

Large Scale Mapping by Survey of India In Schirmacher Oasis and Larsemann Hills During the 27th Indian Antarctic Expedition

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ABSTRACT

Survey of India team carried out large scale mapping on 1:10,000 scale in selected parts of Schirmacher Oasis, with contour interval of 10m. In Larsemann Hills area, large scale mapping on 1:1,000 scale was done at the site selected for the new Indian Antarctic Station, Bharati. The contour interval for this mapping was 1m. Also, a seven-day continuous GPS observation campaign was taken up to study the inter-plate movement between India and Antarctica.

Keywords: Antarctica, Large Scale Mapping, Schirmacher Oasis, Larsemann Hills.

1.0 INTRODUCTION AND OBJECTIVES

Survey of India (SOI) had sent a team of 5 Scientists during the 27th expedition to prepare a large scale map of selected parts in Schirmacher Oasis. This team also surveyed the new station site at Bharati Island in Larsemann Hills. The objectives and the field area of the work are listed below:

1. The main objective of SOI team in Schirmacher Oasis was to carry out large scale Survey on 1:10,000 scale, with contour interval of 10 m. The project at Schirmacher Oasis was to Survey the area bounded by Longitude 11°40'30" to 11°43'30" & Latitude 70°45'00" to 70°45'40", Longitude 11°45'30" to 11°47'30" & Latitude 70°46'00" to 70°46'30", Longitude 11°45'30" to 11°48'00" & Latitude 70°45'00" to 70°45'20" on 1:10,000 scale with contour interval 10 m and to prepare a map of the area and the total area covered was 4.38 sq. km.
2. In Larsemann Hills, the objective was to carry out large scale Survey of the proposed new station site in Bharati Island on scale 1:1,000, with contour interval of 1m. Similarly, the project

of Survey of India in Larsemann Hills was to carry out the large scale Survey of the proposed new station site to be called Bhartiya in Larsemann hills region on scale 1:1,000 with contour interval 1 m and to prepare a map of the station site area. The area of work falls in Bhartiya island of Larsemann Hills bounded by Longitude $76^{\circ}11'15''$, Latitude $69^{\circ}24'22''$; Longitude $76^{\circ}11'30''$, Latitude $69^{\circ}24'25''$; Longitude $76^{\circ}11'40''$, Latitude $69^{\circ}24'13''$ and Longitude $76^{\circ}12'00''$, Latitude $69^{\circ}24'17''$.

3. Also, it was proposed to carry out a 7-days continuous GPS observation campaign in Maitri S., Schirmacher Oasis and in Larsemann S. for interplate movement studies between Indian plate and Antarctic plate.

2.0 INSTRUMENTS USED

The main instruments used were:

1. Trimble 5700 GPS Set with Zypher Geodetic Antenna	2 sets
2. Trimble Path finder Receiver (Type II)	2 sets
3. Recon Hand Held Controller with Battery	2 sets
4. Total station 851 Nikon	1 sets
5. Plane Table with stand	2 sets
6. Sight Rule	2 sets
7. Binocular	2 sets
8. Laptop	2 sets
9. Batteries Exide 12 V with chargers	8 sets

3.0 PLAN FOR FIELD WORK

3.1 Mapping on scale 1:1,000 with Contour Interval 1 m:

3.1.1 Larsemann Hills Region:

First of all, 3-4 Control Points were provided in the area, using Trimble 5700 GPS Receiver (dual frequency) with epoch interval 01 sec. Simultaneously details of the region were picked up using Total station

851 Nikon Instrument. Wherever it was necessary, Conventional Method was also used.

Data of Trimble 5700 GPS instrument was transferred in the Laptop simultaneously, with GPS data of Pathfinder, for getting coordinates of details precisely. The coordinates of details obtained from the instruments, were also plotted in the projected drawing paper mounted on PT, simultaneously with contouring in field.

The above task carried out by the team of SOI Scientists; 2 officers were picking up details of the Total Station; while other 3 officers were preparing the PT with the help of data provided by them, and simultaneously they were drawing the contours in field itself.

3.1.2 Schirmacher Oasis Region:

Same method as above was followed in Schirmacher Oasis also. Observation with Trimble 5700 receiver (dual frequency) was also taken on old existing GCPs, but here in place of Total station, Path finder was used for picking up the details.

3.2 GPS Observations

1. A seven-day GPS observation, in campaign mode, was carried out on a new established GCP in Larsemann Hills Region, for determination of plate movements of Antarctic plate with respect to Indian plate.
2. Also A seven-day GPS observation, in campaign mode, was carried out on Maitri S. in Schirmacher Oasis, for determination of plate movement of Antarctic plate with respect to Indian plate.

