0.123649533$cm in the latitudinal direction when plotted on the map.

Because of the limited minimum unit of the data assignment of the plotter, the actual values used for plotting are 0.126cm in the longitudinal direction, and 0. 124cm in the latitudinal direction.

2. Computation of the IGRF

The IGRF is built up by using the spherical harmonic model. The number of the IGRF 1980. 0 spherical harmonic coefficients totals 120. By using the spherical harmonic expressions [4]

$$V=a\sum_{n=1}^{10}\sum_{m=0}^{n}(a/r)^{n+1}(g_n^m\cos m\lambda+h_n^m\sin m\lambda)P_n^m(\cos\theta)$$

$$X=\frac{1}{r}\frac{\partial v}{\partial\theta}=\sum_{n=1}^{10}\sum_{m=0}^{n}(a/r)^{n+2}(g_n^m\cos m\lambda+h_n^m\sin m\lambda)\frac{dP_n^m(\cos\theta)}{d\theta}$$

…………………………………………………………………… ①

$$Y=\frac{-1}{r\sin\theta}\frac{\partial v}{\partial\lambda}=\sum_{n=1}^{10}\sum_{m=0}^{n}(a/r)^{n+2}\frac{-m}{\sin\theta}(-g_n^m\sin m\lambda+h_n^m\cos m\lambda)P_n^m(\cos\theta)$$

…………………………………………………………………… ②

$$Z=\frac{\partial v}{\partial r}=\sum_{n=1}^{10}\sum_{m=0}^{n}-(n+1)(a/r)^{n+2}(g_n^m\cos m\lambda+h_n^m\sin m\lambda)P_n^m(\cos\theta)$$

…………………………………………………………………… ③

the geomagnetic components under the geocentric coordinate system can be computed, where:

V is the magnetic potential of the Earth;

X, Y, Z are the north, east and vertical components respectively;

$a=6371.2$km (radius of the Earth);

r is the radial distance from the Earth's center to the computed point;

θ is the geocentric colatitude;

λ is the longitude;

g_n^m, h_n^m are the spherical harmonic coefficients;

$P_n^m(\cos\theta)$ is the Schmidt quasi-normalized associated Legendre function, the relation between $P_n^m(\cos\theta)$ and the associated Legendre function $P_{nm}(\cos\theta)$ is:

$$P_n^m(\cos\theta)=\begin{cases}P_{nm}(\cos\theta) & m=0\\ \sqrt{\dfrac{2(n-m)!}{(n+m)!}}\;P_{mn}(\cos\theta) & m\geqslant 1\end{cases}$$

The spherical harmonic analysis is conducted under the geocentric coordinate system. In computing the IGRF value at a given point, it is necessary to convert the geodetic latitude at the point to the corresponding geocentric latitude. Then the geomagnetic value under the geocentric coordinates system is computed. The value is again projected into the geodetic coordinates system to get the final IGRF value under the geodetic coordinate system. In practice, the process is normally accomplished as follows:

Once the reference ellipsoid is specified, the position of any point on the Earth's surface can be expressed by three kinds of coordinates, i. e., rectangular, geodetic, and geocentric coordinates. They satisfy the following relations:

$$X=(N+h)\cos\Phi\cos\lambda=r\cos\varphi\cos\lambda \quad \cdots\cdots \quad ④$$

$$Y=(N+h)\cos\Phi\sin\lambda=r\cos\varphi\sin\lambda \quad \cdots\cdots \quad ⑤$$

$$Z=(\frac{b^2}{a^2}N+h)\sin\Phi=r\sin\varphi \quad \cdots\cdots \quad ⑥$$

where: N is the curvature radius of prime vertical on the reference ellipsoid;

h is the elevation of the computed point;

a, b are the semimajor and semiminor axes of the reference ellipsoid;

Φ is the geodetic latitude;

φ is the geocentric latitude;

λ is the longitude;

r is the radial distance from geocentet to the point:

thus $r=\sqrt{X^2+Y^2+Z^2}$。

The geocentric latitude and r at the computed point thus determined can be substituted into the spherical harmonic series expressions, and then the three components of geomagnetic field at the point under the geocentric coordinate system can be obtained. Hence, according to the equations.

$$X' = X\cos(\Phi-\varphi) + Z\sin(\Phi-\varphi) \quad ⑦$$

$$Y' = Y \quad ⑧$$

$$Z' = Z\cos(\Phi-\varphi) - X\sin(\Phi-\varphi) \quad ⑨$$

the IGRF values X'、Y' and Z' under the geodetic coordinates system can be obtained.

3. The criterion for correcting the main magnetic field (background field) of the aeromagnetic anomaly map and the method of correction for the background field of the 1 : 4 000 000 aeromagnetic anomaly map.

In compiling an aeromagnetic map, the criterion for the magnetic adjustment (with the background field being corrected) is that

$$\sum_{i}^{n}(\pm\triangle Ti)\approx 0$$

The concept comes from the following two aspects:

(1) $$\iint \frac{\partial v}{\partial n}\,ds = \iint (F \cdot ds) = 0$$

This equation implies that the average value of the magnetic intensity on the entire closed surface is equal to zero, that is also to say, the flux of the magnetic vector F through any closed surface with no mass (m) in it is equal to zero [2]. (Note that the F here is the vector perpendicular to the closed surface, i. e. , the Z component as normally designated.

(2) In computing the average value of $\frac{\partial v}{\partial n}$ for the magnetic body close to the Earth's surface, the integrated summed value within a sufficiently large area can be used to substitute for that over the whole Earth's surface. This is because from a locality considerably far away from the projected center of the magnetic body on the Earth's surface, the magnetic field caused by the body is so insignificant as to be practically negligible, i. e.

$$F = K\frac{m}{r^3}\vec{r}; \qquad F \to 0 \quad \text{when} \quad r \to \infty$$

This means when are defining the extent and intensity of anomalies within the study (compilation) area, we do not imply the presence of a background field corresponding to that area. This is to say that the removing of the background field of this order is a proof to show whether the normal field is appropriately chosen. This will consequently lead to the loss of characteristics and shape of the magnetic field of that order during the compilation process.

Before 1980, the three-order Taylor polynomial model was used by AGS for compiling maps of all scales. However, some ineffciencies were observed with this mode when maps of larger areas were compiled. In addition to the inherent inability of the geomagnetic field components to satisfy the mathematic and physical relations, the model also caused changes in the characteristics of the normal field in areas such as the Northeast, Northwest, Southwest China, and offshore areas because of the insufficient amount and uneven distribution of the measured data. Besides, with the very few measured data from foreign stations and satellites, it has been very difficult to make comparison between our magnetic maps and foreign maps. It was decided therefore to use the IGRF spherical harmonic coefficients recommended by IAGA to compute the IGRF within China after 1980.

The 1 : 4 000 000 scale aeromagnetic anomaly map of China has been corrected for the background field by using the IGRF 1980,0 as the main magnetic field. In view of the peculiar conditions in Qinghai-Tibet and Northeast China, it is considered necessary to make further explanations as follows:

(1) The method for correcting the background field in Qinghai-Tibet area

There is a regional background field in the Qinghai-Tibet Plateau, as can be clearly seen on the MAGSAT anomaly map. By using the computed IGRF spherical harmonic coefficients, long-wavelength magnetic anomalies are computed by subtracting the eight-order field from the ten-order field. As showed on Fig 1, there exists a positive background field of 100nT,

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