In discussing the effect of weather on fuel state, Mr. Wilson stated that the moisture content of fine fuels (twigs, leaves, grass etc.) was determined primarily by air temperature and relative humidity, wind speed also being important while the fuels were wet. The effect of rainfall was soon dissipated. Whittingham found with heavy fuels (logs, heavy branches, etc.), that the preceding rainfall and evaporation were the critical factors: fluctuations in temperature, humidity and wind speed had little effect on the inflammability of such fuels.

Many of the factors influencing fire behaviour were non-meteorological in character, but fuel temperature, fuel moisture content, wind speed and atmospheric stability were the principal factors directly or indirectly attributable to weather conditions. Field experiments of the Forestry and Timber Bureau had shown that fires tended to burn slowly and steadily during the "initial establishment period", after which their rate of spread and intensity increased rapidly. The period depended on the type and moisture content of the fuel, and the rate of spread in the early stages of the fire was dependent on these factors. After the initial establishment period, wind speed became the controlling factor and fuel moisture content was less important in determining the rate of spread.

Mr. Wilson concluded by referring briefly to fire storms and crown fires. Fire storms were considered to be attributable to heavy accumulations of fuel and orographic effects. Crown fires in Australia were generally associated with extremely strong gradient winds. It was planned to test the hypothesis of Byram (U.S.A.) that the upper wind structure could account for otherwise unexplained behaviour of such fires.

The effect of convection columns over a fire in producing local areas of low pressure and the part played by atmospheric stability and a negative wind shear in establishing these convection columns were treated at some length in the subsequent discussions.

30 October 1958

Numerical Forecasting with the Barotropic Model

by Dr. U.Radok

This colloquium was held in the School of Physics, University of Melbourne. Dr. U.Radok of the University Meteorology Department described the method by which the University's CSIRAC digital computer integrates the vorticity equation for horizontal non-divergent flow. The absolute vorticity field is computed for the initial 500 mb chart and advected with the geostrophic wind for 1½ hours. The resulting new vorticity pattern is then matched with a new wind field (by "relaxation", essentially a systematic trial and error procedure) which is used for the advection during the next time step. Sixteen such time steps produce a 24 hour forecast of the 500 mb chart.

The limited capacity of the CSIRAC computer made it necessary to break down the procedure into half a dozen separate steps each of which has to be explained to the machine anew for every time step by a series of commands, a "program". These programs were designed by Mr. D. Jenssen, a research assistant in the University Meteorology Department, who demonstrated their execution by the machine during the colloquium. Mr. Jenssen also showed how the machine can be made to print directly the approximate contour lines of the forecast chart at the end of the calculation.

In conclusion Dr. Radok dealt with the results obtained to date. Progress has been slow owing to operating difficulties with the computer on calculations of such length. A first 24 hour calculation for a situation showing a large high over Eastern Australia showed evidence of spurious anticyclogenesis which has been found in Sweden and the U.S.A. to arise from the use of the geostrophic assumption. Other calculations for the same weather situation were outlined which indicated the extent to which various terms and approximations contribute to the spurious tendency. In this way major defects of the mathematical model of the atmosphere can be remedied prior to the large series of forecast calculations which will ultimately be needed to test numerical forecasting under Australian conditions.