

Blizzard Storms: Coastal Regions of Indian Antarctic Station, Dakshin Gangotri (1985-86 Summer)

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Abstract

The Fifth Indian Antarctic Expedition experienced one of the worst summer seasons in Antarctica. Out of a total stay of 69 days on the Continent, on forty-five days either blizzards or strong winds were blowing. Weather forecasts based on the available aids helped to a great extent in accomplishing the various assigned tasks. In this paper, a systematic synoptic study of weather condition, highlighting the blizzard storm situations at Dakshin Gangotri has been presented.

Introduction

Synoptic weather interpretation especially over the coastal regions of Antarctica poses a major challenge to the weather forecastings, because of the following:-

- (a) the unending stream of low pressure areas in the region of semi-polar vortex.
- (b) paucity of weather observing stations and obstruction in the smooth facsimile HF transmission/reception due to severe magnetic storms.
- (c) the local meteorological parameters, especially pressure and temperature, suffer from the inherent flaws of topography and inversion effects, so that change in them do not reflect a true picture for the synoptic interpretation of the systems.
- (d) the consistency in wind direction is a major obstacle. Being of great help in one way for the aviation forecasts, it prohibits a true comprehension of changes that are generally associated with the approach and passage of weather system.

The severity of weather has contrasting feature when compared over the coastal regions and inland. This is well evident especially when observations (during Indian Summer Expedition) are available on board ship, Dakshin Gangotri and Maitree. Weather gets less severe as we proceed from coastal waters to inland. The data used were the synoptic charts received from Pretoria and Molodezhnaya Also local data was collected during the period 24 Dec, 85—03 Mar., 86. Some of the surface analysis charts are reproduced in Fig. 1.

