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A report on surveying in Antarctica during 16th Indian scientific expedition to Antarctica

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SURVEY OF INDIA

Introduction

Environmental danger to Priyadarshini lake by the continuous flow of liquid waste materials into it from Indian summer camp necessitates the establishment of an alternative summer camp set-up in a location such that it does not allow flow of seepage into the lake. In addition environmental concerns of DOD and the appreciable development in the scientific activites during earlier Indian Scientific Expeditions to Antarctica necessitated the provision of geodetic and geophysical control points around Indian Station, Maitri.

As a follow up, action a two member Survey Of India team participated in the 16th Indian Scientific Expedition to Antarctica to carry out field survery for preparation of a site plan for new location of the summer camp on 1:1,000 scale with one metre contour interval.

Objectives

The following objectives were identified for Survery of India team during expedition :-

a) Extension of planimetric and height control to the new site for an alternative summer camp set-up in the vicinity of Indian Station, Maitri.

b) Densification of the control at the above mentioned site.

c) Preparation of a detailed contour map of the new site on 1:1,000 scale with one metre contour interval.

Scientific operations

a) Reconnaissance

A thorough reconnaissance was carried out for providing ground control points. All points were unifromly distributed in the area of work such that height of any point could be computed with respect to them. Cairns were erected for correct identification of ground control points. However, traverse staves were used on main traverse stations.

b) EDM Traverse :

A traverse was started from two known points, viz, Maitri 'S' and TS-3 established by SOI during previous expeditions and closed on the same points.

Wild T2 theodolite for anuglar measurement and DI3000S EDM instrument for linear measurements were used.

Thereafter five sub-traverse lines were run to provide a mesh of 61 subsidiary ground control points (Offsets).

Horizonatal angles to main traverse stations were observed on both the faces at two different zeros and vertical angles were observed on both the faces. The agreement in the horizontal angles at two different zeros was kept within 10 seconds. Horizontal angles to subsidiary ground control points (Offsets) were observed on both the faces at one zero and vertical angles to them were observed on both the faces.

For main traverse, five sets of distances were observed between traverse stations and their mean was accepted. For subsidiary control points (Offsets) one set of distances was observed.

c) Computations

Computations of EDM traverse was carried out using standard method of computations with the help of scientific calculator.

d) Detail and Contour Survey :

The plane table section was divided into regular girds and the ground control points were plotted on it.

In all 61 fixings (plane table positions) were made to cover an area of 0.2 Sq km. The heights of the fixings were always obtained form ground control stations and not from other deduced heights to maintain the accuracy of contours.

Assistance to Other Scientific Teams

a) Norwegian Geodetic Team

Survey of India team assisted a Geodetic team of Norway in doing GPS observations at Indian GPS station, Maitri 'S' with Ashtech GPS instrument.

b) Geological Survery of India Team

On the request of the GSI team incharge & leader of 15th IAE-Shri Arun Chaturvedi, 18 ground control points were established to enable GSI scientists to continue their study of D.G. Snout movement which they have been doing for the last 8 to 9 years.

c) Environmental Team

On the request of the Environment officer of 16'" IAE-Shri Rasik Ravindra, Survey of India team provided 37 ground control points around Priyadarshini lake for environmental purposes.

d) Naval Hydrographic Team

NHO scientists were assisted in operation of their survey instrument installed in a container on shelf when they were away in their boat.

Recommendations

Technical

a) At present, only Russian map on scale 1:25,000 of Schirmacher oasis is available and it has its own inherent drawbacks and it is very difficult to decipher on the ground. Therefore, Survey of India map of Antarctica on scale 1:25,000 or larger, as required by the members, should be prepared, for which G.P.S. can be used to provide topographical control.

b) G.P.S. observations in kinematic mo'de may be used to prepare map of the convoy route from berthing place of the ship at shelf to the dozer point at Maitri.

c) Geodynamic study can be carried out in collaboration with some other country of Europe or Africa.

