European Centre for Medium Range Weather Forecasts

ECMWF NEWSLETTER

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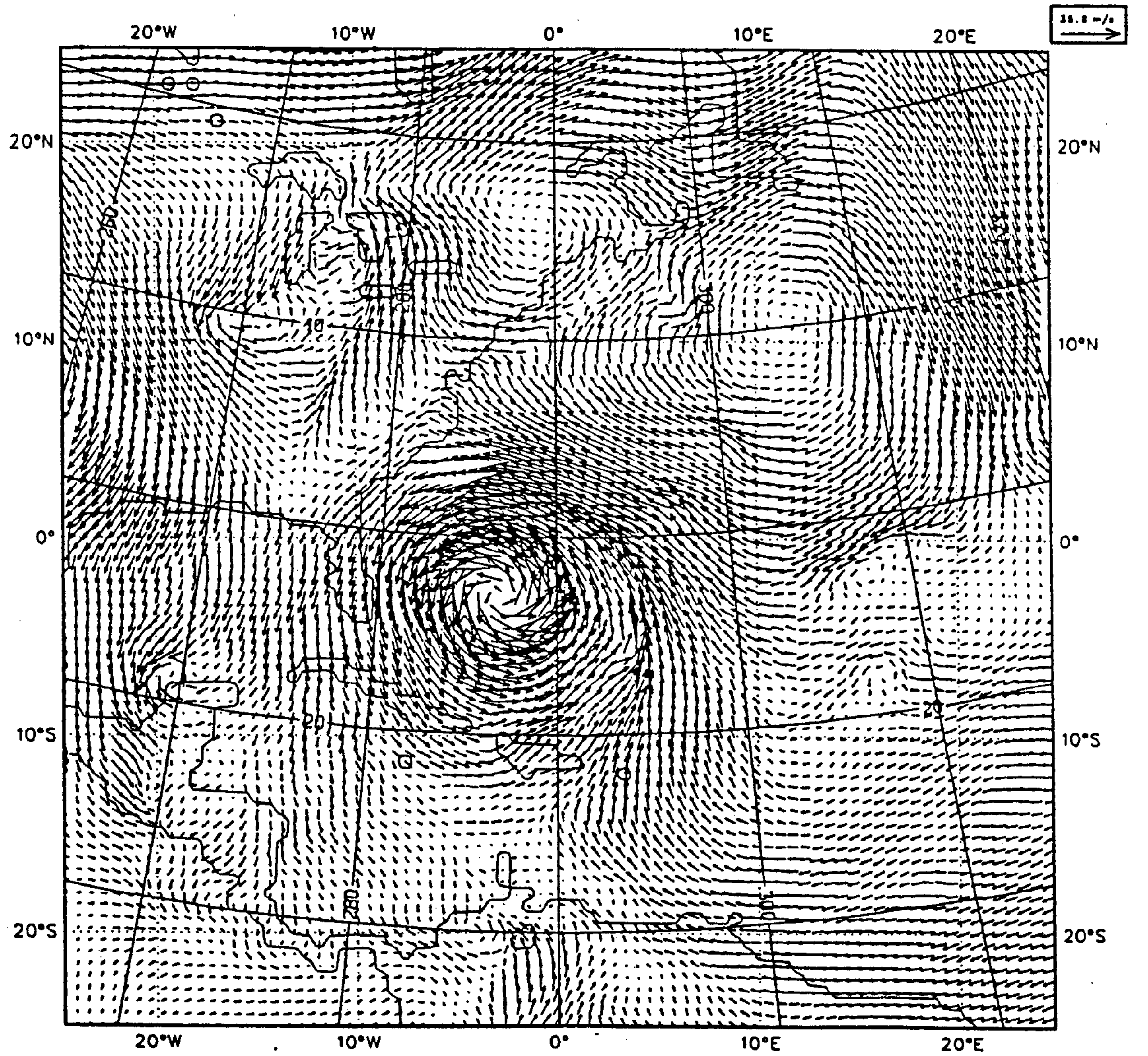

IN THIS ISSUE

COVER: A 48-hour forecast of hurricane GLORIA valid 12z 26 September 1985 produced by the spectral limited-area model run with a horizontal resolution which is equivalent to T212 in a global model. The winds at the fourth model level above the ground are shown, over the whole domain chosen for this integration of the model. Values of latitude and longitude in the rotated co-ordinate system of the model are shown around the outside of the map frame.

This Newsletter is edited and produced by User Support.

The next issue will appear in September 1987.

This issue contains an article on page 3 giving a detailed description of the modifications to the model surface and sub-surface scheme which were implemented in the ECMWF operational model on 7 April 1987 and had been announced in the last edition of this Newsletter (March 1987). A second article analyses the effects of the changes in the forecasts produced (page 7).

An article on page 10 discusses the impact of increased resolution, both in the horizontal and the vertical, on the performance of the operational model and gives the preliminary results gained from recent experiments with increased horizontal resolution.

Computer users of the permanent data set and data transfer routines in the Cray $SYSLIB should take note of the article on page 21.

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CHANGES TO THE OPERATIONAL FORECASTING SYSTEM

Recent Changes

(i) The revision of the model surface and sub-surface scheme was introduced operationally on 7 April 1987.

The new scheme consists of

- a revision of the parametrisation of the surface and sub-surface processes;
- a revision of the post-processing of near-surface parameters.

Evaluations of the impact of the modifications on the near-surface parameters indicate that the new scheme gives a more realistic simulation of the diurnal temperature variation under clear sky conditions. The near-surface temperature minima are now especially well captured. A tendency to exaggerate the night time cooling has been observed. It should also be noted that with the introduction of the new scheme, the previously applied temperature adaptation from the height of the envelope orography to the mean orography was deleted. With the introduction of the high resolution model (T106) such temperature corrections were reduced to less than one degree Celsius in most parts of Europe and so the application was no longer considered necessary. Further details of the revised scheme and an evaluation of the near-surface parameters after the change are given in two Newsletter articles on p.3 and p.7 in this edition.

Planned Changes

Two modifications to the data analysis are planned:

(i) to make better use of satellite sounding data in agreement with the vertical resolution given by the satellite instruments;

(ii) to revise the forecast error correlation statistics resulting in a higher horizontal and slightly increased vertical resolution of the analysis. As a consequence, the analysis will draw more to wind data and less to height observations. Additionally, all observation error statistics will be revised.

- Horst Böttger

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REVISION OF THE SURFACE AND SUB-SURFACE SCHEME IN THE OPERATIONAL MODEL

Introduction

A revised scheme for the surface and sub-surface processes was incorporated into the ECMWF operational model on 7 April 1987.

This revision was motivated mainly by defects in the forecast of the diurnal oscillations of temperature and of the forecasts of precipitation over land, these defects being linked to an inaccurate treatment of both water storage in the soil and surface evaporation. A comparison with observations from HAPEX-MOBILHY, a field experiment which took place last year in the southwest of France, indicated that both the initial values of the surface moisture and the parametrisation of the surface turbulent fluxes, particularly the moisture flux, were inappropriate.

The novelty of the new scheme is its ability to distinguish between the properties of bare soil and of a vegetated area assumed to have one vegetation type with the properties of a tree-like canopy.

The revised scheme

The revision had three main components: modifications to the physical parametrisation, modifications to the post-processing of surface parameters and modification to the analysis of surface parameters.

(i) Physical parametrisation
Each model grid box over land has been ascribed a certain percentage of vegetation coverage, using Henderson-Sellers' vegetation dataset, Wilson, Henderson - Sellers, 1985[1]. The evaporation from bare ground obeys an aerodynamic law in which the surface specific humidity depends upon the surface soil wetness. The vegetation is represented by a canopy layer. The transpiration of plants is controlled by a stomatal resistance, which is itself a function of the net short wave radiation at the surface and the moisture stress in the root zone. The fraction of the canopy which is wet following interception of precipitation and collection of dew evaporates at the potential rate (see Fig. 1 overleaf).

The surface and soil characteristics are constant, independent of soil wetness and the vegetation type is assumed to be universal, with standard values for its stomatal resistance, leaf area index and root profile. Only the thermal soil characteristics are now dependent on the snow cover.

(ii) Post-processing of surface parameters
The derivation of the surface parameters (2m temperature and 10m wind) is based on the definition, a priori, of a realistic vertical profile of thermo-dynamic variables within the model layer closest to the ground, which is assumed to be a Constant Flux Layer (CFL). Values of variables inside this CFL at any height are obtained by integrating their known vertical derivatives.

The dew point depression is computed by assuming a constant relative humidity in the CFL.

(iii) Surface analysis
The initial snow depth and sea surface temperatures are the only surface variables which are now analysed. The analysis of soil moisture is not now carried out and both the initial soil temperature and moisture content are taken from the first guess.

