

## **Hydrographic Survey by the NHO Off-Princess Astrid Coast and Larsemann Hills During January-March 2008**

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### **ABSTRACT**

A team from National Hydrographic Office (NHO) carried out hydrographic survey and bathymetric profiling of Antarctic coastal areas near the two offloading and berthing sites of Indian Antarctic Expeditions, i.e. Princess Astrid Coast and Larsemann Hills. The observations have been submitted to the NHO for inclusion in relevant charts.

**Keywords:** Antarctica, Indian Expedition, Berthing Coasts, Hydrographic Survey.

### **1.0 PRINCESS ASTRID COAST**

#### **1.1 Introduction**

A detached survey party, comprising of one officer and one sailor (Lt Cdr YV Ramakrishna and Abhay Barve LSSR I), were deputed to National Centre for Antarctic and Ocean Research (NCAOR), Goa for the 27th Indian Antarctic Expedition. The Hydrographic survey of Princess Astrid Coast, Antarctica was undertaken from 03 Jan to 15 Feb 2008. The ship experienced generally moderate weather (Sea-State 4), through the roaring forties. The first iceberg was sighted at 53° 47.'097 S & 140° 29.'548 E on 30 Dec 2007. On 03 Jan 08, the ship arrived off Princess Astrid Coast, Antarctica and was moored on fast ice at a distance of about 6 nautical miles from ice shelf.

#### **1.2 Geodetic Control**

Horizontal control for the entire survey was established in WGS 84 Datum and plotted on Mercator projection with scale true at 66° S. GPS coordinates obtained from the Trimble RS 4000 were used for bathymetric survey. No control was established for this purpose. The existing station at Maitri was recovered and used for extension of Geodetic Control. The coordinates in WGS 84 Datum are as follows:

Name	Latitude (S)	Longitude (E)	Height (m)	Source
Maitri S	70° 45' 51".730	011° 44' 02".570	117.068	HI/NHO/01/2 005-06

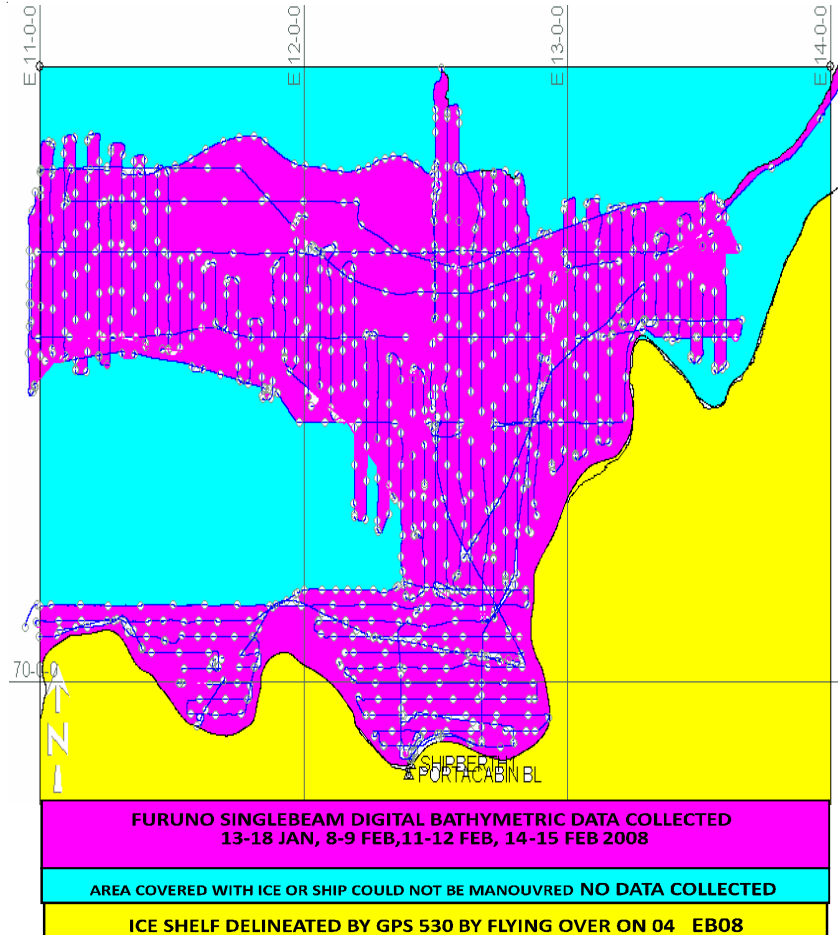
The GPS observations were carried out by deploying GPS530 in static mode from 18:42:45 on 02 Feb to 06:15:15 on 04 Feb 08 for 35 hours. Simultaneous GPS observations were carried out at Portacabin on ice shelf, in the vicinity of ship's berth at India Bay, from 19:49:15 on 02 Feb to 21:03:15 on 03 Feb 2008, for about 25 hours. The temporary station at Portacabin was established for the purpose of extending geodetic control for delineation of ice shelf. The computed coordinates of the temporary station Portacabin using Ski Pro software in baseline method are as follows:

