

ROYAL METEOROLOGICAL SOCIETY: AUSTRALIAN BRANCH MEETING

14 June 1979

The Winter Monsoon: the Phenomenon and the Experiment

P. J. Webster

The Winter Monsoon Experiment (WMONEX) is the latest of a number of data gathering and intensive observation experiments that have been conducted in tropical regions during the past few years. These have arisen from the Global Atmospheric Research Programme (GARP) and are aimed at investigating specific components of the tropical atmosphere and ocean. They include GATE (the GARP Atlantic Tropical Experiment), MONEX (the Monsoon Experiment), WAMEX (the West African Monsoon Experiment) and of course the omnifarious FGGE (First GARP Global Experiment). But of all the regional experiments, WMONEX alone was aimed at investigating a phenomenon that directly affects the weather over northern Australia.

Dr Webster is well qualified to talk on WMONEX. He has been involved in its conception and planning and participated in the field phase. He began his talk by describing the monsoonal circulation over eastern Asia, its climatology and economic effect. He then related the early history of the experiment and described the objectives, observing platforms and organisation. This was followed by a description of the field program, then some science and early results. Finally Dr Webster provided a nice diversion.

The winter monsoon is a temporal component of the East Asian/Australian monsoonal circulation with its characteristic reversal of low level winds between the two seasons. Dr Webster described the general features of this circulation. He also emphasised the importance of the Siberian region, the Indonesian 'maritime continent' and the Australian continent.

WMONEX developed as a distinct part of the MONEX program at the initiative of Professors Ramage and Murakarni, of the University of Hawaii, Mr Ho, Director of the Malaysian Meteorological Service, and Dr Webster. They showed that the winter monsoon was at least as interesting and important as the summer monsoon and merited a full investigation. The experiment was held during December 1978 and January/February 1979. December was the most intensive observing period. It was centred on the South China Sea, Malaysian, Indonesian region but covered an area from Australia to Siberia. The main contributors were Russia, USA, India and Malaysia. Meteorologists from Australia, Indonesia, the Philippines, Thailand, China and Hong Kong also took part in the field phase.

The scientific objectives of the experiment were to collect and analyse as much data as possible on the winter monsoon and also to do detailed case studies of a number of integral phenomena. These are shown schematically in Fig. 1. Dr Webster emphasised that the detail obtained on each phenomenon was dependent on its scale, occurrence and the available observing networks. He described their impressive 'shopping list': special rawinsonde and radar

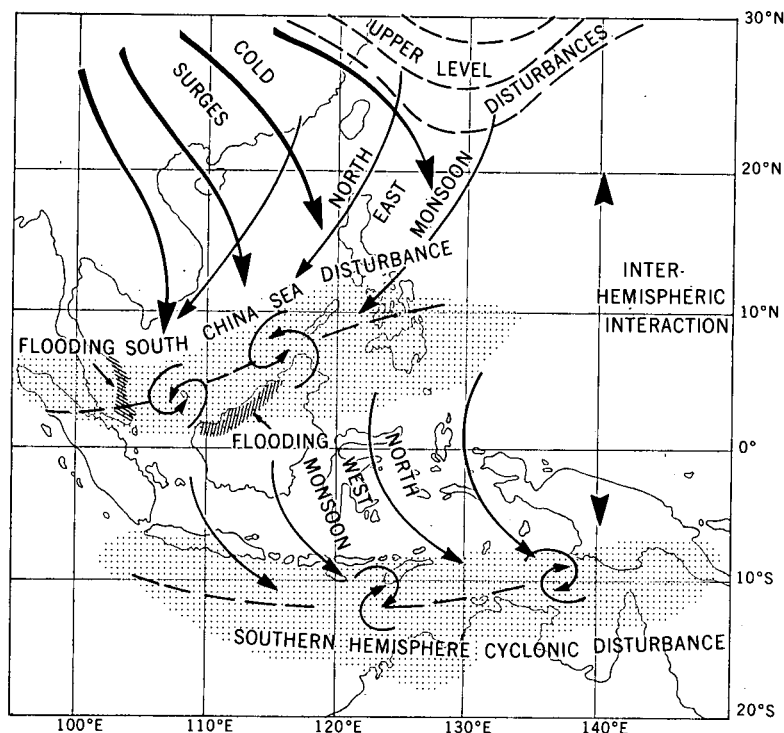


Fig. 1 Schematic description of winter monsoon phenomena.

stations were set up, surface recorders were placed through the South China and Java Seas by the University of Hawaii, three Russian ships and two US research aircraft were provided, and the Japanese Geostationary Meteorological Satellite kept a watchful eye.

Dr Webster also recounted some of the mishaps that seem to be an inevitable consequence of complex experiments such as WMONEX. There was a delightful (although distressing) account of the Kalimantan contractor who built an 8 m high concrete radar platform, but who did not have a crane capable of lifting the radar onto it. More serious was the lightning strike that left the Electra research aircraft without any instrumentation and with a few holes in the gust probe. Happily, it caused no more than an aborted mission.

Rather than generalise on the entire field phase, Dr Webster sensibly elected to describe in detail two aircraft missions as examples of the observational and scientific benefits to be derived from WMONEX. The first mission was through a large disturbed region in the Java Sea on 6 December. This was a fascinating account, well illustrated with slides. We were shown the effective suppression of cumulonimbus activity by the synoptic scale flow, the remarkably large areas of precipitating stratus that can be found in disturbed areas in the tropics, squall lines, and even a waterspout. Dr Webster also emphasised the dominating effect of the Indonesian islands, which make up a very effective maritime continent. Their contribution is particularly evident in the large diurnal variation of systems in this area.

The second mission was through and around a disturbance in the South China Sea. Dr Webster presented some preliminary analyses of the data from

this mission. He again emphasised the extensive stratus decks with precipitation areas. He postulated that radiational differences between the top and bottom of the stratus deck were very important in maintaining these and stressed the importance of the WMONEX data in providing substantiating information for this and other ideas.

In summary, Dr Webster commented on the increasing need for team science in organising expensive exercises such as WMONEX. He considered that many benefits could be obtained from this type of interaction. He also noted the problems that can arise with 'piggy back' experiments and stressed the need for careful planning of the overall experiment in order to accommodate the non-central science and still achieve the principal scientific objectives.

A diversion, in the form of an animated film of a simple monsoon experiment, completed his talk.

Questions from the audience concentrated on the cold surge and the availability of data from the experiment. Dr Webster described many of the synoptic features of the cold surge as it moved off the Asian mainland, became rapidly modified and moved down through the South China Sea. He noted that it was not necessarily in the form of a front between cold and warm air masses. Rather, winds often strengthened well ahead of the original surge. The full mechanisms for this are yet unexplained but it does highlight the large scale nature of the surge. On the availability of data, Dr Webster indicated that the 'first look' data were already available in chart form and would soon become available in tabulated form. It would be some time before the final data sets would be available.

The field phase of WMONEX appears to have been very successful. A large number of data has been collected over the region generally and within a number of systems in the region. Undoubtedly those who took part in the field work have benefitted greatly from the experience. However, the next phase, that of research and investigation, is also very important. An understanding of the Asian winter monsoon is vital to forecasting over the Australian tropics in the wet season. It can only be hoped that we will accept the challenge and devote time and resources to this.

G.J.H.