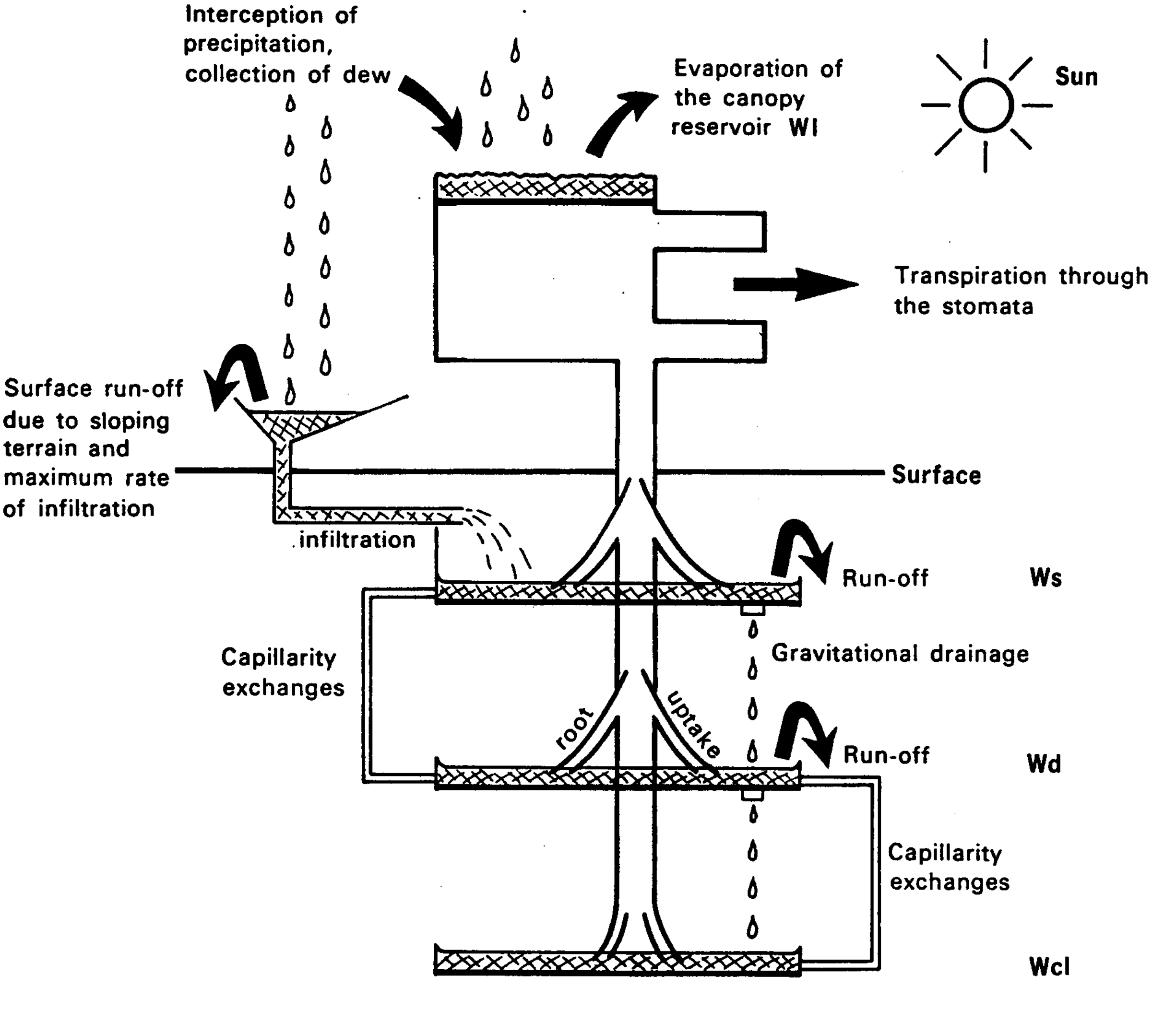
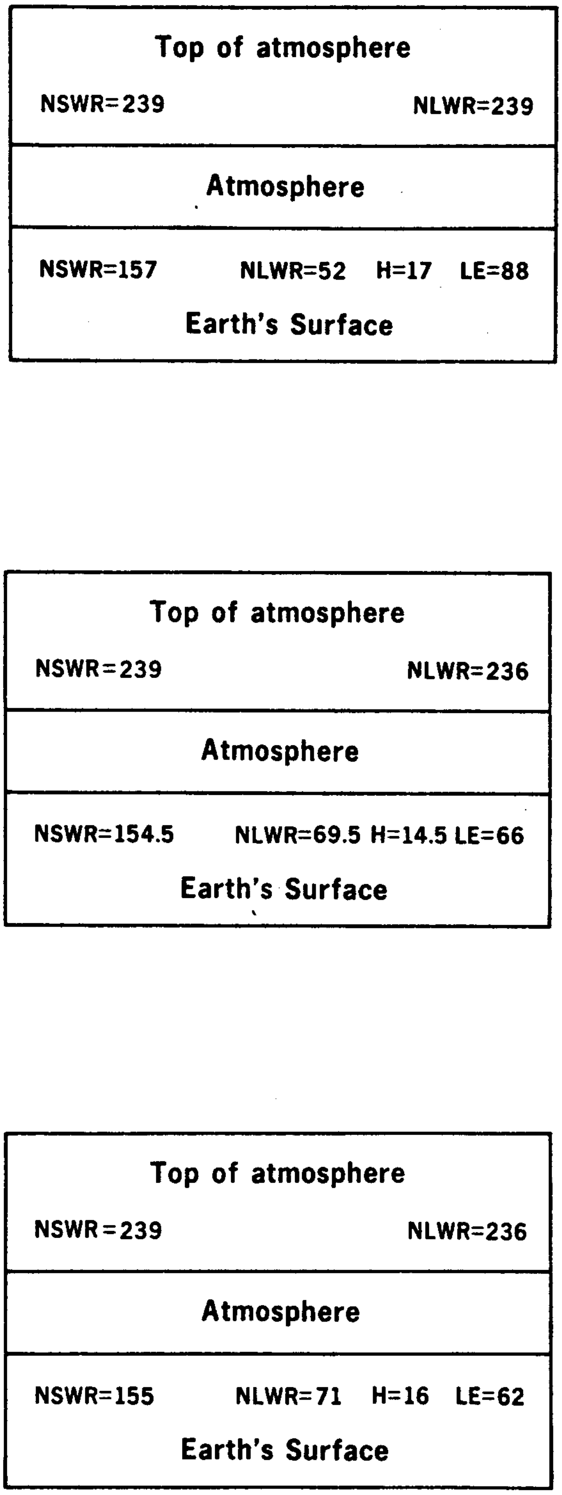
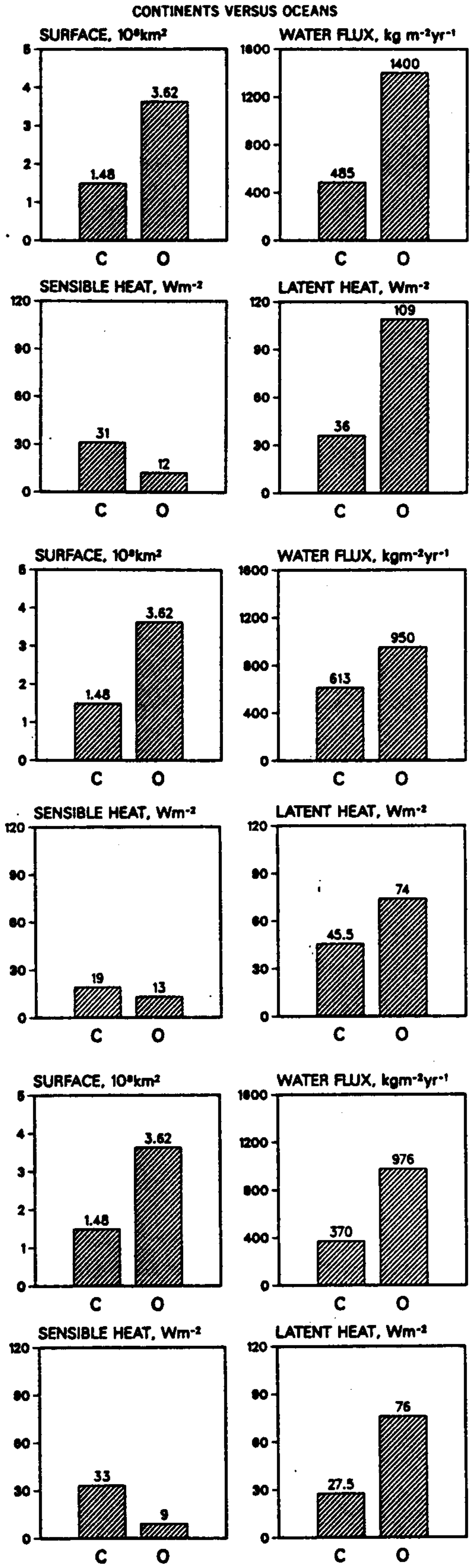


Fig. 1 Schematic description of the moisture exchange over vegetated areas



NSWR=Net Short Wave Radiation
NLWR=Net Long Wave Radiation
H=Sensible Heat
LE=Latent Heat

Global and annual average energy fluxes into and out of the atmosphere, in Wm^{-2}.