Name	Latitude (S)	Longitude (E)	Height (m)	Source
Portacabin	70° 05' 24".71512	012° 23'50".99933	13.5308	Computed

### 1.3 Bathymetry

Trimble RS4000 and ship-borne Color Video sounder FurunoFCV382 were interfaced with automatic digital data collection software Hypack 6.2. The positioning and navigation inputs provided by Trimble RS4000 and sounding inputs provided by Furuno were logged on Toshiba Laptop computer. Singlebeam bathymetric data was collected along survey lines aligned North-South direction, at an interval of 1 cm on scale 1:200000 ie 2000 m apart in the area. In addition to digital data from Furuno digital echosounder, the bathymetric data was also collected on echogram of the ship-borne analog echosounder, since Furuno digital echo sounder does not have an analog output facility. The soundings were compared with the existing chart and found to be in close agreement. The singlebeam bathymetric data was collected in phases, since the vessel was made available in accordance with overall planning of the expedition tasks and existing weather conditions. The bathymetric data was collected on following days 13-18 Jan, 08-09 Feb, 11-12 Feb and 14-15 Feb 2008. A graphical representation of the bathymetric data collection is placed at Enclosure-1. A total of 1672 Nautical Miles sounding was carried out and the minimum and maximum depths recorded were 54m and 828m, respectively.

**Enclosure-1: Princess Astrid Coast - Antarctica: Hydrographic Survey Carried Out Feb-2008**

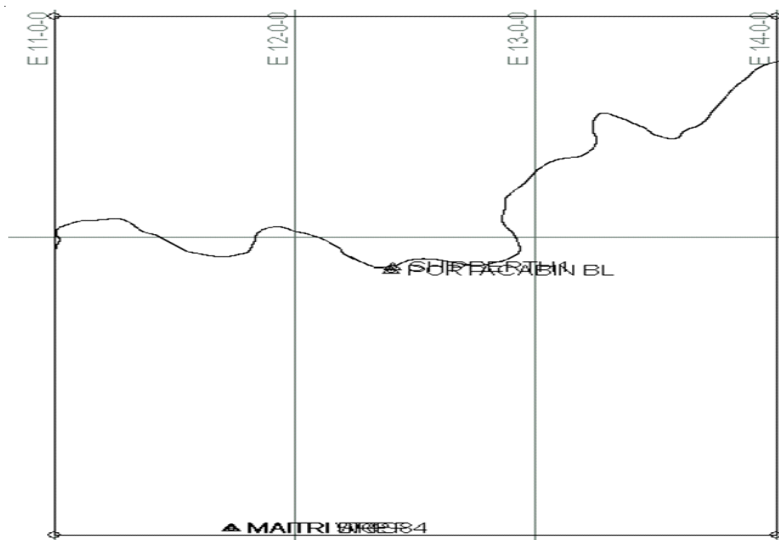


#### 1.4 Coastline

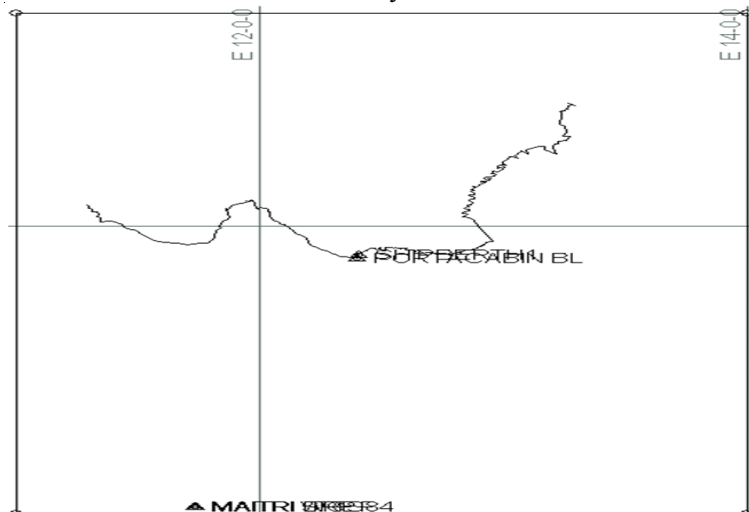
Delineation of ice shelf was carried out from 11°E to 14°E on 04 Feb 2008 with GPS equipment onboard expedition helicopter. Data was logged online, using GPS530 in kinematic mode and the reference was setup at Portacabin. The data was processed using Ski Pro software. A graphical representation of the existing coastline along ice shelf is placed at Enclosure-2. The shelf has numerous indentations and is in a continuous process of change due to calving and accumulation. Additionally, the ice shelf alignment was recorded using the ship-borne radar; the graphical

representation is placed at Enclosure-3. The points collected using radar and GPS530 were compared and found to be in agreement. The reference for coastlining was set up on Portacabin, considering that the movement of ice and subsidence of the Portacabin being negligible for the duration of coastlining. A total of 127 Nautical Miles of coastline data were collected.

