ON THE OPERATIONAL USE OF ECMWF PRODUCTS AT METEO-FRANCE CENTRAL FORECASTING OFFICE. THE FORECASTER'S POINT OF VIEW

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1. INTRODUCTION

The ECMWF products used by METEO-FRANCE forecast service are :

- 500 hPa fields (Z,T),
- sea level pressure and 1000/700 hPa thickness,
- relative humidity at 700 hPa,
- Z and wet bulb potential temperature at 850 hPa
- 6h precipitations, diagrams on six grid points (six main french towns) giving the following parameters : *cloudiness, min./max. temperature, precipitations, pressure, 10m wind.*
- 2 and 3 day min./max. temperature forecast for french meteorological stations, is made by statistical adaptation of the fields issued from ECMWF model.

ECMWF products are used for medium range forecast (until 156h, J+5), but also for short range forecast parallel to french model EMERAUDE (run until 72h).

2. SHORT RANGE FORECAST

For short range forecast, (Day, D+1, D+2), the fields forecast by the ECMWF and french "EMERAUDE" models are compared. In the case of divergence, the forecasters look for it in order to choose the most likely solution ; different criteria are used ; the main ones are :

- to refer to last available data, to check up on model's analysis and very short range and nowcast fields ;
- as the EMERAUDE analysis is twelve hours more recent than the ECMWF model's one, it is possible to compare the ECMWF 12h forecast with EMERAUDE analysis to test a possible first drift of ECMWF model forecast ;
- some well known model's shortcomings and behaviours are taken into account too,
(ECMWF model : tendency to be too active, EMERAUDE : tendency to be smoothed, ...) ;
- some parameters from EMERAUDE, like vertical velocity and 500 hPa absolute vorticity, can help to the decision : for example, the evolution of these parameters can give useful indications about a wave development or activity (sometimes conspicuous but with no repercussion on the final fields) ; the 500 hPa absolute vorticity evolution can often also allow to judge the importance of the smoothing;
- it is also possible to refer to an analogous situation.

When the solution remains doubtful, we can compromise for an intermediate evolution, (concerning the velocity of a wave displacement, or its activity ; the question is to minimize the forecast error) ; the forecast is then progressively improved with next models and with data evolution.

3. MEDIUM RANGE FORECAST (D+3, D+4, D+5)

Medium range forecast is entirely based on ECMWF products. However, the forecaster's experience and his knowledge of the model's behaviour and variability may moderate the reliability on the evolution given by the model ; but it is very difficult to assign a value to the evolution given by the model. Both the following examples emphasize the medium range forecast's problems.

The first example shows two successive runs ending at a very different forecast ; both 500 hPa forecasts for the same dates are set out (fig. 1, 2).

On fig. 1, both forecasts outlines are comparable, but differences appear, which can be seen if we examine closely the restitution of the cut-off : differences in the position of the centre and in the restitution of the circulation around the cut-off ; the circulation between Canada and Greenland, which has an influence on the cut-off's evolution, is not reproduced similary by both models.