Comparison between oceans and continents, in terms of area, evaporation, sensible and latent heat annual mean fluxes.

Fig. 2 The impact of the revised surface scheme on the model climate

Experimentation

The experimentation carried out prior to the operational implementation focused on the sensitivity of the model climate to the representation of some of the main physical properties of the soil and vegetation cover and on the evaluation of 10 day forecasts. In particular, the dependency of soil characteristics upon soil wetness and snow, the definition of the root zone and of a canopy reservoir was evaluated.

One winter and one summer run have been used to define the earth-atmosphere budget, both for the old scheme and various versions of the new surface scheme. Fig. 2 shows a comparison between the energy fluxes into and out of the atmosphere and their partitioning over continents and oceans as estimated by Verstraete and Dickinson (1986)[2] and those simulated by the two versions of the model: the old scheme (control) and the final version of the revised scheme. A large improvement can be seen in the Bowen ratio both over land and sea, and in the balance between the evaporation, and consequently the precipitation, over the continents and the ocean. The major defect which remains is the systematic underestimation of fluxes over the oceans.

An assimilation over one week was carried out to demonstrate the stability of the new scheme. The experimental 10-day forecasts were run from these assimilations. No major synoptic differences were noticed when compared to the control runs, though it was clear that the convection was sensitive to the differences of moisture fluxes, especially over the continents. For an analysis of the effects of the new scheme on surface parameters, see the following article.

\- Christian Blondin

References:

1 Wilson, M.F. and A. Henderson-Sellers, 1985: Cover and soil datasets for use in general circulation climate models. J. Climatol., 5, 119-143.

2 Verstraete, M.M and R.E. Dickinson, 1986: Modelling surface processes in atmospheric general circulation models. Ann. Geophysc., 4,B,4,357-364.

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THE IMPACT OF THE REVISED SURFACE SCHEME ON NEAR-SURFACE WEATHER ELEMENTS

Near-surface temperature (T at 2m)

The modified post-processing scheme for deriving the near-surface temperature at 2m above the model surface led to a more realistic simulation of the diurnal temperature variation under clear sky conditions, during which nocturnal inversions near the surface can develop.

Fig. 1 shows the impact of the new scheme on the 2m temperature forecast at Paris and Madrid during the first 48 hours of the forecast of 25 November 1986, when much of Europe was under the influence of a major anticyclone at the surface. The smooth curves show the continuously evolving temperature forecasts produced during experimentation with the new scheme, with post-processing at 15 minute intervals. The verification indicates that the radiational cooling is now well captured by the new scheme, while the daytime maximum remains almost unchanged. Note that the temperature forecast for Paris is unaffected by the new scheme during the first 24 hours when overcast sky is predicted and observed. For Madrid, the new scheme gives a good estimate of the sharp drop in temperature during the first night of the forecast. The variation from the operational forecast is approximately 10°C. A near-surface wind of 2-3ms^{-1} in the model prevented a similar development during the second night. Mesoscale features have an additional impact on night time inversions, but cannot be simulated by the model.

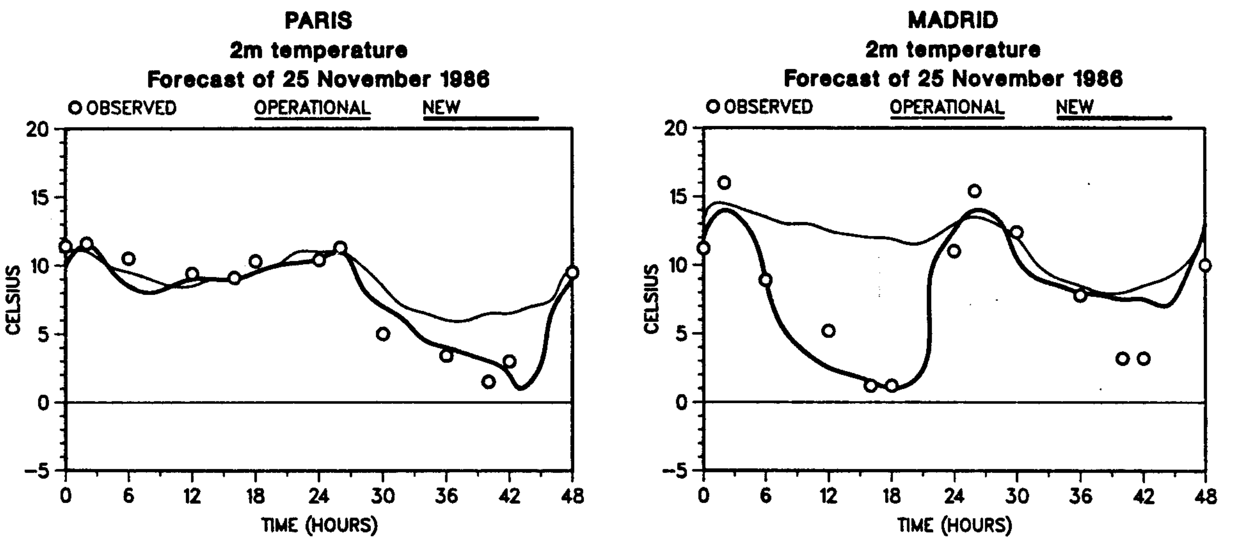

Fig. 1 Temperature forecast for Paris and Madrid with the former operational and revised post-processing and parametrisation scheme. The observed values are shown by circles.

The radiational cooling at night is even more pronounced during the late winter/early spring months, when, in particular in the northern latitudes, increasing insulation will lead to rising maxima and larger diurnal variation, while temperatures still drop to extremely low values in stable conditions over a snow covered surface at night. One of the major deficiencies in the former operational products was not capturing the low minima over snow in spring. The revised post-processing will remedy many of these defects. The new treatment of the thermal properties of snow contributes further towards improving the temperature forecasts.

Fig. 2 shows the direct model output of 2m temperature predicted for the location of Jokioinen in Finland. The new scheme captures the night time minima and gives a better description of the diurnal variation in temperature. A tendency to exaggerate the nocturnal cooling was noted in places and is also detectable in this forecast for Jokioinen. However, the figure highlights a different problem with the near-surface temperature, which is not related to the revised parameterisation scheme: with the onset of spring and the beginning of the snowmelt, temperatures in Scandinavia (and other regions of similar climatic conditions) begin to rise above freezing point. The albedo of melting snow which has been on the ground for some time is quite different from that of fresh snow. The snow cover breaks up in places and snow disappears from trees, etc., but the snow cover reported from synoptic stations may still be substantial. These changes in the surface conditions are not captured in the initial analysis and cannot therefore, be treated appropriately by the forecast model. As a consequence, in spring over melting snow, a large negative bias for daytime temperatures will be observed by users for the direct model output of near-surface temperature (see Fig. 2). This needs to be monitored and corrected locally, as such bias will change with the time of year.

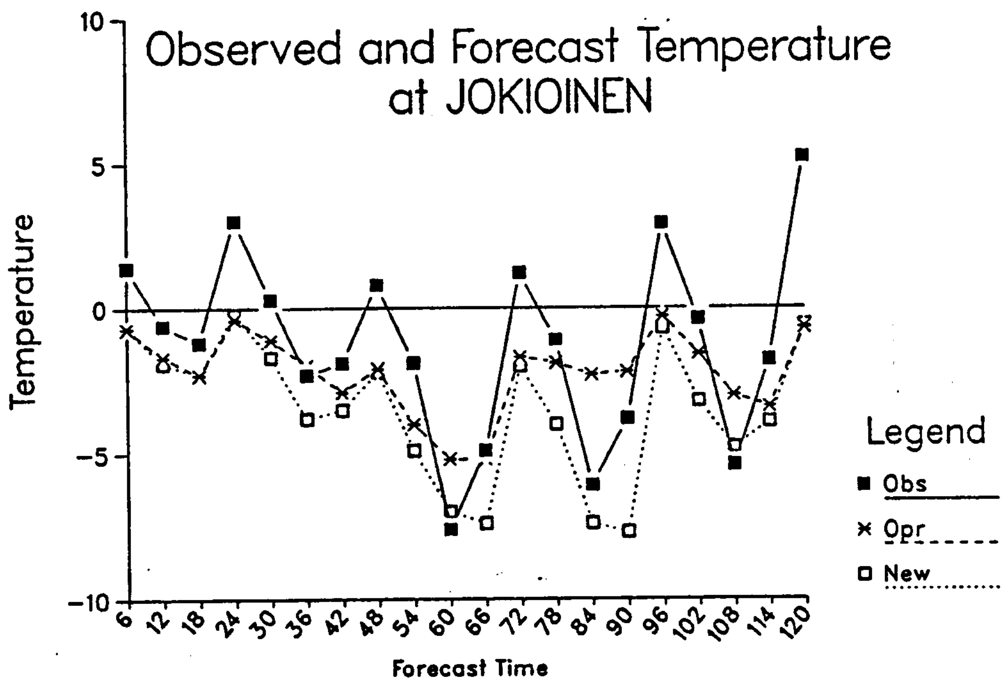

Fig. 2 120 hour forecast from 6 April 1987 of model derived 2m temperature for Jokioinen in Finland with the old operational scheme (opr), the revised surface scheme and post-processing (new) and the verifying observations (obs).