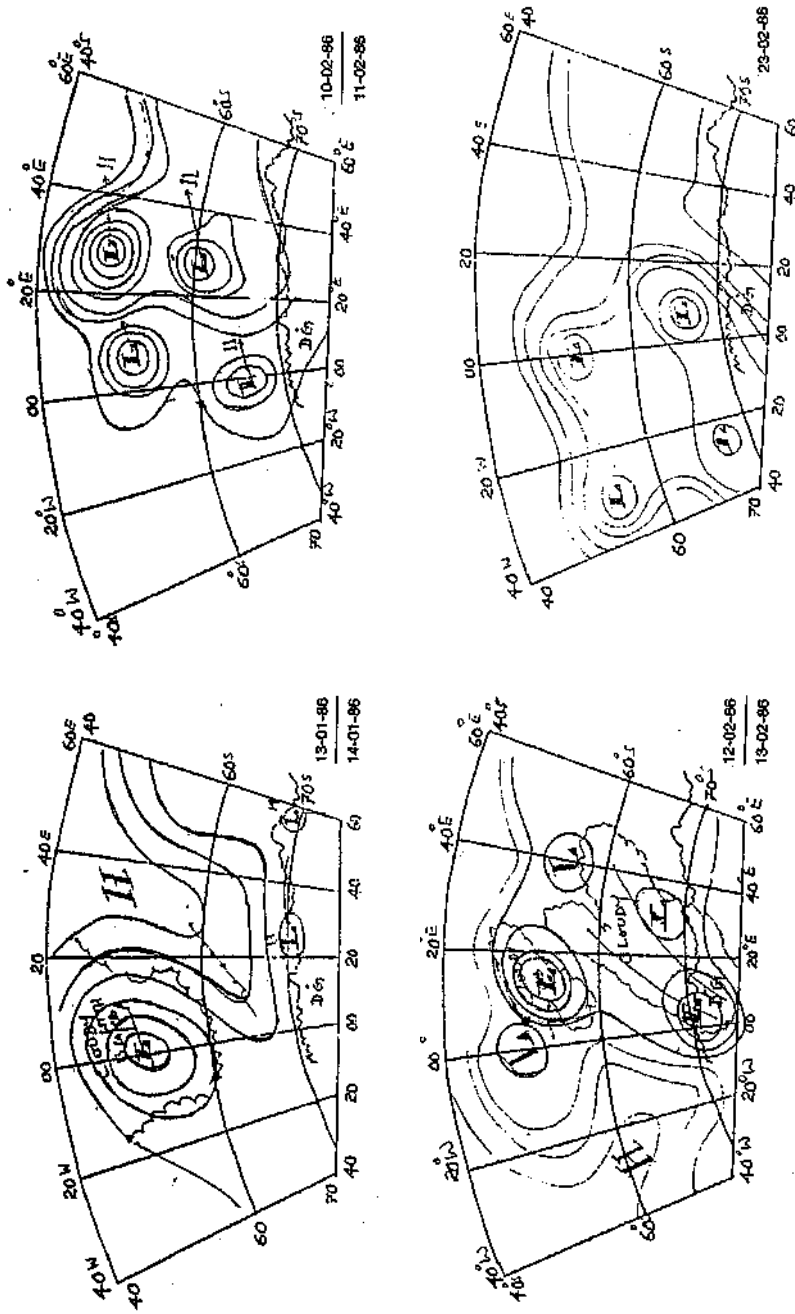


Fig. 1. Some typical surface analysis charts

Description of Blizzard Storms

25 Dec 85—06 Jan 86: Blizzard followed an occurrence of fog/low clouds. Prior to this on 23 Dec 85 and 24 Dec 85, fair weather prevailed. Bad weather approach was signified by a change in the wind direction from consistent northeast to south-south-west and south. A low pressure area was lying with its centre near 65°S Lat. and 10°E Long. It lay at the trailing edge of cold front lying between 60 to 70°S latitude. There was a time gap of approximately six hours between the change in the wind direction and appearance of low clouds. Low near 65°S and 10°E moved southeastwards. The blizzard continued to blow constantly till 30 Dec 85. Wind speed at times reached 60-65 kt, but was constantly blowing between 35-40 kt. On the evening of 30th Dec, clearance occurred in the wake of the passage of this system for a very short duration and weather got clamped by 31st morning and remained bad for next six days upto 06 Jan 86. During this period, it was more of a strong wind and weather was interspread with snow drift. As compared to the weather on board, weather at Maitree was mild and wind speed relatively just 20 kt. But Weather was equally bad over Dakshin Gangotri.

10 Jan 86-20 Jan 86: A deep frontal system was lying near 54°S and 03°E. It moved south-south-eastwards and lay near 60°S and 10°E. In this system also wind direction became persistent from northeast (110°) to south-south-west (200°). With respect to ship position, weather started drifting from south and south-west. Wind reverted back to easterly direction and snowfall ensued. On 14 Jan, this pressure system was lying as an extended system between 65° to 70°S and 0-16°E and it was moving northeastwards. Fog occurred in the wake of the passage of the system. On the 16th, wind direction once again changed to south-south-west (230/10kt) by about 10.00 hours. Weather lifted up for two to three hours but again became bad as another frontal system approached the station. Wind speed remained 30-40 kt with an occasional light to heavy snow showers. Weather lifted up and fog again occurred by midnight.

There was another spell of bad weather following a bright weather period between 20 Jan 86 to 26 Jan 86. On 27 Jan, the upper layer of atmosphere had become turbulent due to the passage of the system to the north. Only its region of maximum wind was affecting the station. It is clear from the satellite picture (Fig. 2) that part of the warm front was only affecting the region of DG and neighbourhood.

10 Feb 86-16 Feb 86: A frontal system was lying with its centre near 68°S and 03°E (extension 05°W-15°E). Variable clouding (Morning Stratus with base 250; Afternoon Stratus, Stratocumulus and Altocumulus) led to the occurrence of this blizzard. By 2100 hrs local time, wind speed reached 45 kt and heavy snowfall occurred. This system resulted in one of the heaviest snowfalls. The system showed signs of fast movement on the 13th Feb. as deep ridge was following in the rear, causing a sort of block for any other system to join it. It resulted in blowing snow. Weather finally got lifted up by 16th morning.

