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## JET STREAMS AS OBSERVED BY INFRA-RED SATELLITES

By D.W. Beran

Mr. Beran, who is at present Senior Research Fellow for Aeronautical Turbulence Studies at Melbourne University, commenced his lecture with a criticism of the reluctance of early research workers to continue investigations beyond examination of the easily recognised features of the TIROS cloud photographs. His research was aimed at fully utilizing the available infra-red information in conjunction with the visible channel, using in particular the MRIR radiation data obtained from NIMBUS probes.

The specific problem discussed was: could Channel 1 (6.4 to 6.9μ) data be used to study the jet stream and motion near the jet? The height of the layer contributing the maximum radiance to the satellite was found to be related to the atmospheric moisture content - the drier the atmosphere the greater the "penetration". Vorticity advection and divergence theories were applied to the special case of wind maxima at areas of maximum cyclonic curvature and the classical distribution of vertical motion (subsidence mainly considered) obtained. Finally, the Reed and Danielson stratospheric tapping theory - introduction of dry air into the troposphere through the baroclinic zone underlying the jet stream - was incorporated into the general hypothesis, "Dry air near the jet should give anomalous warm bands parallel to jet streams".

Vertical temperature, moisture and wind cross-sections were constructed and checked using all available data sources, emphasis being placed on the great difficulty in obtaining radiosonde moisture data above 400 mb. Positive recognition of warm areas associated only with jet streams then depended upon their characteristic elongated shape, the shadow structure obvious from infra-red photographs when cirrus bands overlap, and also the 15μ carbon dioxide band radiation measurements which appear to show tropopause breaks.

The research outlined culminated in a model showing jet maxima associated with two warm subsidence areas and a cold region polewards of the exit.

In reply to several questioners, Mr. Beran stressed the inability of Channel 1 to differentiate between ocean and land surfaces and surface humidity distributions.

The model was considered to apply reasonably well in most cases studied, whilst the actual configuration was not thought to severely limit its application as suggested by Mr. Zillman, since the maximum wind was more important than the cyclonic curvature.

Mr. Beran agreed with Mr. Phillpot that improved knowledge of the exact height to which the 15 μ radiation temperatures apply, is necessary.

Southern Hemisphere analogs to this work remain very difficult as there is virtually no supporting conventional data.

B.F.D.