Conclusions

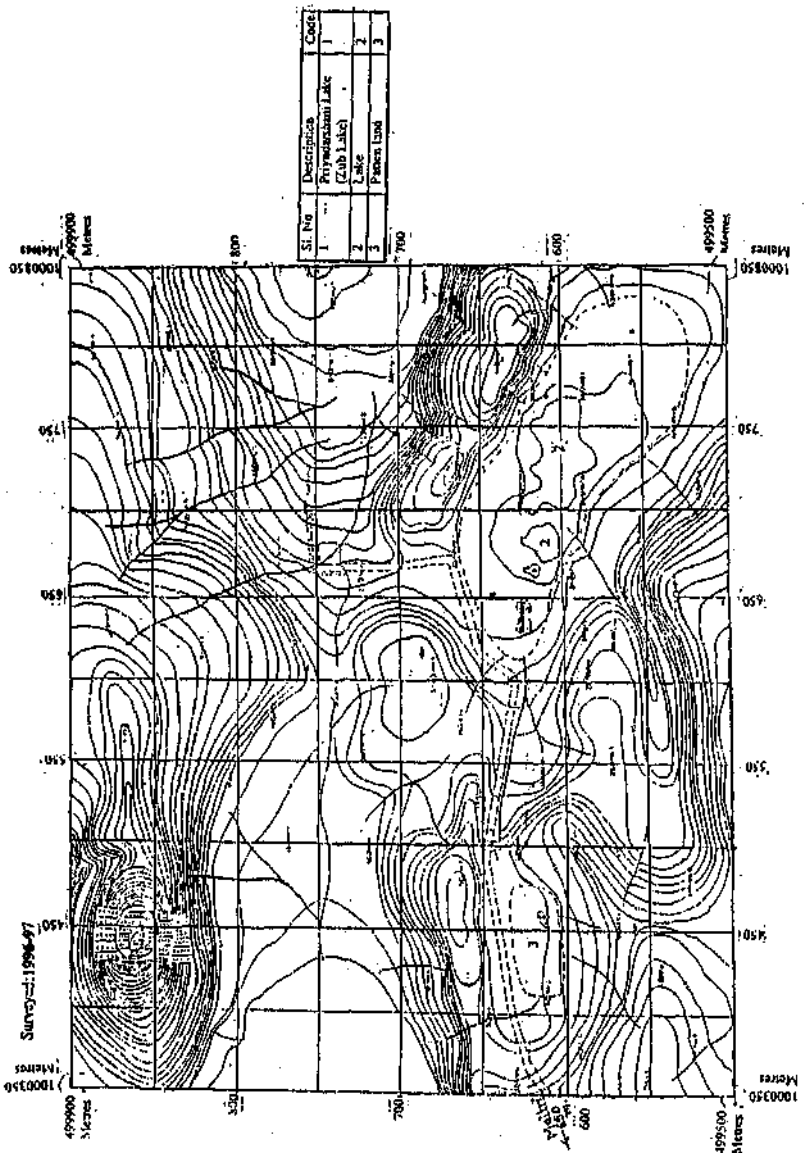
After putting in our best efforts and utilising every bit of available time, undeterred by the hostile weather, we could survey an area of 0.2 Sq km as earmarked by the Environment Officer of 16'" IAE on 1:1,000 scale with one metre contour interval.

The planning of the work for the day was made in advance in order to cover the area with optimum number of fixings and heights.
It will not be out place to mention that ground survey is an out door task which required whole day trodding in difficult terrain of Schirmacher, where the survey and mapping work was clone at sub-zero temperatures without the use of gloves.

Acknowledgements

We are grateful to the Surveyor General of India, and the Director, Geodetic & Research Branch of Survey of India for giving us this unique opportunity to participate in 16'" Indian Scientific Expedition to Antarctica.
Survey of India team is thankful to Dr. A.L. Koppar, leader of 16th IAE for providing logistic support as and when required during field observations in Antarctica.

Thanks are also due to Shri Arun Chaturvedi for arranging combined mess for 15'" IAE and 16th IAE, which made our stay comfortable in Antarctica.
Last but not the least, all the members of 15th & 16th Indian Scientific Expeditions deserve our sincere thanks for making homely environment at Maitri in Antarctica.