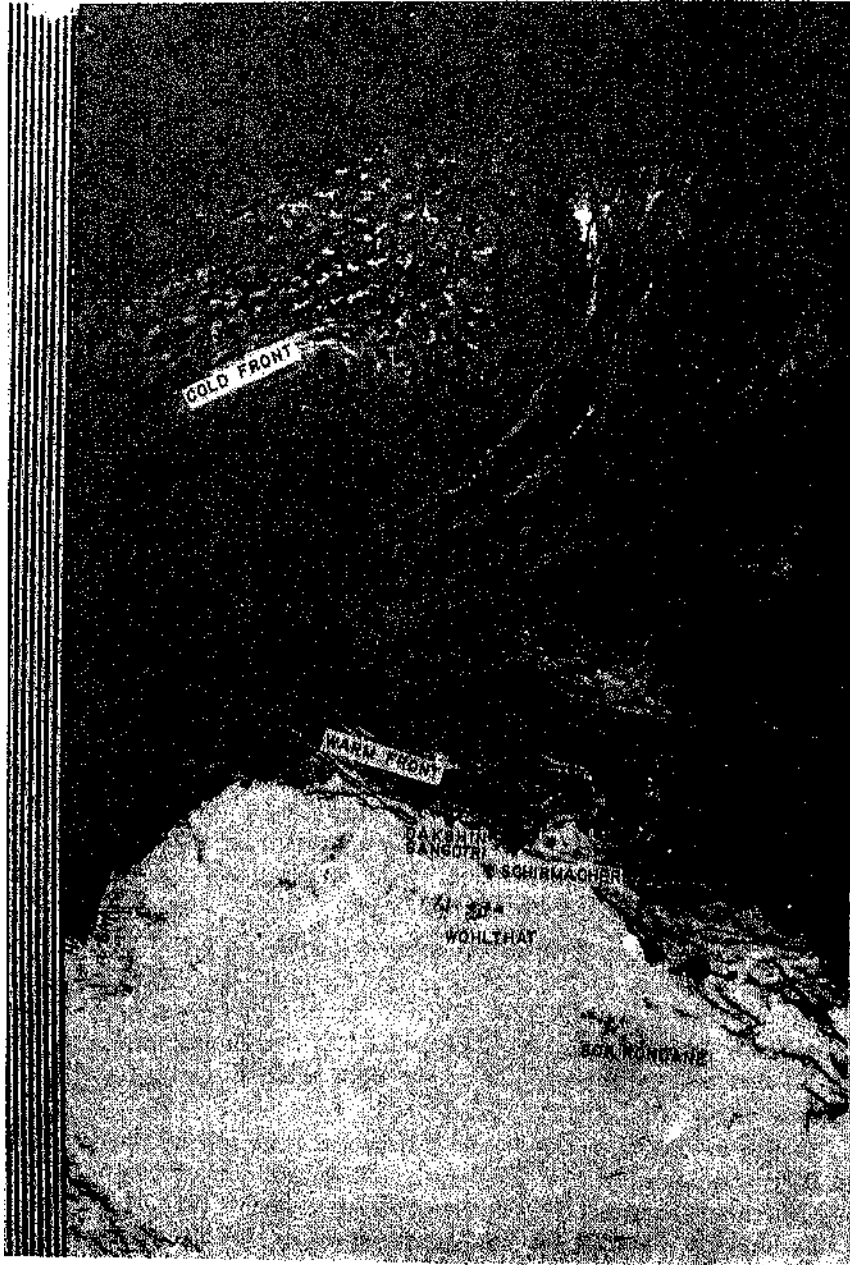


Fig.2. Satellite picture obtained on 28.1.86

20 Feb 86-28 Feb. 86: This was due to one system following another system. Trailing edge of a system was just moving away from the region of Dakshin Gangotri and another system near 60°S and 10°E was following it. By the 23rd Feb, a system with an extension in north was well entrenched over the region, which finally moved away on the 28th Feb. In this system, a contrasting feature was the formation of Cumulus clouds. Again upper atmosphere upto 5000' had become turbulent. Overcast skies with intermittent snow continued to occur. On the 23rd the snowfall ceased. This was a situation in which strong wind persisted (40—45 kt) but with no significant snowfall although at times, there was blowing of snow over the shelf due to strong wind.

Inferences

Though wind direction is very consistent (northeasterly) in Dakshin Gangotri region, change in its direction to south or south-west is a marked indication of impending bad weather. Analysis of the charts need a clear correlation keeping in view the large extension of the frontal systems. Weather starts becoming bad even when the systems are 5° to the west of DG station. Wind over the Station will remain strong in cases where a few isobars run over the Station from a system located in the north around 60°S and 5 to 10°E. The region of 60°S and around is a region of cyclogenesis; lows may be seen waxing and waning as the system moves (in various synoptic charts). This is to be understood clearly. The inference that no low pressure system moves south of DG thus needs confirmation. Systems do approach from south-west of the Station.