**Enclosure-2: Ice Shelf Delineation By GPS530 In Kinematic Mode On 04 Feb 08 by Flying Over**



**Enclosure-3: Ice Shelf Delineation by Radar**



## 2.0 LARSEMANN HILLS

### 2.1 Introduction

On 24<sup>th</sup> Feb 2008, the ship arrived off Larsemann Hills, Antarctica and an inaugural flight was launched for the purpose of reconnaissance of the survey area.

### 2.2 Geodetic Control

Horizontal control for the entire survey was established in WGS 84 Datum. The team prepared station markers onboard. These station markers were embedded on Fisher Island, McLeod Island and an unnamed island between Bread Loaf Island and Solomon Island. The station established by the NHO personnel at Larsemann Hills (LH\_Ref) during the previous expedition (26<sup>th</sup> expedition) was recovered. Static GPS observations were carried out at 6 other positions and were connected to LH\_Ref for establishing geodetic control. The details of the positions are tabulated below:

Stn.Id	Station Name	Latitude (S)	Longitude (E)	Height (m)
A	LH_Ref	69° 24' 18.03413"	076° 11' 21.35121"	61.9966
B	McLeod	69° 22' 25.76129"	076° 08' 19.04391"	43.1071
C	Saderock	69° 22' 52.87326"	076° 07' 07.19879"	85.0621
D	SOI Control	69° 24' 21.24129"	076° 11' 39.95012"	52.9069
E	Island 3	69° 22' 54.59226"	076° 11' 06.96887"	68.1165
F	Fisher Island	69° 23' 35.86174"	076° 13' 47.12123"	96.397
G	Bharati Top	69° 24' 38.46641"	076° 11' 04.48712"	119.552

### 2.3 Bathymetry

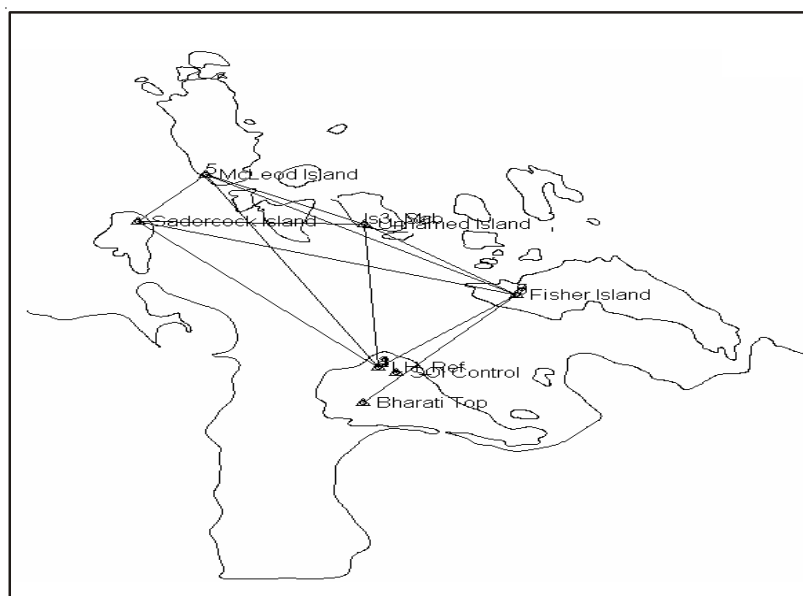
The vessel MV Emerald Sea could be maneuvered; neither in the channel nor in the vicinity of the channel, due to presence of numerous icebergs. The navigational situation was considered to be hazardous for the expedition vessel. Therefore no bathymetric data was collected in this area.

### 2.4 Coastline, Topography, Conspicuous Objects and Marks

The team carried out coastline delineation, using helicopter, along the islands in the vicinity of the designated channel on 07 Mar 2008. Data

was logged online using GPS530 in kinematic mode and the reference was setup at LH\_Ref. The data was processed using Ski Pro software. A graphical representation of the existing coastline is placed at **Enclosure-4**. The helicopter was navigated along the general alignment of the islands and is in close agreement with Australian satellite imagery. The entire coast is rocky, with steep gradients. The coast is barren and devoid of any marks or objects. The Thala Fjord and Quilty Bay have continental ice shelf along the coast. A total of 39 Nautical miles of coastline data were collected.

**Enclosure-4:** Graphical Representation - Coastline Off-Bharati, Larsemann Hills



### 3.0 CONCLUSION

The data collected during the expedition were processed and handed over to the NHO for QA/QC. The data are being incorporated in the relevant charts.

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