

ROYAL METEOROLOGICAL SOCIETY: AUSTRALIAN BRANCH MEETING

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The Cold Fronts Research Program

B.F. Ryan

In introducing Dr Ryan, the Society Vice-Chairman designate, Professor W.F. Budd, noted that the Cold Fronts Research Program had achieved unprecedented cooperative support from local meteorological centres and this theme of cooperation was maintained throughout the speaker's informative presentation.

The Cold Fronts Research Program is a collaborative effort involving the Bureau of Meteorology and the CSIRO Divisions of Atmospheric Physics and Cloud Physics supported by the ANMRC and Melbourne, Monash and more recently Flinders universities. Dr Ryan gave the overall objectives of the program as being threefold: (i) to determine the three-dimensional structure, time evolution, dynamics and thermodynamics of southeastern Australian summer cold fronts including surface effects, but excluding topography; (ii) to clarify the relationship and interactions between the front and the upper trough; (iii) to provide a data base for the initialisation and verification of fine grid numerical models. The speaker explained that frontal weather represented the net result of several different interacting scales of motion but said that the observational program would concentrate on the two primary scales, those of the upper trough (100-1000 km) and the front itself, as measured normal to its lateral axis (10-100 km).

The program is planned over three phases, each associated with an approximate one month observation period. Phase 1 is scheduled for November/December 1980 at Mount Gambier with Phases 2 and 3 planned for late 1981 and 1983 respectively. Attention will be focused on the mesoscale during the first two phases with the broadscale questions to be addressed during Phase 3. Dr Ryan pointed out that a program of this size requires extensive planning, in this case supervised by a Joint Planning Committee having the primary function of coordinating the efforts of three working groups, the Synoptic, Theoretical and Field Studies groups, the latter having the primary responsibility for the organisation of the field phases.

The talk then concentrated on the rationale for, and the details of, the Phase 1 field program. Dr Ryan described the four objectives of Phase 1 as: (i) the study of the dynamic and thermodynamic structure of frontal systems in the lower troposphere normal to their lateral axis; (ii) the study of the compatibility of aircraft, satellite and rawinsonde soundings - important if data from these platforms are to be successfully composited; (iii) the optimisation of logistical procedures for the aircraft - an area of limited local experience; (iv) an assessment of the value of the additional real time field observations to forecasters in southern Australian Regional Forecasting Centres (RFCs). In order to meet these objectives a

variety of additional observations are planned, requiring up to 30 people on site for the 26 days of the Phase 1 field program.

A miniature RFC is being established at the Mt Gambier Meteorological Office and the forecasting group will be responsible for monitoring the weather and issuing an initial warning of a likely frontal passage. From this point a detailed three stage alert has been designed to bring the overall observing system to a state of readiness. Additional staff will be located at the Mt Gambier station to monitor the weather radar and to conduct a program of two-hourly rawinsonde ascents for the 18 to 24 hours over which an observing period is expected to last. An extra station will be established on the coast at Pelican Point some 35 km southwest of Mt Gambier to provide detailed surface observations and conduct hourly double theodolite pilot balloon ascents. When no fronts are in the vicinity the pilot balloon observations will continue as part of a subsidiary sea breeze project. A further group will be located at a nearby CSIRO facility and will use the material provided by the forecasting and other groups to perform post analyses as well as any supplementary analyses. They will also support the forecasting group, provide consultative advice to the research flight staff and arrange discussions of preliminary findings. An instrumented aircraft will provide wind, temperature and moisture data along both horizontal traverses near the front and vertical profiles, extending from the sub-cloud layer up to 5 km, both ahead of and behind the front before landfall. Surface wind and pressure observations will be available from an enhanced mesonetwork and frontal positions will be notified by volunteer observers of the Country Fire Authorities, local fishing fleets and general coastal shipping. In addition the Japanese Meteorological Agency has agreed to provide hourly GMS pictures for selected 24-hour periods, and analyses based on the VTPR data from the TIROS-N satellite will be provided by ANMRC.

The speaker pointed out that as the detailed design of Phase 2 would be strongly dependent on the experience of Phase 1 it was important that as much analysis as possible be performed on site with a view to presenting preliminary results in May 1981. It was planned to subsequently prepare detailed case study data sets for the use of interested research groups. In concluding, Dr Ryan expressed the hope that this study would confirm the reputation of Australian scientists for conducting observational programs of a high standard, and he thanked the representatives of the local meteorological community whose cooperation has allowed the project to proceed.

Questions centred mainly on the parameters to be measured and the observation strategies. The speaker indicated that the aircraft would not be taking microphysical observations during Phase 1 but would be concentrating on broad dynamic and thermodynamic parameters, including sea surface temperature, which will assist in calibrating the VTPR soundings from TIROS-N. Rawinsonde data will be gathered up to the tropopause but all special wind and thermodynamic measurements will be confined to a plane normal to the lateral axis of the front during Phases 1 and 2.

K.W.