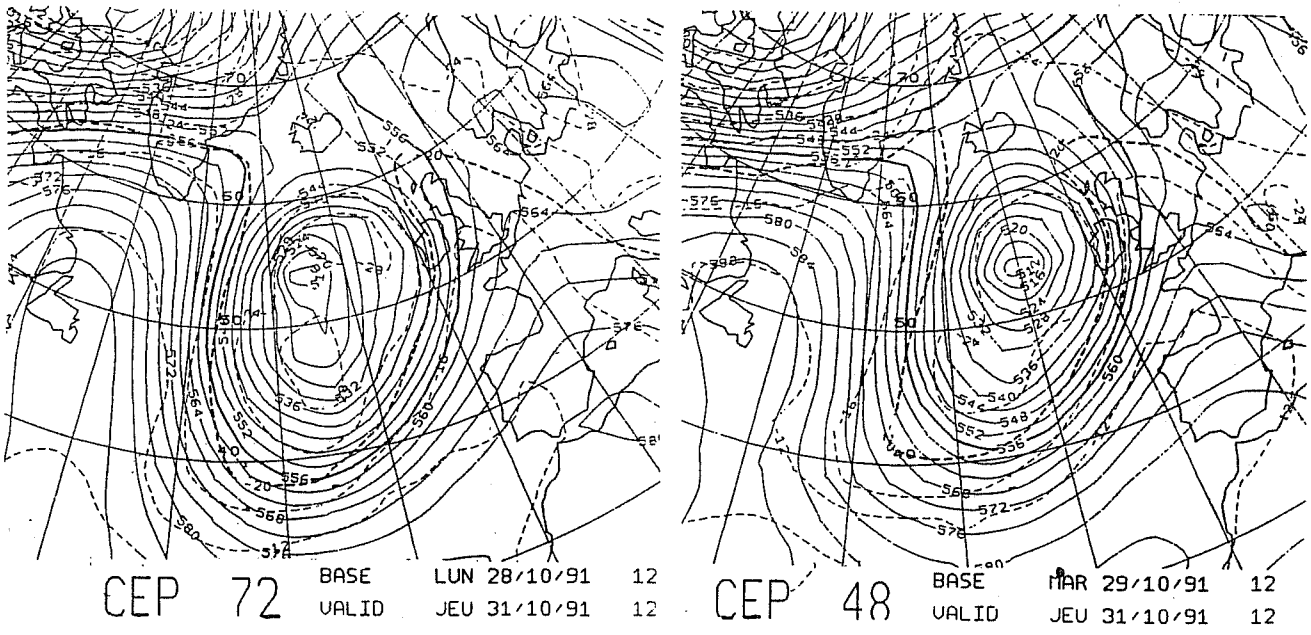

Fig. 1 - Z, T 500 hPa forecast, valid for October 31th 1991 (data base from October 28th left, October 29th right).

As a consequence, the forecasts for the next days are completely different (fig. 2) : the model from October 28th maintains anticyclonic conditions over France ; on the opposite, according to the model from october 29th, a front is crossing France.