It should also be noted that, even with the revised scheme, it will not be possible to fully describe the effect of cold air advection in a very thin layer over snow or ice. The vertical resolution of the model and in the analysis is not sufficient to capture these effects.

Near-surface dewpoint (Td at 2m)

The old operational product Td at 2m suffered from a surface layer which was too moist, resulting in too narrow a dewpoint spread. The new scheme corrects this deficiency to a large extent, however, careful evaluation and further studies of the product during other seasons will also be required.

Near-surface wind (u, v at 10m)

The new post-processing will, in stable conditions, give lower wind speeds near the surface. The reduction is in the order of 1 to 3m s^{-1} and gives better agreement with locally observed winds.

Concluding remarks

The direct model output of near-surface weather parameters is a by-product of the physical parameterisation package and therefore strongly related to the formulation and modifications of the physics in the model. Furthermore, the resolution of the grid used for the computation of physical processes, currently 1.125 degrees, will limit the horizontal scales which can be resolved. These model derived weather parameters are verified against synoptic observations at ECMWF, in order to evaluate the realism of the model physics and the performance in the boundary layer. Continuous monitoring of these weather parameters gives a good indication of the geographical areas in which they may be used directly as forecast guidance or where further adaption to local conditions not captured by the model is required. Member States making use of the experimental products such as the 2m temperature, precipitation or the cloud amount are strongly advised to undertake their own verification for the locations of interest.

It should also be noted that, as from the autumn of 1987 with the implementation of the new dissemination strategy at ECMWF, Member States will have access to all products at model levels and with the original horizontal grid of the model (this is in addition to the present dissemination catalogue). Member States will then be able to select the model output from grid points as required and apply the vertical interpolation scheme which is most suitable for the particular location of the forecast.

\- Horst Böttger

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STUDIES OF INCREASED RESOLUTION

Introduction

Increases in the resolution of the forecast model have undoubtedly played a major role in the improvement of numerical weather prediction over the years. In particular, a significant part of the distinct improvements in the accuracy of ECMWF forecasts recorded in the year from 1 May 1985 can be attributed to the increase in horizontal resolution of the operational spectral model from triangular truncation at wavenumber 63 (T63) to truncation at wavenumber 106 (T106). Benefit has been noted across a wide range of scales, with more realistic forecasts for specific locations, better detail in the depiction of synoptic scale systems and, occasionally, a substantial improvement in the large-scale evolution of the medium-range forecast. A more recent change in the vertical resolution of the model stratosphere brought about a marked improvement in stratospheric data assimilation with clear benefit for the resulting tropospheric forecasts in the second half of the 10-day range. Further information is provided in the February 1985 and June 1986 issues of this Newsletter.

The impact of past resolution changes and the foreseen development of computing power have led the Centre to begin experimentation with horizontal and vertical resolutions beyond those now being used operationally. The first results of these studies are presented in this article, with emphasis on increased horizontal resolution, which is discussed in the following section. The third section deals more briefly with work on vertical resolution, and some remarks on future plans are given in the final section.

Higher horizontal resolution

Three 10-day global forecasts have been carried out using a T159 version of the Centre's spectral model. This has a smallest resolved half wavelength of about 125 km and a grid resolution close to 0.75° of latitude and longitude for the computation of non-linear terms. This resolution was chosen because it was the largest that could run with acceptable efficiency within the memory constraints of the Centre's present computer system, albeit over too long a time to be operationally feasible (8-9 hours for a 10-day forecast). The model used a one standard deviation envelope orography evaluated at T159 resolution and smaller horizontal diffusion coefficients, but was in other respects identical to the operational model. Initial data were interpolated from operational T106 analyses.

An initial date of 20 March 1986 was chosen for the first case because of an Alpine lee cyclogenesis early in the forecast range which was underestimated by the operational forecast. Fig. 1 compares 1-day forecasts at T63, T106 and T159 resolutions with the verifying operational analysis. The superiority of T106 over T63 is evident, and T159 improves further over T106 in the intensity of the lee cyclone. The T159 forecast shows detail which cannot be resolved in the

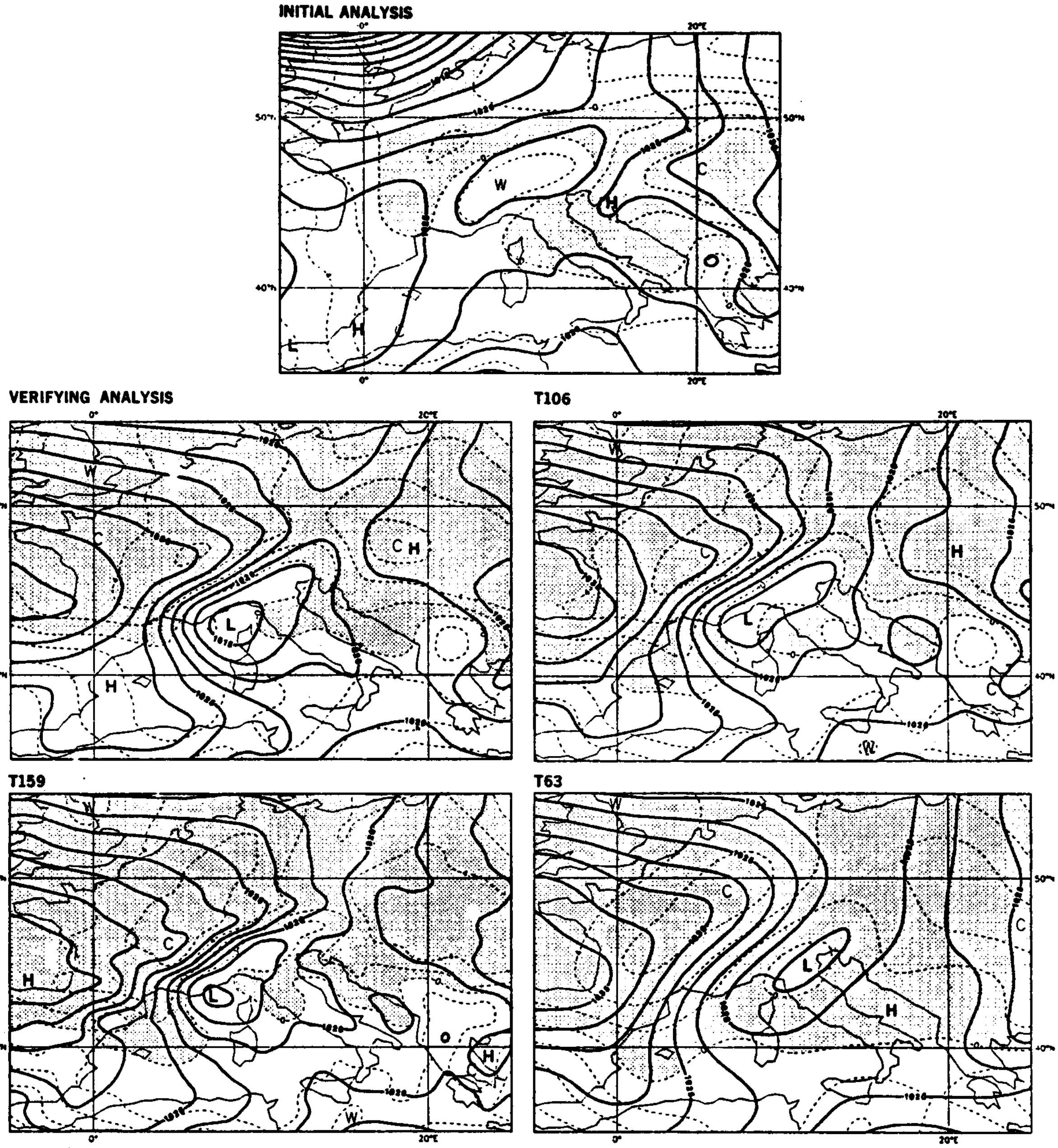

Fig. 1: The operational (T106) analysis for 12z, 20 March 1986 (upper) and for 12z, 21 March 1986 (middle left), and 1-day forecasts valid at the latter time performed using horizontal resolutions T106 (middle right), T159 (lower left) and T63 (lower right). Solid lines show mean sea-level pressure with a contour interval of 2.5 hPa, and 850 hPa temperature is denoted by dashed contours, with 2K interval, and by shading values below 0°C.