4.0 DATA PROCESSING

For inter-plate movement studies, three Indian stations are fixed with respect to three IGS Stations and then baselines for MATRI 'S' and LARSEMANN 'S' are processed with three fixed Indian Stations. GPS data for both one week campaigns were downloaded in field and converted into RINEX format and were checked for quality control, using TGO software during halt at respective stations. Post processing software Bernese 4.2 was used for processing the 7-day campaign observation data, from GPS receiver at MAITRI 'S' and LARSEMANN 'S' with respect to IGS Stations. The results of all the base line and RMS of each distance were within the permissible limits.

For preparation of Map of Schirmacher Oasis on scale 1:10,000 and Map of the New Station site at Larsemann Hills on scale 1:1,000—projection, scanning, warping and digitization was done at SOI-HQ, using the Microstation Software package used for map-making. The datum for the map was WGS84. The map of new station site was produced and printed under Special Series Map. The final Map of Schirmacher Oasis is in the compilation stage.

5.0 SUMMARY

The project taken up for mapping of the proposed station site of India at Bharati Island in Larsemann Hills of Antarctica on scale 1:1,000 with contour interval 1m and mapping of Schirmacher Oasis on scale 1:10,000 with contour interval 10m was completed in time. The strength of the SOI team was an added advantage for the field work; as everyday loads of costly instruments were taken to the field and were brought back to the Station for charging. Bad weather days and wind-chill factor were the main constraints for the field work. The results are shown in **Figures 1 to 6**. All kinds of support were provided by the Expedition Leader to the SOI team for their field work.