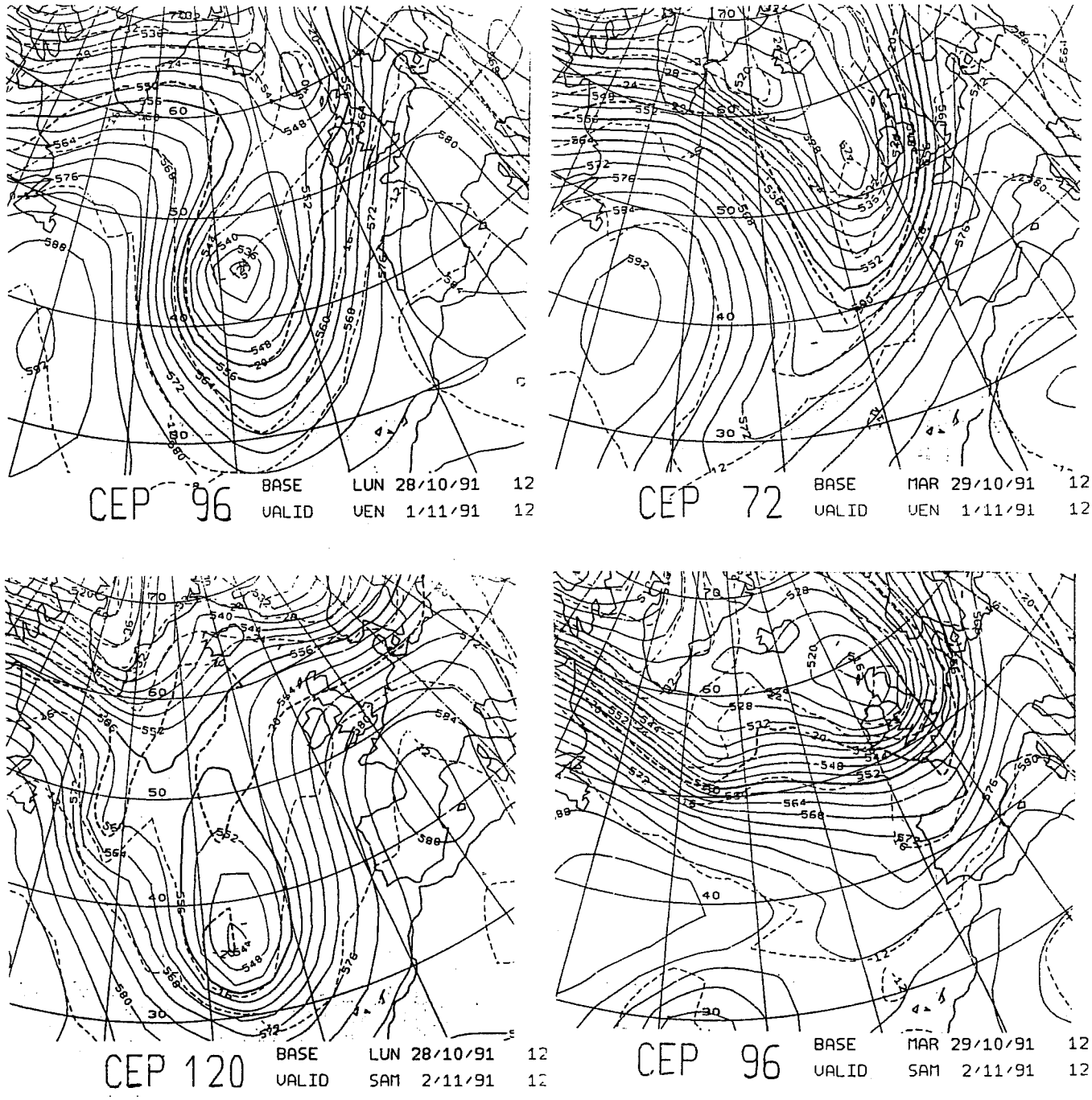

Fig. 2 - Z, T 500 hPa forecast, valid for November 1st 1991 (top), and for November 2nd 1991 (bottom) ; data base from October 28th on the left, October 29th on the right.

The next example shows an other case of model's variability (fig. 3, 4, 5). Fig. 3 set-out the mean-sea-level-pressure forecast by two consecutive models for the same date ; a cyclogenesis occurs over Ireland according to the 132h forecast from data base November 10th (left), but the next run gives a very different forecast (right) : no cyclogenesis, but a ridge running from Iceland to the Bay of Biscay.

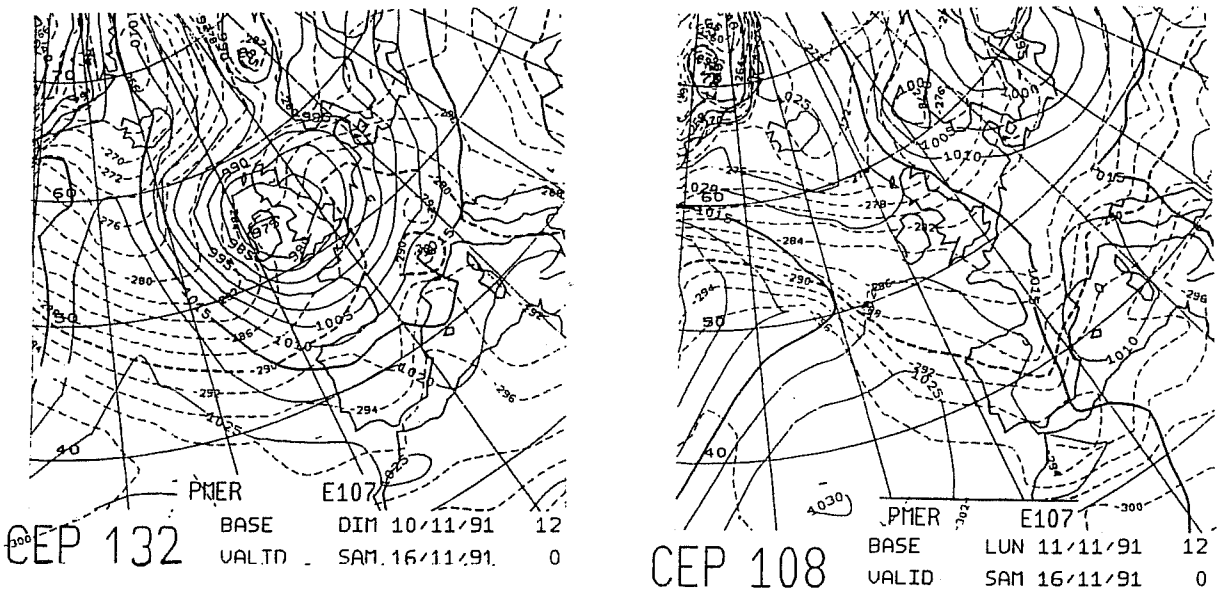

Fig. 3 - Mean-sea-level-pressure forecast valid for November 16th 1991 ; data base from November 10th on the left, November 11th on the right.

