

## JOINT COLLOQUIA

26 October 1967

## ANALYSIS OF ZONAL INDEX IN WINTER

By J. C. Langford

Mr. Langford of the Bureau of Meteorology drew attention to the fact that analysis for the Southern Hemisphere involved a considerable amount of prediction because of the large areas without observations. It was therefore desirable to relate the analysis of synoptic scale systems to the large scale or macro-scale flow. One way of describing a macro-scale flow is by use of a zonal index.

Such a description should enable one to use and develop models of the synoptic scale perturbations. For instance, when the index is decreasing, momentum transfer considerations indicate that troughs should be tilted from northeast to southwest.

Mr. Langford suggested a model of zonal index and its changes in the Australian region. This would be a large-amplitude three-wave flow around the hemisphere. The waves would retrogress, with a period of about six weeks - this period was indicated by the frequency of blocking in the New Zealand region. Such a model helped to explain the variations of zonal wind profiles against latitude at the 500 mb level; sequences of such profiles were presented. An attempt had been made to relate the changes in index to the poleward flux of westerly momentum at 300 mb but so far the results had not been very definite. In relating such a model to synoptic perturbations it was found that the behaviour of these differed in different regions. Thus blocking occurred in the New Zealand region in conjunction with a long-wave ridge, but was not observed when such a ridge lay over the Indian Ocean.

In the subsequent discussion it was suggested that the absence of blocking over the Indian Ocean might be related to the presence of East Antarctica to the south, which tended to produce a cold trough to its north. In answer to a query on the evidence for retrogression, Mr. Langford indicated that the sequence of zonal wind profiles and index variations did not seem to be explicable in any other way.

A. J. T.

7 December 1967

## EXTENDED EXPERIMENTAL PREDICTION WITH A NINE-LEVEL HEMISPHERIC MODEL

By J. Smagorinsky

Dr. Smagorinsky, Director of the Geophysical Fluid Dynamics Laboratory, E.S.S.A., Washington D.C., described a series of computational experiments using real data as initial conditions.

The models used were essentially those described in some detail by Smagorinsky et al. (Monthly Weather Review, 1965) and used for general circulation experiments. They have nine levels and a horizontal grid such that 40 intervals span the distance from equator to pole (approximately 270 km in middle latitudes). The resolution is sufficient to describe in some detail the stratosphere, tropopause, boundary layer and frontal zones, and is just sufficient to describe the effects of moist convection. Mountains on the scale of the grid are treated. Radiation, depending on observed distributions of radiating gases and clouds and computed temperatures, is included, together with latent heat release and surface fluxes of heat, water