

A Note on the Role of Sub-Tropical Anticyclones of Southern Hemisphere on the Severity and Persistence of Weather over Coastal Antarctica

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Abstract

Role of sub-tropical anticyclones on the modification of weather over coastal region of Antarctica is generally underestimated. The aim of this paper is to highlight their role, a viewpoint, which is required to be developed further.

Introduction

A cursory glance on the general circulation (Fig. 1) in the Southern hemisphere brings out the following:-

- a) The sub-tropical anticyclone belt: 30-40°S.
- b) The zone of strong westerlies in temperate latitudes with strongly varying air pressure decreasing poleward in the mean.
- c) The polar zone with asymmetric circumpolar vortex (Sub Polar Low) and Continental High. The asymmetry of the polar vortex is a consequence of the asymmetric topography of Antarctica.
- d) The meridional temperature gradient between the coast of Antarctica and open ocean near the surface is moderate in the summer and large during the rest of the year. The sign of this gradient does not change all through the year.

For variety of reasons, the major attention of the synopticians of weather is on the cyclogenesis of the migratory cyclones moving in the sub-polar region. These cyclonic disturbances form or intensify in a strongly baroclinic field (i.e. a band-like area across which the isobaric temperature gradient in the region is large). These are attributed as the major weather causing systems. Hardly any importance is given to sub-tropical anticyclones, on the southern periphery of which the general cyclogenesis region exists.

Even the existence of permanent anticyclone over the Antarctic continent was disputed as long back as 1926 by Van Everdingen E. (1926, Stationare

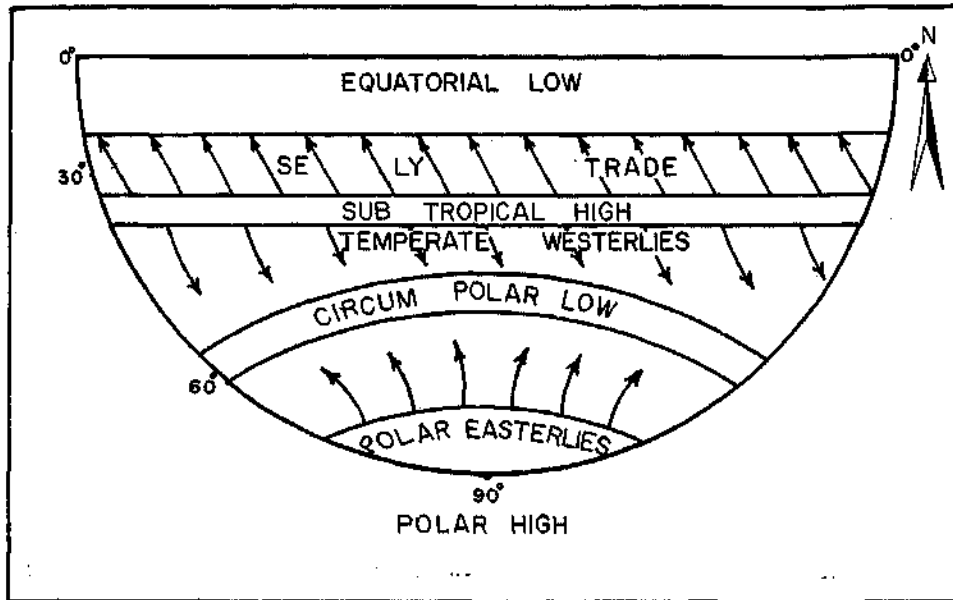


Fig. 1. General circulation in southern hemisphere

Anticyclone Ann. Hydrograph Maritim Meteorol). Moreover, the outward extension of this anticyclone does not have much effect on the occurrence of weather over coastal Antarctica.

Discussion

The synoptic charts received during the Fifth Indian Scientific Expedition to Antarctica are used as the data.

The sub-tropical anticyclones in the Southern Hemisphere have more stable character as compared to Northern Hemisphere. But their meandering at times is more pronounced and these wedge in circum-polar vortex right upto 60-65° South latitude. Also wave-trains of cyclones develop in their vicinity and travel east or east-southeastwards. Such a south-east moving cyclone further strengthens the cyclone moving along the coastal region. Such a strengthening was noticed in Jan-Feb, 1986 when Dakshin Gangotri region suffered long spells of consistent bad weather even when the cyclones were moving away.

In a more typical situation these anticyclonic belts lead to blocking situations thereby impeding the movement of cyclones. So during the process of blocking (which takes 3-5 days), low pressure areas continue to stagnate over the region wherever these are lying. Also east-southeastward moving cyclone result in retrogression of the systems thus prolonging the effects of the system in causing bad weather.

Conclusions

There are lot of red-herrings in the true understanding of the role of sub-tropical anticyclones on the circumpolar vortex and vice-versa. Also the problem of forecasting the weather over coastal regions of Antarctica can be solved if the models can be evolved about various ways these anticyclones pulsate.