If we look at the 500 hPa forecasts, we can see differences appear as early as the forecast for November 14th (fig. 4) ; both runs do not reproduce the same circulation relating to the troughs and waves moving from north America to west Atlantic. On the 500 hPa forecasts for November 15th and 16th (Fig. 5, 6), the divergences increase ; according to the forecast from the run from November 10th, the trough moving over Atlantic becomes accentuated with a very active and contrasted circulation.

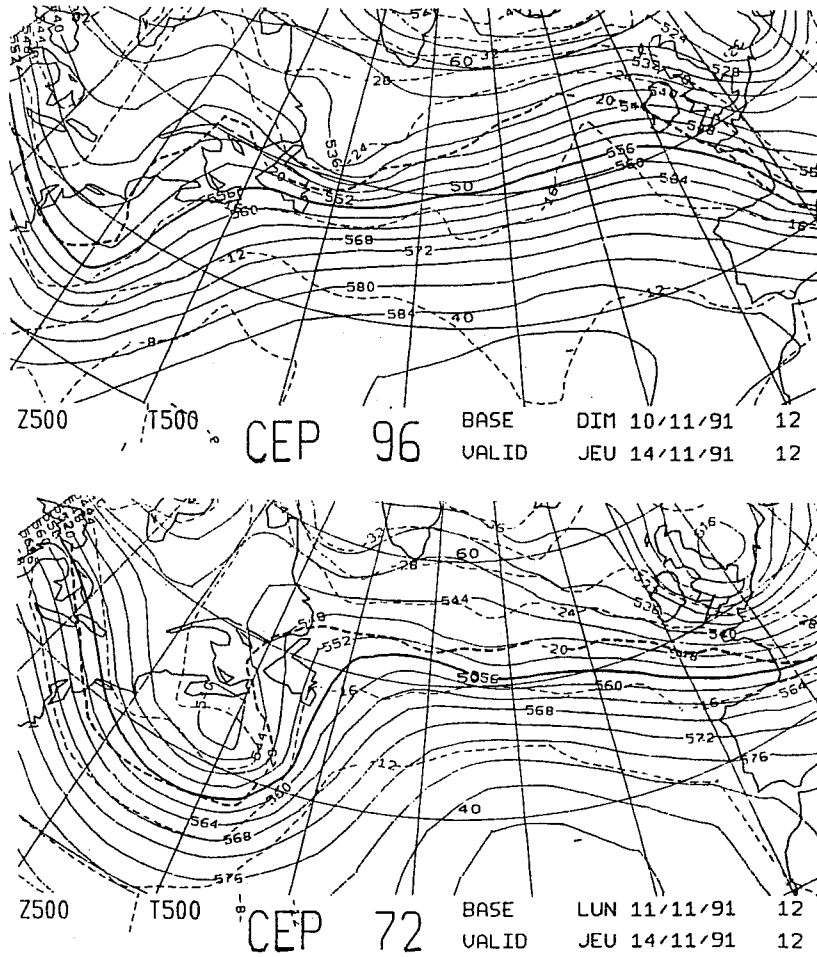

Fig. 4 - Z,T 500 hPa forecasts valid for November 14th 1991 ; data base from November 10th 1991 (top), November 11th 1991 (bottom)

