

Establishment of Gravity Stations around Indian Station in Antarctica by NGRI

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Abstract

Description of eighteen gravity bases established by NGRI during 1990-91 around Indian station in Antarctica together with their observed gravity value, elevation, position location, Bouguer anomaly value and free air anomaly form the subject matter of this work. The procedure followed in establishing these bases and their probable accuracy is also described.

Introduction

As a sequel to the participation of NGRI in the IX Indian Scientific Expedition to Antarctica, it was realized to launch a program to establish gravity stations around 'Maitri' in collaboration with Survey of India. Accordingly NGRI provided gravity values at selected locations while Survey of India provided the positions and elevations using Global Positioning System. NGRI's interest was to establish gravity stations in Schirmacher Oasis and various Nunataks located south of Schirmacher Oasis and in Wohlthat mountains. During the present survey, a permanent station with bench mark was established at Maitri, near the lake.

Reference Station

Gravity readings were recorded at the beginning and at the end of the expedition at the important station situated in the National Institute of Oceanography, Goa. This base station was established by Survey of India. Its absolute value, 976344.71 mgal, was taken for computing the gravity values in Antarctica. All the values of gravity in Antarctica, repeated in this work are thus referable to the base at NIO's main entrance.

Recording of Gravity Values

Depending on the weather conditions and the availability of helicopter transport, the time taken to occupy one station was 1/2 h to 1 h, each. Recording was taken

approximately at 5 mts interval. A minimum of 10 such readings were recorded at each station. During all the observations consistency and repeatability were observed to be satisfactory. Each recording of station was followed by a base station recording immediately. This minimised the effect of instrument drift of readings and diurnal variations. A permanent station opposite Maitri adjacent to Indira Priyadarshini lake, which serves as a base station in and around Maitri, was established by constructing a sound platform.

Instruments Used

For this purpose, Lacoste and Romberg make S.No. 954 Model was used. The instrument was kept at 51°C by the thermostat supplied by the manufacturer for temperature compensation throughout the period of stay in Antarctica. Survey of India provided the position location and elevation required for further computations in gravity values using global positioning system,

Location of Bases

Based on the requirement of NGRI and experience of Survey of India in establishing various survey stations in India, a number of stations were established

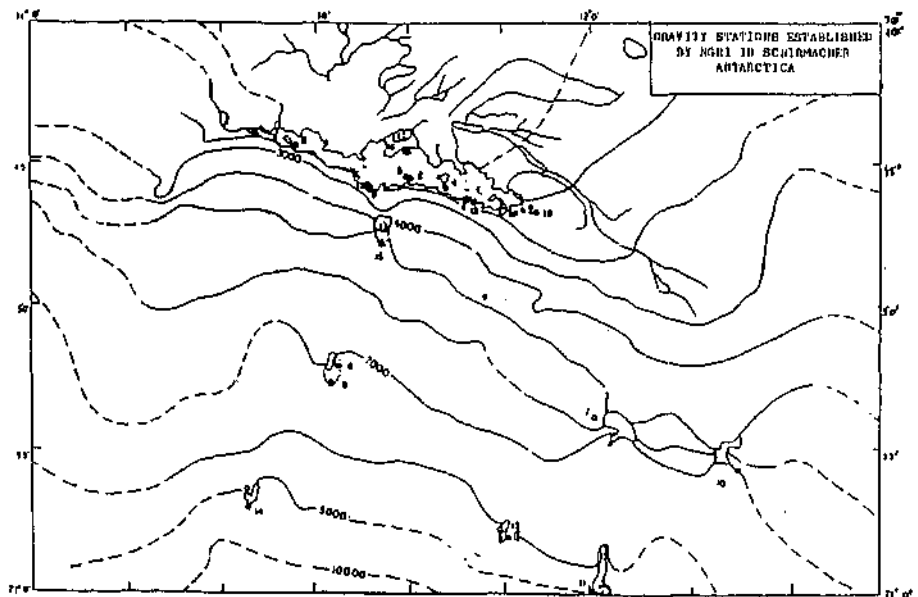


Fig.1. Gravity stations established by NGRI around Schirmacher Oasis, Antarctica.

Table 1: Gravity Values Recorded in Tenth Indian Expedition to Antarctica

S.No	Station	Date	Observed gravity absolute value in mgals.	Free-air anomaly	Bouguer anomaly	Remarks	
1 -	Maitri	25-12-90	982576.55	-40.0	-53.3		
2-	Thrishuie	25-12-90	982552.33	-30.3	-55.9		
3 -	West Lake	26-12-90	982576.20	-44.5	-55.7		
4-	East Hill Top	28-12-90	982569.32	-36.2	-53.7	All the values are computed on the basis of Absolute Value recorded at N.I.O's main entrance by Survey of India	
5-	Point 5	29-12-90	982568.35	-35.7	-53.5		
6-	Nunatak old (9)	31-12-90	982442.63	5.6	-75.6		
-7.	Nunatak(14)	3-1-91	982491.32	-14.0	-70.6		
8.	Nunatak New (9)	4-1-91	982430.56	10.9	-76.9		978344.71 IGSN Base for entire work
9.	Offset (1) from Trishule	5-1-91	982576.02	-30.2	-47.1		
10.	Nunatak (15)	6-1-91	982438.14	5.1	-78.8		
1 1.	Nunatak (13)	7-1-91	982371.55	0.8	-107.5		
1 2.	Offset(2) from Hill Top	8-1-91	982578.17	-40.0	-52.8		
1 3.	Nunatak (12)	10-1-91	982362.55	14.9	-101.1		
14.	Nunatak(10)	10-1-91	982353.27	23.4	-98.7		
15.	Nunatak(8)	19-1-91	982496.71	3.1	-59.8		
16.	Nunatak(2)	20-1-91	982568.16	43.6	-58.1		
17.	Offset for (5)	23-1-91	982573.16	-37.3	-54.0		
18.	Eastern Tip Point 7	9-2-91	982567.73	-43.1	-58.7		

in Schirmacher Oasis and various Nunataks, between Wohlthat mountains and Schirmacher (Fig.1). The details of each station including its position location and elevation are available in Survey of India's paper (this publication).

Accuracy

The accuracy of gravity values for stations established in Antarctica is better than 0.2 mgal. However, since the Gravimeter was not kept at 51°C during the journey from Goa to Antarctica, the accuracy may not be better than 1.0 mgal, although all the values in Antarctica are accurate within 0.2 mgal with respect to Maitri value.

Gravity values are computed for 18 stations in Antarctica and are with respect to the absolute value recorded in Goa (at NIO). Table 1 shows the gravity values for

all the stations established in Antarctica by NGRI during Tenth Scientific Expedition.

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