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GLACIOLOGICAL STUDIES DURING THE SEVENTEENTH ANTARCTIC EXPEDITION

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Abstract

Geological survey of India is actively pursuing on long term basis glaciological studies like Dakshin Gangotri Snout monitoring, Ice shelf stake network measurement and observation of iceberg distribution in the southern ocean. Dakshin Gangotri Snout monitoring is aimed at determining the seasonal and long term fluctuation and behaviour of polar ice as interpreted through the changes observed in the glacier tongue protruding into the Schirmacher Oasis. The observations made in February 1998 reveals that a retreat is in the glacier. The ice shelf stake network measurement has indicated an average accumulation of 60 cms between February 1997 And February 1998.

I. Monitoring of the Snout of Dakshin Gangotri Glacier

G.S.I. team since 1982-1983 Expedition is physically monitoring the Dakshin Gangotri Glacier snout in Schirmacher Oasis, Central Dronning Maud Land. The data collected has direct relevance in understanding the effects of global change in climate and its impact on Antarctic ice. To determine the change in the snout outline with greater resolution, marking were laid on ground in February 1996 by GSI team define the actual position of glacier at that period of time. With respect to these markings which were 19 in number the outline of glacier snout as it stood in February 1997 and February 1998 was measured.

The graph given (Fig 1) highlights the position of glacier snout with respect to the 19 above mentioned ground points. The point nos. 1 to 9 are the on the eastern side of the snout while the remaining are on the western side. The year 1996 has been taken as the base for each of the 19 points and hence has been shown as zero level. A change towards negative indicates retreat. It is seen that during year 1997, at 1-to1O points there is minimum change in respect to position of 1996. The retreat is however pronounced in part of the western face of snout. During the year 1998 the change towards negative is perceptible at all 19 points while the retreat is very much pronounced on the western side of the snout. The maximum retreat noted is about 3.50 m at point 19. The data collected during the coming few years will indicate if this trend of retreat will continue.