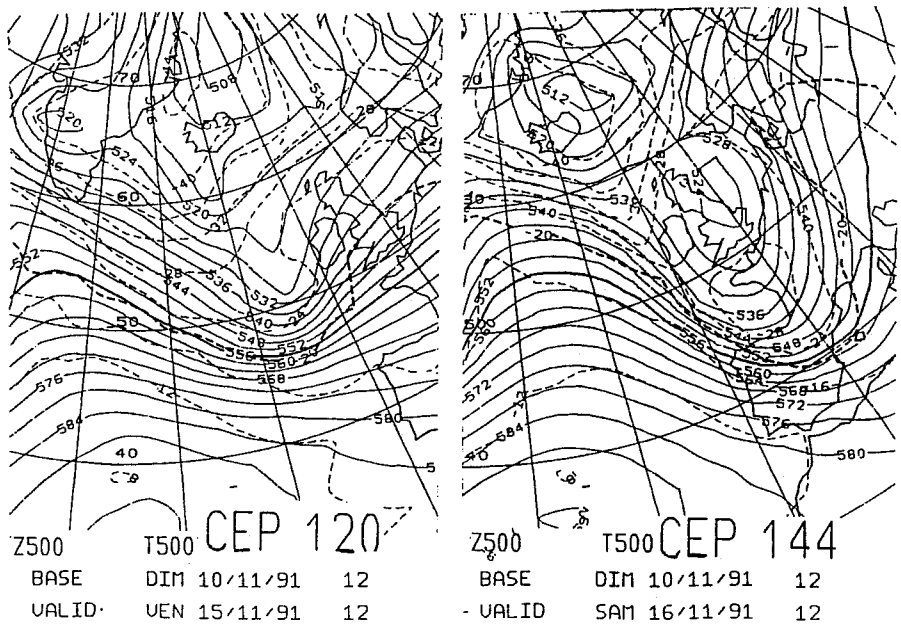

Fig. 5 - Z, T 500 hPa forecast, valid for November 15th (left), and 16th (right) 1991 ; run from November 10th 1991.

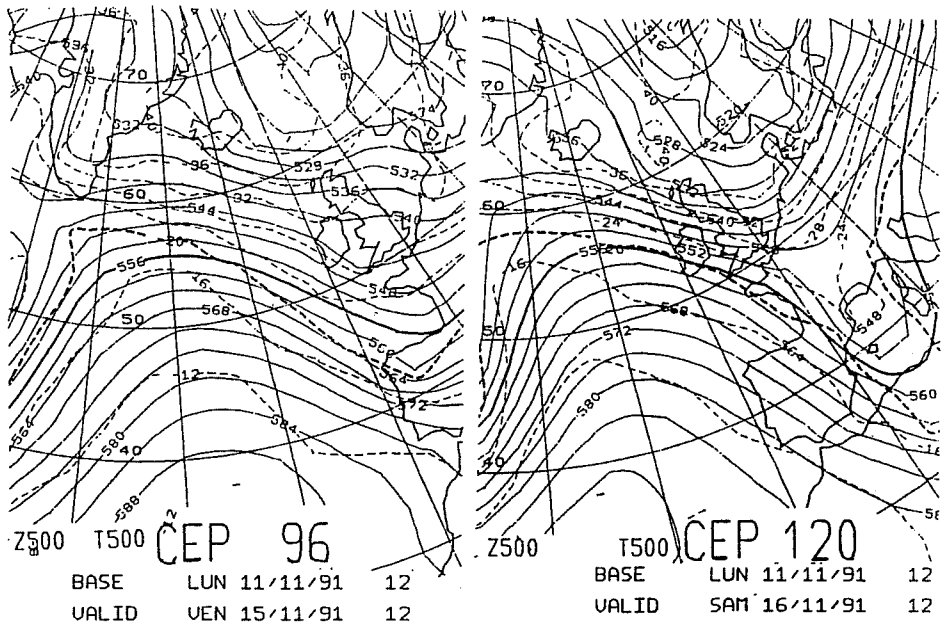

Fig. 6 - Z, T 500 hPa forecast, valid for November 15th (left), and 16th (right) 1991 ; run from November 11th 1991.

In a situation comparable to the first case, the forecaster does not have any keys to pass judgment on the model's forecast, allowing to moderate the final forecast. Knowing the model's shortcoming (to be too active, to produce too contrasted circulations), the forecaster who has to cope with a situation comparable to the one shown with the second case, can make reserves relating to the evolution ending to a cyclogenesis after such a very (too?) active trough becoming very accentuated over Atlantic, particulary for a 144h forecast.

As a consequence, forecasts for D + 4, D + 5 are limited to the outlines of the weather ; for D + 3 : the accuracy of the forecast depends on the amount of trust we can put in the model, according to : the situation (quick change in synoptic evolution, likely dephasing), potential divergences with french model EMERAUDE, some well known model shortcomings (too contrasted and rapid circulations,...), variability with regard to previous model ; in the case of severe weather forecast, one rule is not to alert the authorities and press to early.

So, forecasters need operational guidance in medium range forecast ; but they also need to learn how to use this guidance effectively for final forecast.