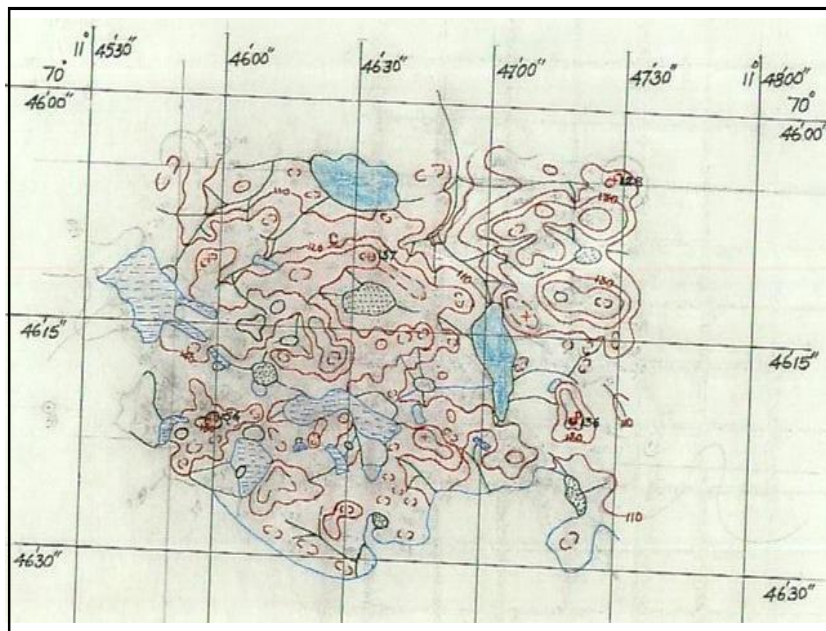


Fig. 1: PT Survey SE of Maitri Station

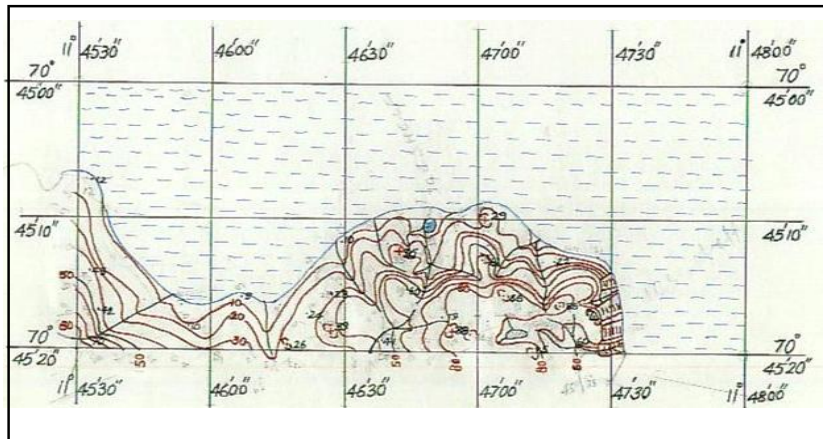


Fig. 2: PT Survey NE of Maitri Station

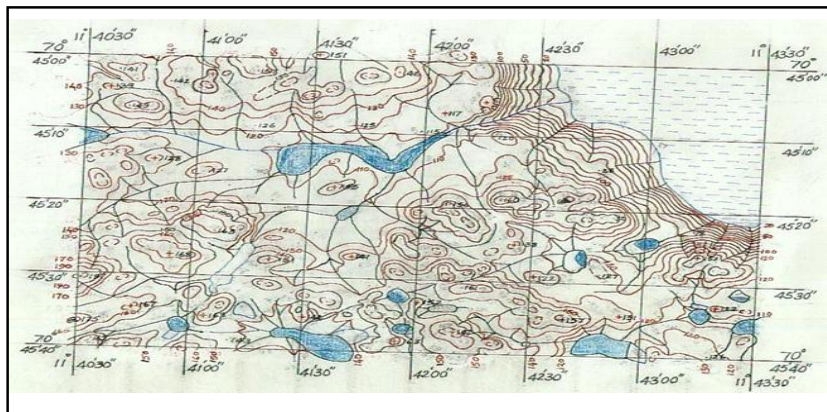


Fig. 3: PT Survey NW of Maitri Station

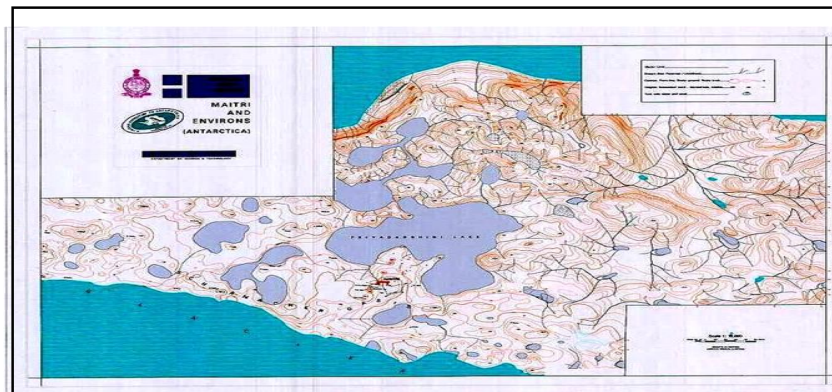


Fig. 4: Mapping Taken Up In Schirmacher Oasis

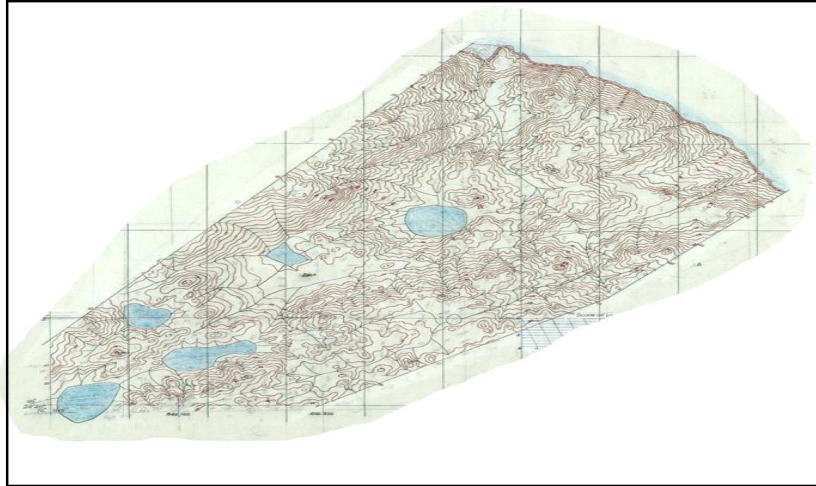


Fig. 5: PT Survey on 1:1,000 Scale at the New Station Site in Bharati Island

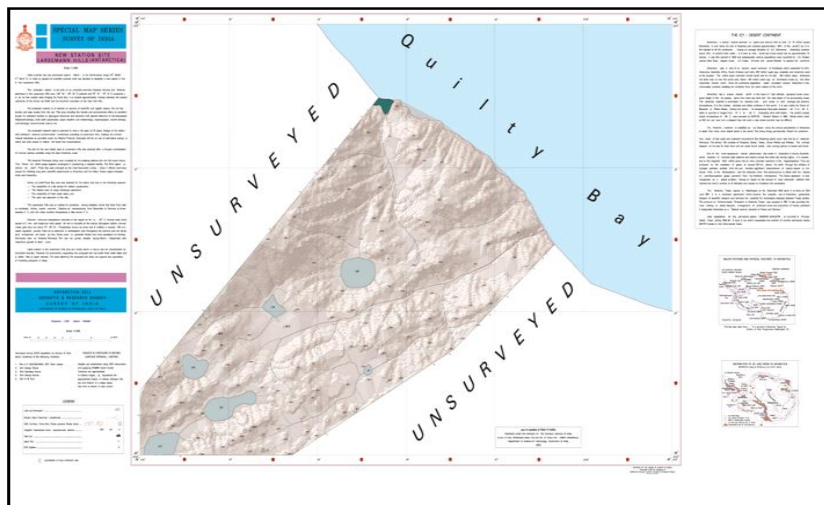


Fig. 6: Final Printed Map of Proposed Station Site at Larsemann Hills Area On Scale 1:1,000 with Contour Interval of 1m