European Centre for Medium Range Weather Forecasts

ECMWF NEWSLETTER

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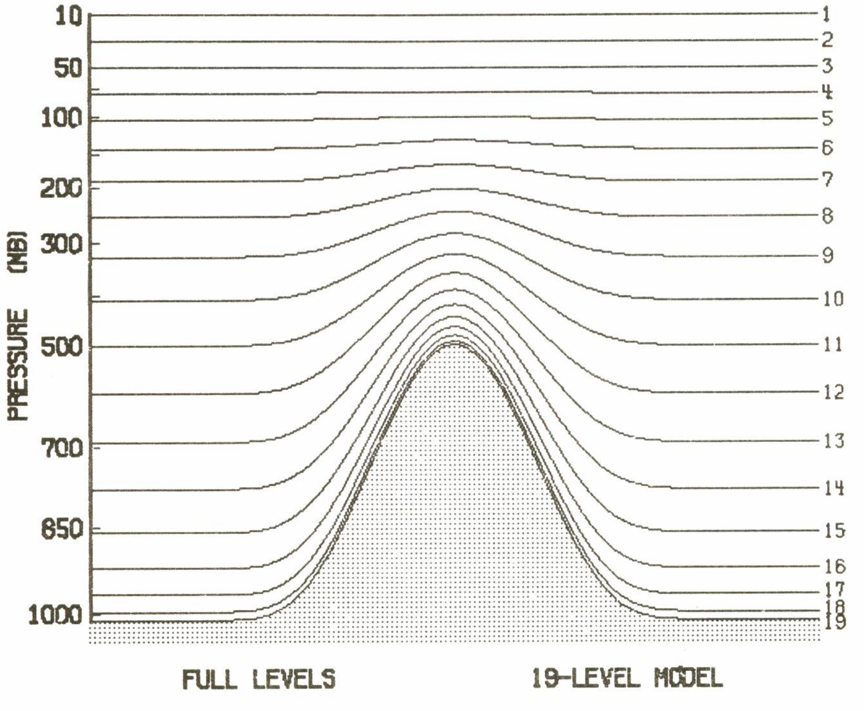

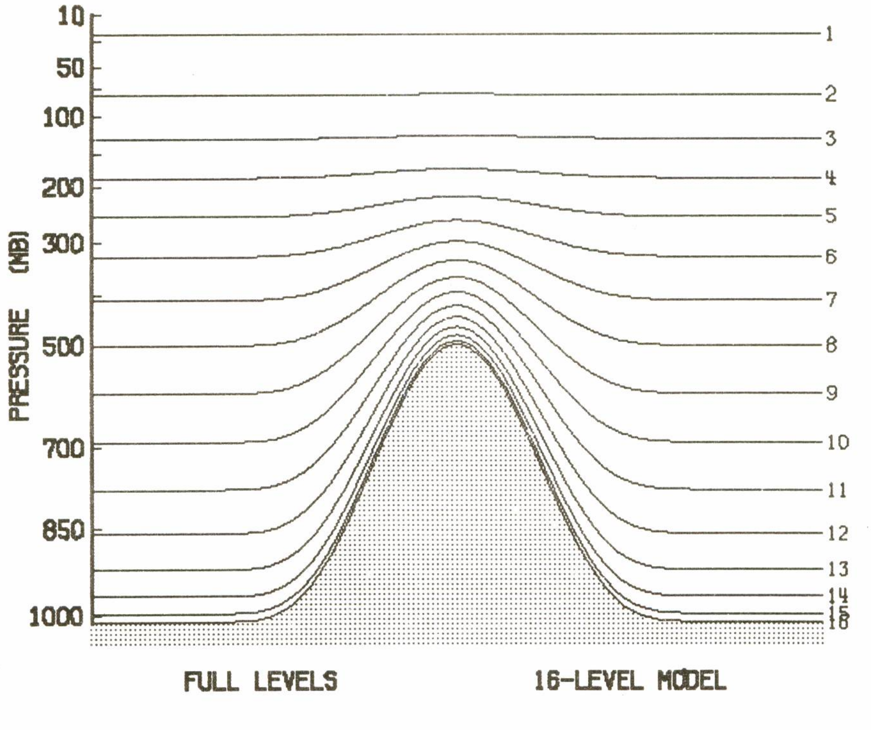

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COVER: Vertical distribution of full model levels for former operational forecast model with 16 levels (below) and new 19 level model (above).

This Newsletter is edited and produced by User Support.

The next issue will appear in September 1986.

As can be seen from the regular article on Page 1 of this Newsletter, we are in the midst of a period of considerable changes to the ECMWF operational forecasting system. An article on Page 3 gives details of the recently introduced modification to the stratospheric levels of the forecasting model and some initial information on the improvements expected to ensue from this change.