T106 analysis used for verification, but the pressure and temperature fields exhibit patterns near the Alps and Pyrenees which are characteristic of high resolution manual analyses of similar synoptic situations, for example the cyclogeneses of the ALPEX period.

Later in the forecast range, synoptic differences became apparent over northern Europe. Fig. 2 illustrates how the 5-day prediction of a low which was located in reality over southern Sweden is progressively and significantly improved as resolution increases. T159 also gives the best indication of a second, weaker low to the west. There was less synoptic difference over southern Europe at this time, all forecasts exhibiting quite high accuracy. Sensitivity to resolution was, however, seen in the precipitation forecasts. In most respects the expected increase in detail with increasing resolution was such as to bring forecast and observation closer together.

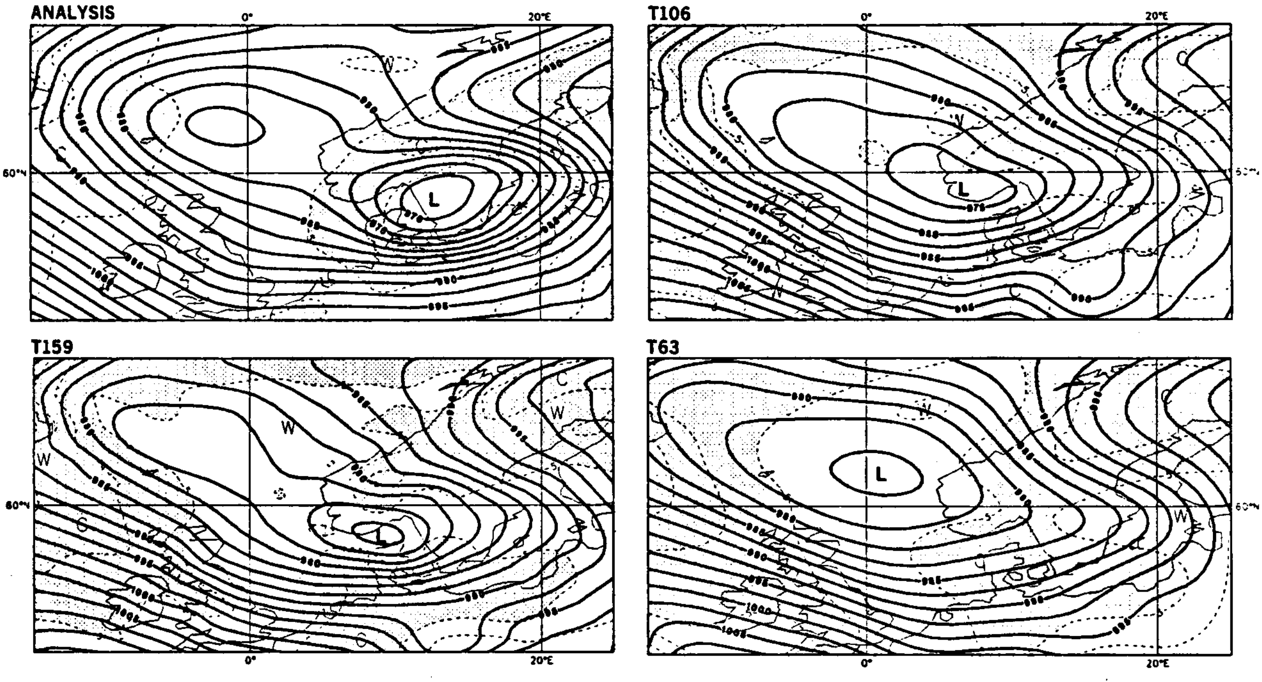

Fig. 2: The operational (T106) analysis for 12z, 25 March 1986 (upper left), and 5-day forecasts valid at this time performed using horizontal resolutions T106 (upper right), T159 (lower left) and T63 (lower right). Solid lines show mean sea-level pressure with a contour interval of 2.5 hPa, and 850 hPa temperature is denoted by dashed contours, with 2K interval, and by shading values below -5°C.

The two other cases for which 10-day forecasts were run were chosen without regard to the synoptic situation. Improvements over T106 forecasts were again found. Overall, objective verification favoured the T159 forecasts, differences between T159 and T106 being about half those found between T106 and T63, although the sample of three forecasts is not sufficient for firm conclusions to be drawn. Three 1-day T159 forecasts were also run for cases of rapid cyclogenesis. In two of them, somewhat deeper and better located surface lows resulted and frontal structures were sharper and more coherent.

Deficiencies in models can be highlighted by changes in resolution. The present T159 experiments have revealed a more pronounced overshoot (or 'spin-up') of tropical convective heating in the early forecast period than occurs with T106 resolution, and the occasional occurrence of "noise" in the planetary boundary layer indicates the need to investigate further the parameterisation of vertical diffusion, work that was indeed necessary for the change from T63 to T106. Furthermore, gravity waves which propagate upwards into the model stratosphere are more readily generated by the finer T159 orography, as illustrated in Fig. 3. Whilst not necessarily unrealistic, this can give rise to noise problems in the stratosphere, because of the inadequacy of the upper boundary treatment conventionally adopted in NWP models.

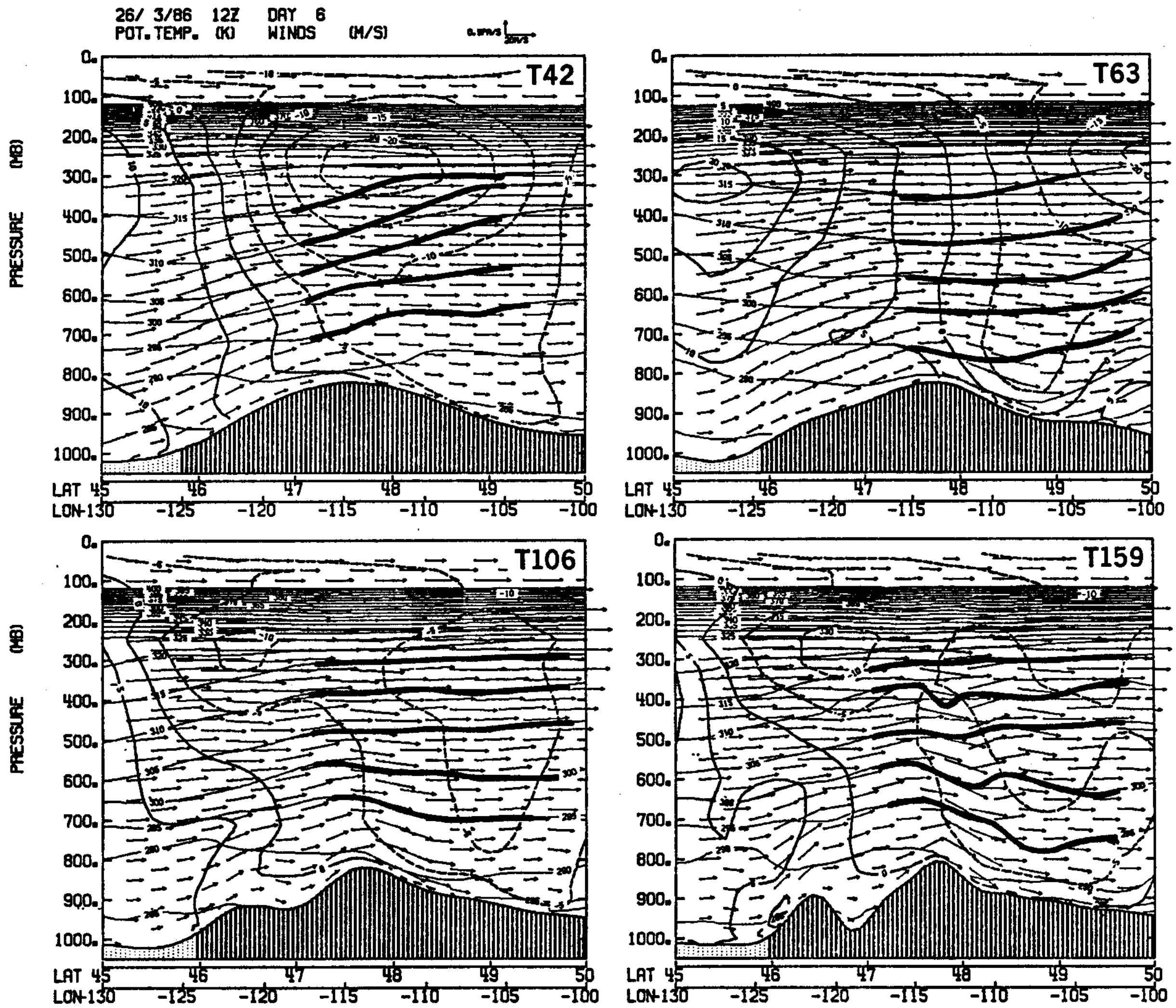

Fig. 3: Cross-sections of potential temperature (K) and winds (m s^{-1}) from 45°N 130°W to 50°N 100°W for day 6 forecasts from 20 March 1986 using resolutions T42 (upper left), T63 (upper right), T106 (lower left) and T159 (lower right).