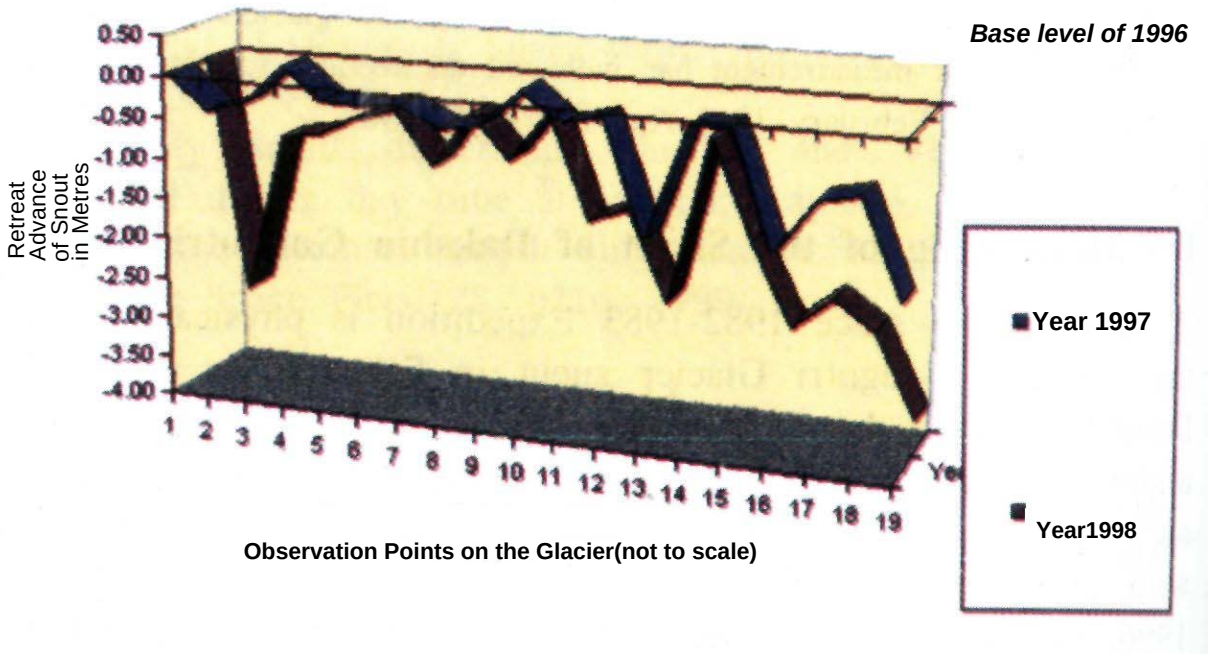

Fig.l
Position of Dakshin Gangotri Glacier in February 1996-97-98

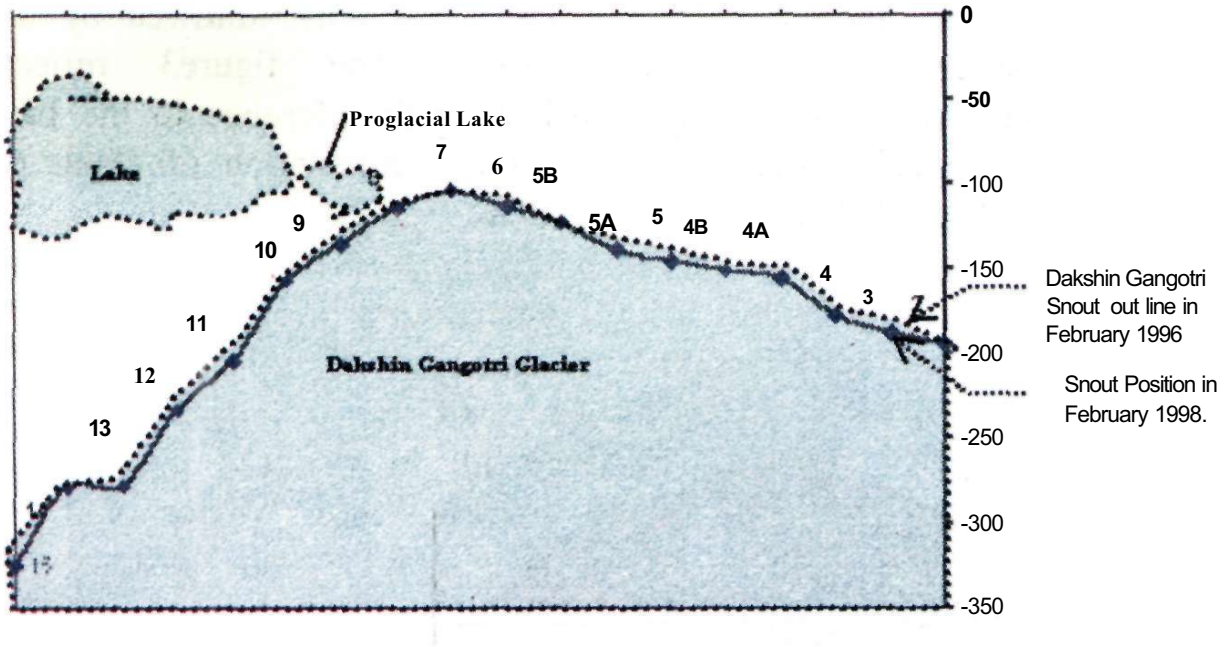

Fig2: Position of glacier snout in February 1998 with reference to the outline in February 1996(Base). Quantitative shift at each point indicated in table below.

Points	1	2	3	4	4a	4b	5	5a	6	7	8	9	10	11	12	13	14	15
Feb-98	2.9	0.9	0.83	0.6	0.45	1.1	0.41	0.95	0.3	1.6	1.4	2.5	0.43	1.66	2.65	2.55	2.6	3.6

Table shows the points as seen in the figure and shift of glacier outline with reference to points in February 1998. The position of points is considered to be 0 in February 1996. The shift is indicated in metres

II. Ice Shelf Monitoring

GSI has been carrying out accumulation and ablation studies on the ice-shelf near Dakshin Gangotri station since the V expedition.

Earlier these observations reflecting accumulation/ablation was being done based on a network of 9 stakes. In March 1996 this network was expanded to 25 stakes representing an area of 200 m x 200m As there was no wintering over team during 1997-98 the measurement taken in February 1997 was only followed by the stake measurement in February 1998. The figure3 reflects accumulation pattern in Feb. 1997 & 1998 with reference to the base level of March 1996. There is an average accumulation of about 60 cm of snow from Feb. 1997 to Feb. 1998.

