# GRAPHICAL REPRESENTATION AT THE CENTRE

by

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## Graphical Representation at the Centre

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I am going to show, in the next 30 minutes, the graphical products produced from the operational data at ECMWF. Some of these products are produced automatically each night during the operational run and some are available on request using the Operational Watch programs. I will start with these products produced automatically.

1. European-Atlantic Area MSL/850T. Forecast D+2 with fronts drawn manually.

There are two sets of charts, based on this projection produced each night and hung in Met. Ops.Room. One set consists of the 1200Z analysis (Initialised and uninitialised) for MSL/850 TEMPS as well as the ten days forecasts. The other set is for 500 mb Z/T. Heights and pressures are always drawn with solid lines and temperature with dashed lines. The $0^{o}$ temperature line is double thickness. Fronts are drawn manually on the first 2 or 3 days.

2. Eur + AT 500mb Z/T Analysis + observations

This analysis chart is on a similar projection with observations plotted. Temp reports are plotted on U/A maps - heights, temperatures and winds. Synops are plotted on surface maps - pressure, temps and winds. Because of the density of synops in some areas, there is a selection algorithm which selects the most important reports. There is also an algorithm to reduce the number of ships plotted near coasts.

3. NH 500 Z/T Anal + observations

These charts, whole northern hemisphere, are produced at each 12 hour time step in the operational run for MSL/850T and 500mb Z/T. For the main analysis the 700, 300, 100 and 50 mb Z/T charts are also drawn. The same convention, solid lines for heights on pressures and dashed lines for temperatures, is used throughout.

4. SH 500 mb Anal + Observations

Same as for 3 NH - For most of the charts displayed smoothing is used in drawing the contours.

5. OPS Room Hemispherical Wall-Charts (SH)

These charts, MSL and 500Z, consist of a smaller section of the southern hemisphere. They are hung on Met. Ops.Room wall in such a way that at any time we can see the previous forecasts verifying on a particular analysis and also the 7 days forecasts based on the same analysis. Only heights or pressures drawn. The contour lines are made quite thick so that they can be seen from a distance. There are similar charts for NH.

6. Hall Maps + Rainfall

These maps were designed to cover the member states and also the North Atlantic and to give as much information as possible without getting too cluttered. Note that the 2mtr temps are plotted as well as the 24 hr rainfall 00-24Z. The rainfall is plotted with dotted lines to give a hazy effect that would stand out without interfering with the other parameters. 500mb wind arrows give the relative strength of the wind and this relativity is maintained on all the charts.

7. 5 Day Means D+5, D+8 and Verification

Straightforward plot - one parameter. Same conventions, thickness of lines etc. used on all three maps to enable comparisons. The analyses must be stored on a data base to enable the verification plotting.

8. GRID CODE - P.S. WASH/ECM/MOSCOW

Other Centres' products received on G.T.S. compared with ECMWF products. Only three Centres issue charts for entire NH. Even though forecasts are based on different analysis - ECMWF is 1200Z based, others 0000Z - all charts verify at some time. For Moscow, quite a lot of the grid points have to be interpolated and smoothing of the contour lines is not used.

9. GRID CODE - EU+AT PARIS/OFFEN/ECM/UK

The area plotted here was selected to include all the data transmitted, which varies from centre to centre. MSL pressure (solid lines) and 1000/500 mb thickness (dashes) one plotted. Some interpolation needed for Offenbach but smoothing is used.

## 10. Reference Maps - Forecasts

Analysis + 10 days forecasts based on this analysis.
These are produced across the full width of graphics paper but are reduced to A4 for publication - this gives a better picture than if produced graphically in A4. The Contour labelling is reduced to avoid confusion. Day 9 is omitted to enable the charts to fit on one page.

## 11. Reference Maps - Verification

Previous 10 days forecasts verifying on current analysis. Again day 9 omitted. Rest as for 10.

## 12. PSEUDO - SATELLITE MAPS

This uses cloud-cover fields. Black for no cloud. The fields are extracted for a plane tangential to a point on the earth. This is then projected on a Polar Stereographic background. The area is divided into small boxes and the size and shape of the boxes depend on their positions in the area. A number of dots are plotted inside each box depending on the values of the grid points. The values vary between $\emptyset$ and 1. A zero means no cloud and 1 means completely cloudy. No dots are plotted when completely cloudy. Note the coastline is drawn as dark lines in which areas and white lines in dark areas.

## 13. Data Coverage SYNOPS - Temps

A symbol is plotted for each report received at ECMWF for the given time range. Different symbols are used for different code-types. In some cases, e.g. Temps, there are distinguishing symbols for different parts of the reports.

There will be overprinting of reports received more than once for a particular time range.

## 14. Data Coverage - SATEMS

Same as for 13.
PAOB distinguished from SATEMS.

15. Tropical Belt Winds

Tropical belt area - 30N to 30S and $0^{o}$ to $360^{o}$. Wind arrows and isotachs. Arrows give relative strength of wind. Relativity is maintained from chart to chart. Levels: 850 and 200 mb. ANAL + 7 days f/casts.

16. Rainfall

Selected area for checking rainfall validity - temporary production. Rainfall is a difficult field to contour due to large number of values at or near zero and the non-uniformity of the values. Logarithms are used here and make a better plot. Scale is pinned next to maps. Non-convective, convective and 24 hour non-convective and convective.

Opwatch Programs

Following charts are a selection from facilities of the Opwatch system. These are available on request from VDU and are available on the Tektronix as well as the Versatec.

17. Cross-Sections

This produces vertical cross sections across a given line. The number of points used is determined from the length of the line. Surface pressure fields are used to plot the land or sea surfaces. Arrows are used to depict the parallel or horizontal winds and isotachsfor the vertical winds. The lines underneath the chart are labelled to give the lat/long co-ordinates along the line.

18. Tephigrams

The Background is drawn by graphics package but the range can be varied by the user. Solid line is used for temperature curve. Winds and heights are plotted in a separate box but directly opposite the point of occurrence.

19. Data Coverage

As for automatic, except three different projections available - NH, SH and Globe. Again different symbols are used for different code types. The Grid lines are omitted to avoid confusion and the coastlines are plotted with solid lines for the same reason.

20. Fields Request

Example of request - lat/long window plotting wind arrows and isotachs. Again wind arrows give relative strength of wind. Any area can be selected.

21. Thickness + Satems

Another example of Fields Request program. This shows a Polar Stereographic window with the 1000/500 mb thickness field plotted. The observations are Satems - where the thickness levels are given underneath the position and the satellite identification above and to the left.

22. Zoom

There is also a facility for zooming in on a particular area. The zooming is done in the software. Four levels of zooming are allowed. The contour interval varies at each level as also does the number of observations plotted. For example, here, a level 1 picture has contour interval of 8 and the observations are those defined as Important stations in our Data Base.

23. Level 2 has a contour interval of 6 and the observations are selected by an algorithm in the software of the program.

24. Level 3 has contour interval of 4 and slightly more observations and finally

25 Level 4 has contour interval of 2 with the maximum number of observations available.

Please note that all of the fields produced by the Operational Run are capable of being plotted on request as well as any type of observation. There are standard areas available - NH, SH, Global, Europe, Europe and Atlantic, and also Polar stereograph or Lat/long windows.

26. METGRAMS

Based on 12 hourly spot values - some as graphs others as charts or frequency diagrams, can be produced for any location. A verifying map can be drawn at the end of a period giving the values that actually occurred. This can only be done if the location is a Meteorological Reporting Station.