Higher vertical resolution

Research on the vertical discretisation has recently been concentrated on the development of finite element techniques and it is expected that a scheme using linear elements will be implemented operationally within a few months. Major experimentation with increased vertical resolution has been deferred until this implementation has taken place, but some preliminary work has been carried out at T63 horizontal resolution using the current finite-difference scheme and a 31-level resolution in which layer thicknesses are approximately halved in the free troposphere and around the tropopause. This resolution is shown schematically in Fig. 4, together with the current 19-level resolution. The experimentation used initial data interpolated from 16- or 19-level analyses, although the principal testing of this resolution will include its use in data assimilation.

Beneficial synoptic impact of the increase in vertical resolution has been demonstrated in two specially chosen FGGE cases. The first had shown sensitivity to vertical resolution in much earlier tests with the Centre's original grid-point model and the new experiment again demonstrated a better representation of a blocking high over the Northern Atlantic in the second half of the forecast range. The second case was chosen because of the presence early in the forecast range of a pronounced tropopause fold which diagnostic studies have suggested was linked with a rapid cyclogenesis. This cyclogenesis was underestimated in 16-level forecasts and improvement in the depth of the low was indeed found in the forecast with increased resolution. Other forecasts have been run from recent operational analyses. Objective verification indicates a small net benefit from the resolution increase, although the variability, from case to case, of impact beyond day 5 is such that further experimentation is needed to establish the validity of this result.

Future studies

The Centre's current 4-year plan for the period 1987-1990 envisages the development and operational implementation, by 1990, of a third generation forecasting model. The encouraging results obtained to date from the initial tests of increased resolution have led to the planning and initiation of further experiments aimed both at establishing more firmly the likely operational benefits of higher resolution in the new generation model, and at identifying (and then testing solutions to) any problems which arise in model performance. The general programme of experimentation will include both a set of objectively chosen cases, to gain some measure of the routine improvement expected, and a set of specific cases chosen either on the basis of a significant weather development, or because of the availability of special data or previous diagnostic studies which can be used for verification.

A new tool for these studies will be the recently developed spectral limited area model, which can be run at resolutions much higher than is currently possible globally, and which provides an efficient means of investigating local aspects of the performance of the global model. Global and limited area forecasts will be carried out both with the current operational parameterisation

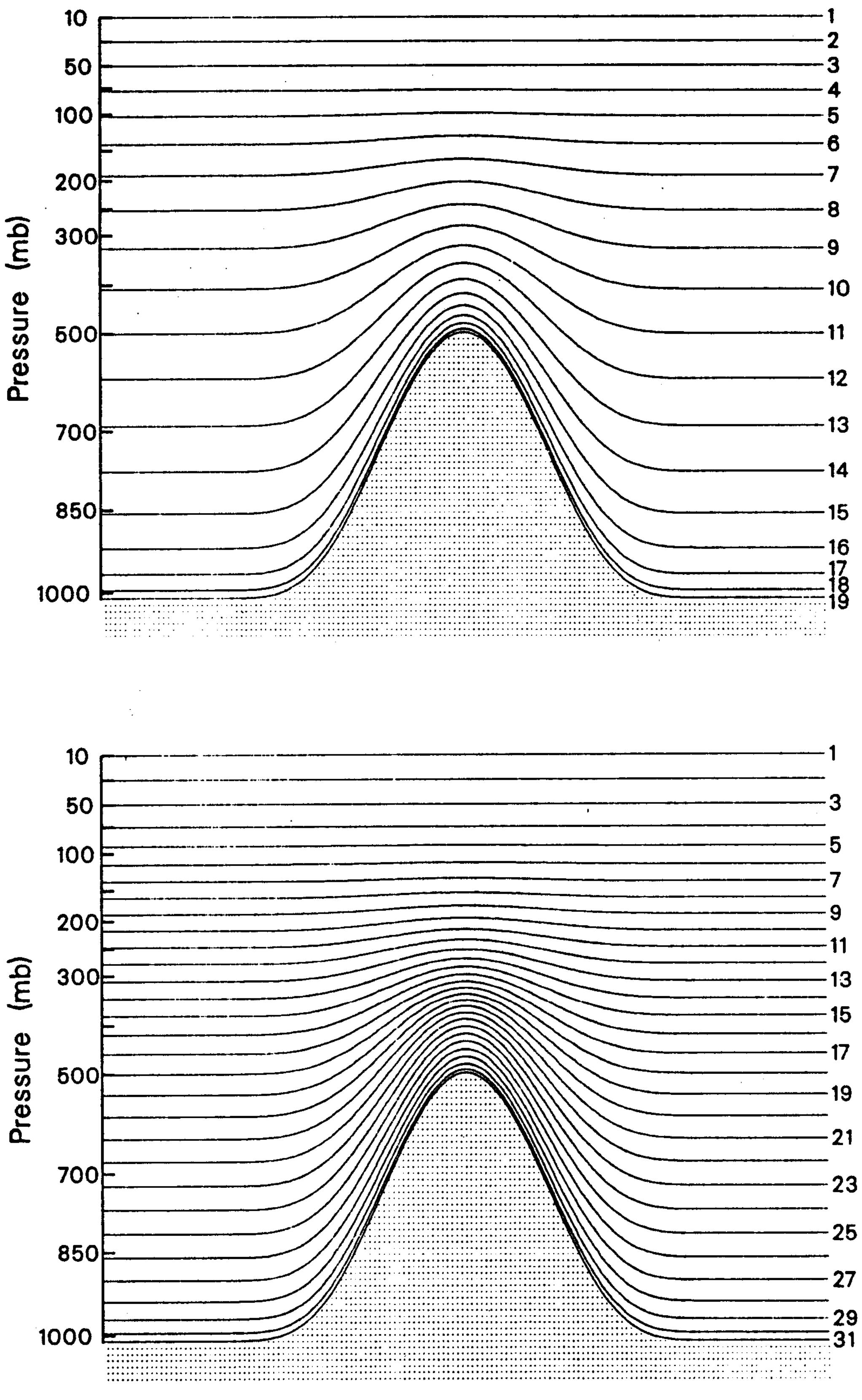

Fig. 4: Distributions of the "full" levels where winds, temperature and humidity are represented for the 19-level operational resolutions and the experimental 31-level resolution.

schemes and with alternatives which are viewed as possible future operational schemes. Work has already begun on a set of four cases involving different types of intense cyclonic activity and the front cover displays a 48-hour forecast of low-level wind for an Atlantic hurricane produced using the limited area model with a resolution equivalent to T212 in a global model. The convective adjustment scheme described in the December 1984 issue of this Newsletter was also used.

- Adrian Simmons, Jean-Michel Hoyer

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THE METEOROLOGIST VERSUS THE METEOGRAM: AN ASSESSMENT OF FORECAST QUALITY

The selection of products from the European Centre for Medium-Range Weather Forecasts has been enhanced in recent years to include, in addition to the conventional numerical forecast products such as height and temperature fields in the free atmosphere, several Direct Model Output (DMO) forecast parameters which depict the weather, i.e. parameters of the kind prepared for the general public by the forecasters, such as temperature near the surface, amount of precipitation and cloud, wind direction and speed etc. ECMWF classifies these products as "experimental" to distinguish them from its conventional r "operational" products. The derivation of these parameters from an atmospheric model is far from simple and straightforward, but this aspect will not be discussed here.

ECMWF has built up an easy to use software package for its Member States, making it possible to depict the experimental forecast products graphically, as time series for any geographical location, for ten days ahead. Fig. 1 shows such a meteogram. As far as I know, similar meteograms have been produced at the Finnish Meteorological Institute for Finnish locations for some public events, and sometimes even distributed to the general public. Personally, I have always believed that experimental ECMWF products should be distributed without modification only to professional experts such as forecasters. This position has also been repeatedly stressed by ECMWF scientists. On the other hand, where does one find meteograms displayed more openly than in the entrance area of the ECMWF headquarters?