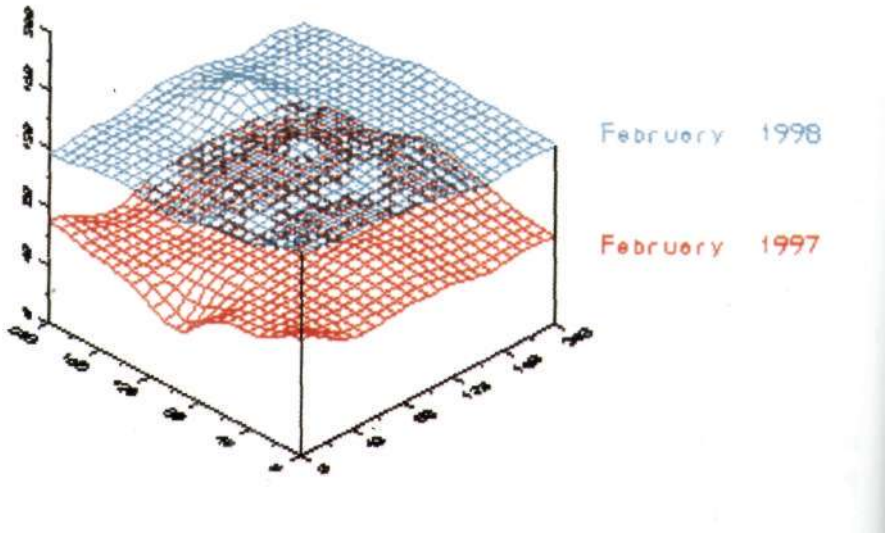

Fig3: Surfer diagram shows projecton from each of the stakes in February 1997 and February 1998. Average accumulation indicated of about 60 cm is indicated.

III. Monitoring of Icebergs in Antarctic Waters During The Seventeenth Expedition

The ocean encircling the Antarctic continent is replete with icebergs. These massive ice floats are formed due to calving of ice blocks from ice shelves or glacier tongues floating into Antarctic waters. The icebergs are carried away from the place of their origin by the prevailing currents. Monitoring of icebergs has been a part of the programme of Geological Survey of India (GSI) in

Antarctica since the Second Indian Expedition. The iceberg monitoring is carried out as per the guidelines of Norsk Polar Institute (Norwegian Polar Research Institute). The study includes recording the location, dimensions and morphological characteristics of the icebergs encountered during the cruise.

During the XVII expedition to Antarctica first iceberg was sighted on 30 December 1997 at south Latitude 57° 39' and east Longitude 26° 18'. During the onward voyage total number of 213 icebergs were sighted. Concentration of icebergs was in two well-defined zones separated by an iceberg free zone. The iceberg free zone located between 62° 30'and ~ 67° South latitude is a characteristic feature observed during most of the earlier Antarctic voyages. Majority of the observed icebergs (82%) are concentrated in a narrow zone between 68° 40" and 69° 48' South latitude encircling the Polynya and nearer to the ice shelf. The icebergs present near the ice shelf are very big in size usually larger than 500mts and reaching upto 2000mts or more. These icebergs nearer to Antarctic continent are less weathered and also younger in age. The icebergs concentrated in first zone i.e.59° and 63° South latitude is marked by more weathered ridged and smaller icebergs (upto 400mts). During the return journey however the concentration of icebergs is seen only nearer to polynya (Fig 4) and rarely beyond it. The last iceberg sighted during the return journey was at south latitude 62° 45' and east longitude 21° 57' on 9 March 1998. The icebergs seen at around 60° South Latitude are absent.

It has been observed that the prevailing oceanic currents define the iceberg concentration. In the high concentration zone nearer to shelf, the Antarctic Coastal Current carry the icebergs in an anticlockwise direction. In the concentration zone of lower latitudes (60° south latitude), the southern ocean current moves the icebergs in a clockwise direction and the icebergs in this zone being older are also more weathered.

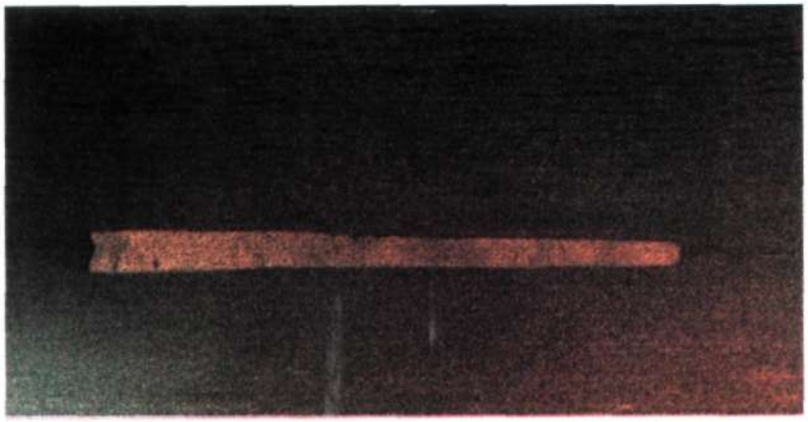

Fig 4 : Tabular iceberg near Polynya

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