FORECASTING OF FRONTS 1

(W. Hand)

The movement and development of an active frontal system that crossed the British Isles during 15th October 1983 is studied using the operational fine mesh model.

The forecasting problems of frontal timing, intensity of precipitation and possible wave development are addressed.

The charts displayed during this lecture and lecture 2 will show how a front can be represented in a numerical model by:

1) Troughing in isobars
2) Temperature contrasts
3) Organised cloud
   (Areas of high relative humidity)
4) Sudden change of wind direction
5) Organised rain bands
6) Regions of large scale vertical motion
7) Areas of positive vorticity.

These representations can be related to each other eg. 6) with 7), examples of these relationships will be given during the lectures.

The fine mesh forecast is verified every 6 hours from T + 0 to T + 18 and a comparison is made with a forecast using empirical methods.

The fine mesh operational model is defined by lines of latitude and longitude and has a grid-length of 0.9375^{o} in the east-west direction and 0.75^{o} degrees in the north-south direction. The geographical area covered by the grid extends from $79^{1}/_{2}{}^{o}$N to 30^{o}N and from, approximately 80^{o}W to 39^{o}E. In the vertical, the sigma coordinate is used which is defined as p/p^{*} where p = pressure and p^{*} = pressure at the earth's surface. The model has 15 levels in the vertical with greater concentrations in the boundary layer and near the usual jet-stream levels.

FORECASTING OF FRONTS 2

(W. Hand)

This lecture follows on from lecture 1. In this lecture the movement and development of a slow moving occlusion, that gave some snow over England and Wales on 12/12/83, is looked at using output from the operational fine mesh model and the mesoscale model (currently being developed in Met O 11).

The mesoscale forecast starts at 0600 GMT on 12.12.83 and uses as its initial field a T + 6 fine mesh forecast field run from 0000 GMT on 12/12/83. The mesoscale model in this case uses a 15 KM grid on a National Grid projection (see figure). In the vertical there are 16 unequally spaced levels from 10 metres to 12 KM above the height of the orography. As well as the fine mesh background field the mesoscale model uses observations of wind, temperature, precipitation, visibility, and cloud from the observing network to derive its initial field. The boundaries of the model are updated throughout the forecast using the fine mesh forecast information.

The quality of the mesoscale model forecasts greatly depend upon the success of the fine mesh, but it is expected that the mesoscale model can add useful small scale detail to a good fine mesh forecast.

The mesoscale forecast that is shown in this lecture was run to 12 hours (ending 1800 GMT 12/12/83). Model output is examined at 3 hourly intervals and comparisons are made with the fine mesh forecast. Output shown consists of charts of pressure, temperature, wind and precipitation. A useful snow predictor for the mesoscale model is introduced and the front is examined in cross-section.

It must be remembered that the mesoscale model is very much experimental at the moment but the results of this study suggest that it has a lot of potential in the forecasting of fronts and their associated weather, particularly slow moving systems.