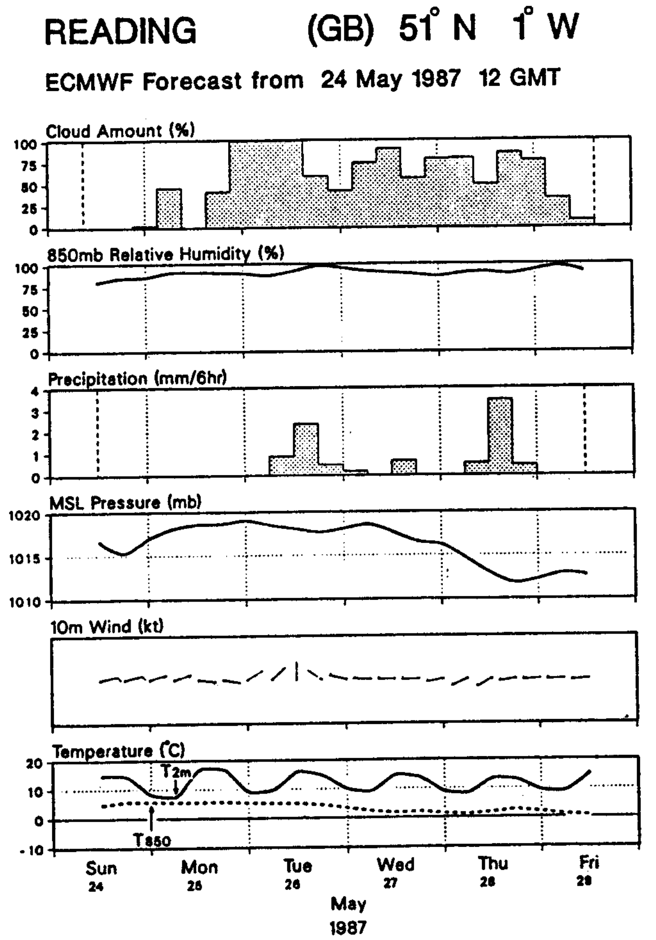

Fig. 1: Local forecast for Reading derived from the ECMWF direct model output of weather parameters

I will try to justify my position in this article first be quoting an ECMWF Meteorological Bulletin: "It must be stressed that extreme caution be exercised in making use of these parameters. Before they are to be seriously considered for operational use, it is essential that an extended period of testing be carried out, so that a thorough appreciation of their limitations be gained." Such quality monitoring has been undertaken within the Finnish Weather Department in some detail and results have been included e.g. in the annual progress reports on the application and use of the Centre's products within the Member States, published by ECMWF. The experimental parameters have been found to be useful tools for professional forecasters, in particular if they have been modified by applying appropriate, e.g. statistical, corrections. However, these products are not suitable for the general public, not only because of their systematic errors, but simply because the forecast model cannot be expected to depict small scale phenomena below the model resolution. In the meteograms, the forecasts relate to a single point. As the use of meteograms becomes more widespread, there is a risk that unskilled users interpret and equate them with the official weather forecasts.

In order to assess the quality of the DMO weather parameters depicted in the meteograms, it is appropriate to compare them with the actual forecasts produced by the meteorologist on duty. The results presented here are quite recent, as they are based on the forecasts for Helsinki for last December/January. During this period, record cold temperatures were measured in many locations, e.g. an all-time temperature minimum of -34.3°C in Helsinki.

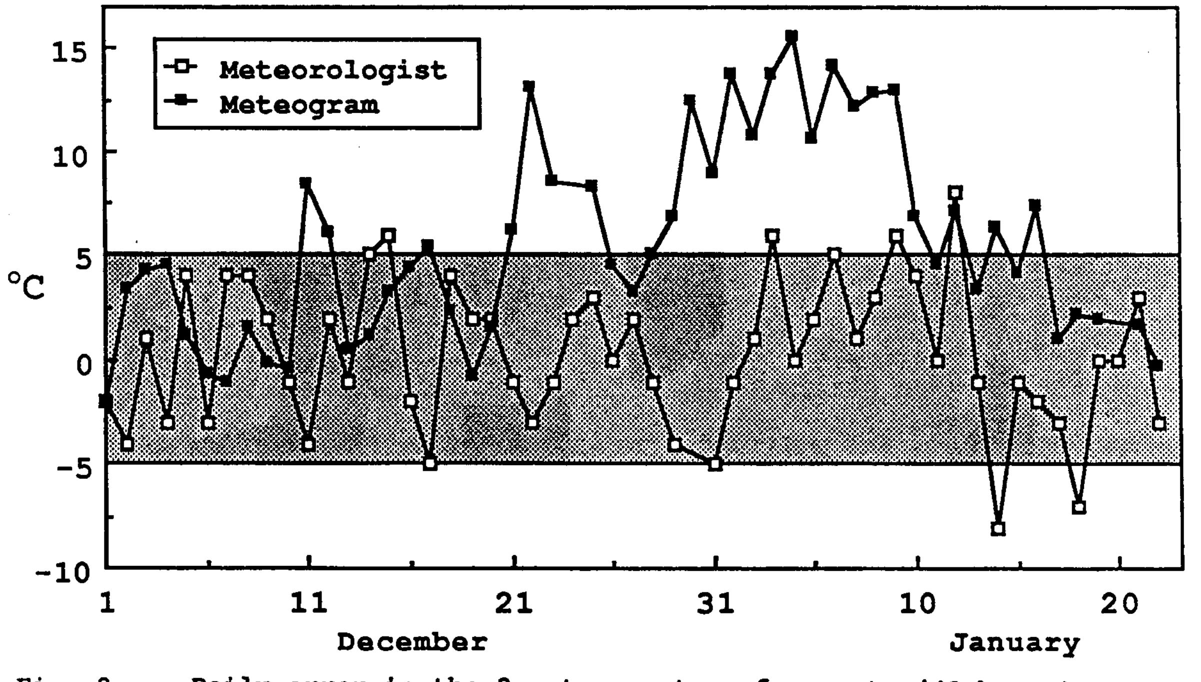

Fig. 2: Daily error in the 2 m temperature forecasts (48 hours) for Helsinki for December 1986 and January 1987, comparing the direct model output (full squares) with the prediction made by the forecaster (open squares).

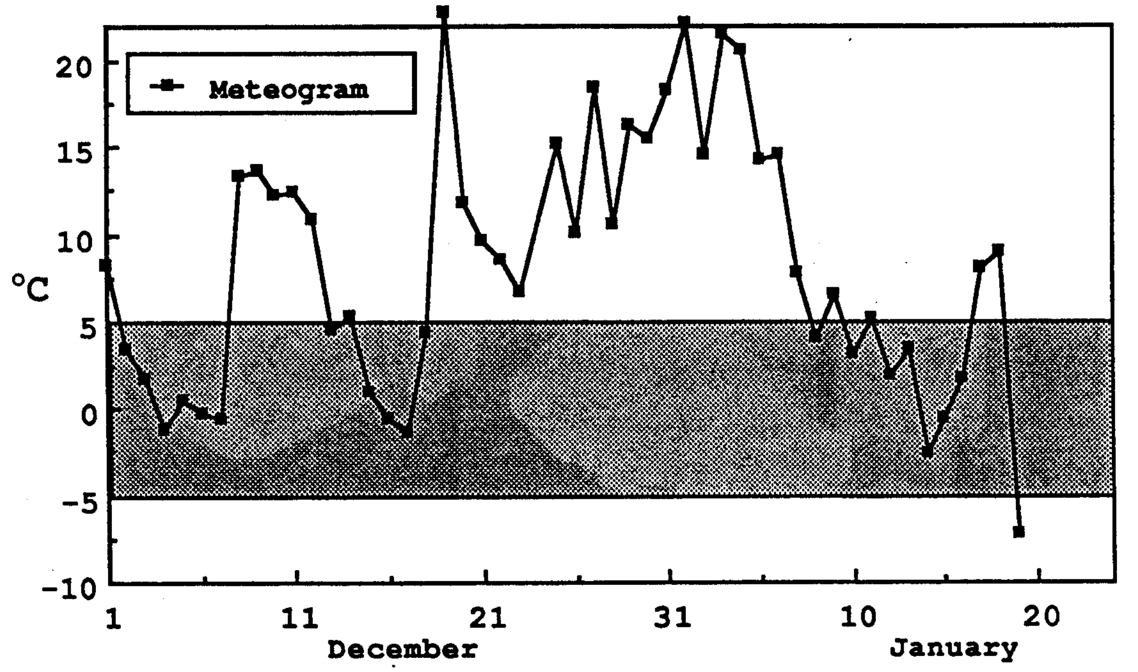

Fig. 3: As for Fig. 2, but for the 5 day forecasts, direct model output only.

Fig. 2 shows the errors (forecast - observation) of 2-day forecasts for the 2 metre temperature direct model output of the Centre's model, as normally depicted in the meteograms, compared to the forecasts of the meteorologist on duty, for December 1986/January 1987. It can be noted that the error made by the forecasters exceeds 5°C only six times, whilst the DMO error exceeded 5°C twenty three times, with a maximum error of more than 15°C. Fig. 3 shows clearly how more than half of the 5-day DMO forecast errors are larger than 5°C.

It is important to note that in reality the situation is not at all as discouraging as it seems from the meteogram. The forecasts are consistently too warm and consequently, such an error can be removed by statistical means or by the forecaster's skills. The man in the street, of course, is not aware of this.