SURVEY OF INDIA 16TH INDIAN ANTARCTIC EXPEDITION CONTOURED MAP OF THE NEW SUMMER CAMP SITE
Contour interval 1m
(A reduced photo copy of scale 1:1 000)

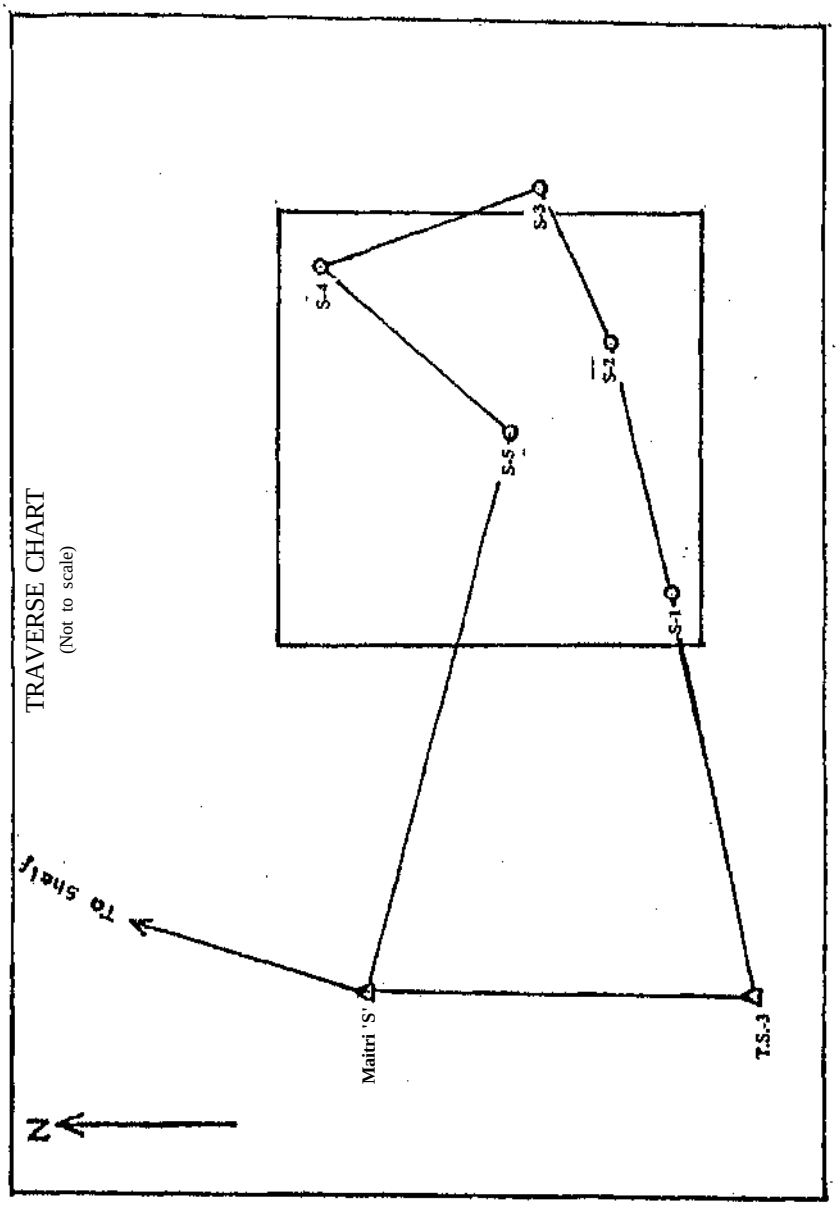

TRAVERSE CHART
(Not to scale)
S-3
S-4
S-2
S-5
S-1
To Shirl
Maitri 'S'
T.S.-3
N

Fig. 1: Surveying in Antarctica with Theodolite and E.D.M. instrument.

Fig. 2: Mapping in Antarctica.