The systematic (or mean) error of the DMO forecasts is over 5°C, i.e. the forecasts were on average 5°C too warm. The mean error of the meteorologists' forecasts was very close to 0°C. The so-called mean absolute error (the mean of the absolute values of daily forecast errors) was 5.5°C for the meteogram and 2.8°C for the meteorologist. Based on this measure, it is common practice to determine a relative skill score, depicting the quality of the forecasts in relation to a reference forecast such as persistence.

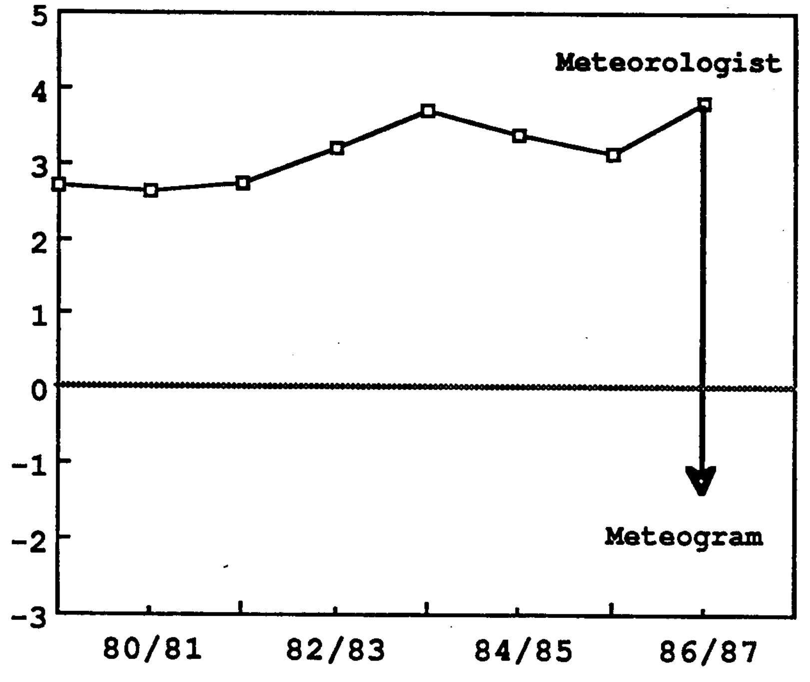

Fig. 4: Evolution of the relative skill of 48 hour temperature forecasts for Helsinki for January/December from 1979-80 to 1986-87. Arrow points to the (negative) skill of the direct model output during the last winter. Persistence is used as a measure of comparison.

The skill of the 2-day temperature forecasts produced by the meteorologists for the months of December/January during the 1980's is shown in Fig. 4. It shows, for instance, a relatively small positive trend (the trend for data covering the whole years is much steeper). The vertical arrow points to the score for the DMO forecasts for December 1986/January 1987; it is clearly beneath the zero line meaning that it would have been better to publish a simple persistence forecast instead of one based on DMO. The same result applies to DMO for all forecast ranges, i.e. it would be better to use the temperature observed today as a forecast as far as five days ahead than to look at the meteogram.

Above, I have published verification results only for the temperature. As regards the other surface weather parameters produced by the ECMWF model, similar observations apply to some extent. The precipitation and wind forecasts are known to be systematically in error, the cloud forecasts only give the total amount of clouds, which in many cases gives a misleading picture of prevailing weather (thin cirrus cover/thick cloud layers) etc.

It is regrettable if the meteograms are allowed to give a misleading picture of the quality of the ECMWF forecasts. In my view there is a real risk that this will happen in the longer term. The fact is, however, that the numerical forecasts produced by ECMWF are of top quality; as they continue to improve, they give the forecaster even better support to carry out his demanding duties.

- Pertti Nurmi,
Finnish Meteorological Institute

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FORTHCOMING CHANGES TO THE PERMANENT DATASET AND STAGING ROUTINES OF $SYSLIB AND ECLIB

This article is based on pre-release information from Cray Research and as such may be subject to change. With COS 1.16, Cray plan to change some of the parameter formats for the Permanent Dataset and Dataset Transfer routines in $SYSLIB. These routines include ACCESS, SAVE, DELETE, MODIFY, ACQUIRE, DISPOSE and FETCH. This may also have implications for the ECLIB routines which make use of these basic Cray routines, namely REQUEST, ATTACHL, CATALOG, PURGE, RENAME, STAGE and ATTACH. The main aims of these changes are to resolve some existing problems linked with multiple-value parameters and to provide CHARACTER data type support. These are 4 types of arguments to the $SYSLIB routines:

- keyword only (e.g. NA, UQ)
- single-value, single-word (e.g. DN, ED)
- single-value, multiple-word (e.g. PDN, TEXT)
- multiple-value, single word per value (e.g. PAM)

Currently the $SYSLIB routines accept only L-Hollerith data (e.g. 'MYFILE'L) for these parameters, either as constants or contained in integer variables. This changes with the 1.16 release:

- 'keyword-only' parameters may be specified using a character-constant (variable), or an L-Hollerith constant (or integer variable) or an H-Hollerith constant (or integer variable).

- For 'single-value, single-word' parameters, the values may be specified using the 3 methods described above.

- For 'single-value, multiple-word' parameters, the value must be specified by a character constant (or variable). The only exception to this is the PDN parameter, which can be specified by L-Hollerith if it is 8 characters or less in length.

- For 'multiple-value, single-word per value' parameters, the values may only be specified by an integer array whose elements hold the values as L-Hollerith data, terminated by an element containing zero.

As regards the ECLIB routines, the use of character constants/variables for the NPFN and NPLIST parameters should continue to work, but it is not yet certain if the routines can be modified to accept Hollerith data for these parameters. If you are using them at present, convert them to use character data type instead, to avoid future problems when COS 1.16 is put into production this summer.

- Neil Storer

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STILL VALID NEWS SHEETS

Below is a list of News Sheets that still contain some valid information which has not been incorporated into the Bulletin set or republished in this Newsletter series (up to News Sheet 201). All other News Sheets are redundant and can be thrown away.

No.	Still Valid Article
16	Checkpointing and program termination
19	CRAY UPDATE (temporary datasets used)
56	DISP
67	Attention Cyber BUFFER IN users
73	Minimum Cyber field length
89	Minimum field length for Cray jobs
93	Stranger tapes
118	Terminal timeout
120	Non-permanent ACQUIRE to the Cray
121	Cyber job class structure
122	Mixing FTN4 and FTN5 compiled routines
127	(25.1.82) IMSL Library
130	Contouring package: addition of highs and lows
135	Local print file size limitations
136	Care of terminals in offices
140	PURGE policy change
141	AUTOLOGOUT - time limit increases
144	DISSPLA FTN5 version
152	Job information card
158	Change of behaviour of EDIT features SAVE, SAVEX. Reduction in maximum print size for AB and AC
164	CFT New Calling Sequence on the Cray X-MP
166	Corrections to the Contouring Package
172	Change to CFT Compiler default parameter (ON=A)
174	Warning against mixing FTN4 and FTN5 compiled routines.
176	Archival of Cyber permanent files onto IBM mass storage
177	RETURNX, REWINDX
178	TIDs on Cray include 2 chara. TID plus 3 chara. source computer ID. Caution with ACQUIRE on RERUN jobs
183	NEXT version of Cray ECLIB and CONVERT DAYFILE/DAYFIL commands
186	PROCLIB changes
187	CFT 1.14. Bugfix 4 Maximum memory size for Cray jobs
189	ROUTEDF
190	Using ROUTE to direct RJE output to the Centre
194	NOS/BE level 664 Preventive maintenance schedules
197	MARSINT - subroutines for transformation from spectral to Gaussian or regular lat.-long. grid, and Gaussian to/from regular lat.-long. grid PROCLIB changes
198	Using the MOHAWK printer
201	New Cray job classes

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ECMWF CALENDAR 1987

11-12 June	25th session of the Council
31 August	ECMWF Public Holiday
7-11 September	Seminar: "The nature and prediction of extra tropical weather systems
14-16 September	15th session of the Scientific Advisory Committee
16-18 September	12th session of the Technical Advisory Committee
29 September-1 October	39th session of the Finance Committee
2-4 November	Workshop on Numerical Methods
25-26 November	26th session of the Council
30 November-2 December	Workshop on Diabatic Forcing
7-11 December	Workshop on Meteorological Operational Systems

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ECMWF PUBLICATIONS

TECHNICAL MEMORANDUM N° 132:	Turbulence closure applied to the parameterisation of vertical diffusion in the ECMWF model.
TECHNICAL MEMORANDUM N° 124 (2nd edition) :	A second generation fields database.
Daily Global Analysis :	October-December 1985

Forecast and verification charts: up to 31 March 1987

Proceedings of the Workshop on predictability in the medium and extended range, 17-19 March 1987.

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This is an index of the major articles published in the ECMWF Newsletter plus those in the original ECMWF Technical Newsletter series. As one goes back in time, some points in these articles may have been superseded. When in doubt, contact the author or User Support.

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*T indicates the original Technical Newsletter series

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