Later on, an article on Page 15 brings the news that the first phase of the implementation of the new telecommunications system is now complete and that the process of transferring Member States' telecommunications lines from the NFEP to the new system is about to commence. This enhancement of the telecommunications system, both in capacity and in the facilities which will eventually be available, represents a considerable step forward in the Centre's development and will substantially improve the service offered to the Member States.

The attention of users of the ECMWF computer system is drawn to two important pieces of practical advice on Page 17. File space remains the most limited resource of the Centre's computing facility: users should take note of this advice on how to use TEMP and SSD with the greatest economy and consideration for other users.

CHANGES TO THE ECMWF OPERATIONAL FORECASTING SYSTEM

Recent Changes

(i) Initialisation:
A modification was made to the initialisation scheme on 4 March 1986 in order to help preserve the tidal waves in the data assimilation. As a result, better use is made of surface pressure observations, in particular in the tropics, where the tidal fluctuations contribute, to a large extent, to the observed diurnal pressure variations.

(ii) Humidity analysis:
The humidity analysis was modified on 11 March 1986. Use is now made of the precipitable water content in the atmosphere, as observed from space and reported in the satellite data. Furthermore, the information about humidity in the atmosphere derived from synoptic surface reports, such as dewpoint and cloud amounts, is used in a modified way.

The change had a modest but consistent positive impact on the temperature forecast in the free atmosphere. More realistic forecasts of precipitation amounts result, in particular in tropical regions. For further information on the new humidity analysis, please refer to the article by L. Illari in ECMWF Newsletter No. 32.

(iii) 19-level forecast model:
The 16-level model was replaced by a 19-level model on 13 May 1986. The three extra levels were introduced in the stratosphere, where the five topmost model levels now closely coincide with 10, 30, 50, 70 and 100 hPa giving a better match in the resolution of the model and the analysis. Much improved stratospheric analyses of the mass and wind fields result from the use of the first-guess fields derived from the 19-level forecast model, removing, in particular, strong spurious vortices which sometimes occurred in the tropical stratosphere with the previous system.

The 19-level model also has a beneficial impact on the quality of the forecast. A better simulation of the vertical propagation of planetary waves is observed with the 19-level model. Forecast experiments showed on average an improvement in the anomaly correlations for the northern hemisphere height fields. This improvement is most significant in the later stage of the forecast. Further information on the change is given in an article by W. Wergen and A. Simmons on page 3 of this Newsletter.

Planned Changes

(i) New analysis code:
A newly coded version of the ECMWF analysis is planned to be implemented later in June. This change is primarily of a technical nature. However, further benefits from the 19-level model in conjunction with the new analysis code can be expected for the data assimilation. Data increments

will be assimilated on the model grid, thus making use of the full model resolution. Less vertical interpolation between model and pressure levels will be required.

(ii) Gravity wave drag:
On scales smaller than model resolution there exist gravity waves excited by stratified flow over irregular terrain. Depending on the atmospheric static stability and vertical wind shear, these waves propagate upwards and interact with the flow at other levels - an effect which has been ignored in the present model formulation. The parameterisation of the gravity wave drag is expected to be implemented after the new analysis code, later this summer. It will have a positive impact on the model climate, counteracting the zonalisation of the general flow and the development of too strong westerlies in winter, which are typical systematic errors of the present system. Experiments show a positive impact on the model performance in the northern hemisphere and Europe measured by the rms error and anomaly correlation of height. The improvement is most significant in the range 4-8 days.

- Horst Böttger

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THE USE OF INCREASED STRATOSPHERIC RESOLUTION IN THE OPERATIONAL FORECAST MODEL

Introduction

The vertical resolution of the operational ECMWF forecast model was increased from 16 to 19 levels on 13 May 1986. The uppermost "full level" at which winds and temperatures are predicted was raised from 25 to 10 hPa, and additional stratospheric levels were introduced such that the second full level is now at 30 hPa, the third level at almost exactly 50 hPa and two further levels are near 70 and 100 hPa. New and old distributions of levels are shown in the illustration on the front cover. It can be seen that the resolution was little changed below 200 hPa, the only difference of note being a reduction in the rate at which the terrain-following coordinate surfaces flatten over high ground as pressure decreases, a consequence of constraining layer thicknesses to vary smoothly as a function of pressure.

The principal motivation for investigating the change from 16 to 19 levels came from problems experienced with the stratospheric analyses produced operationally with the 16-level model. Because of the limited stratospheric resolution of this model, it was used in data assimilation to provide first-guess information only up to 50 hPa. For analysis at 30, 20 and 10 hPa, the differences of first-guess fields from model-generated values at 50 hPa were taken to be a blend of the differences for the preceding analysis and climatology. The preceding analysis was smoothed by representing it as a truncated series of Hough functions.

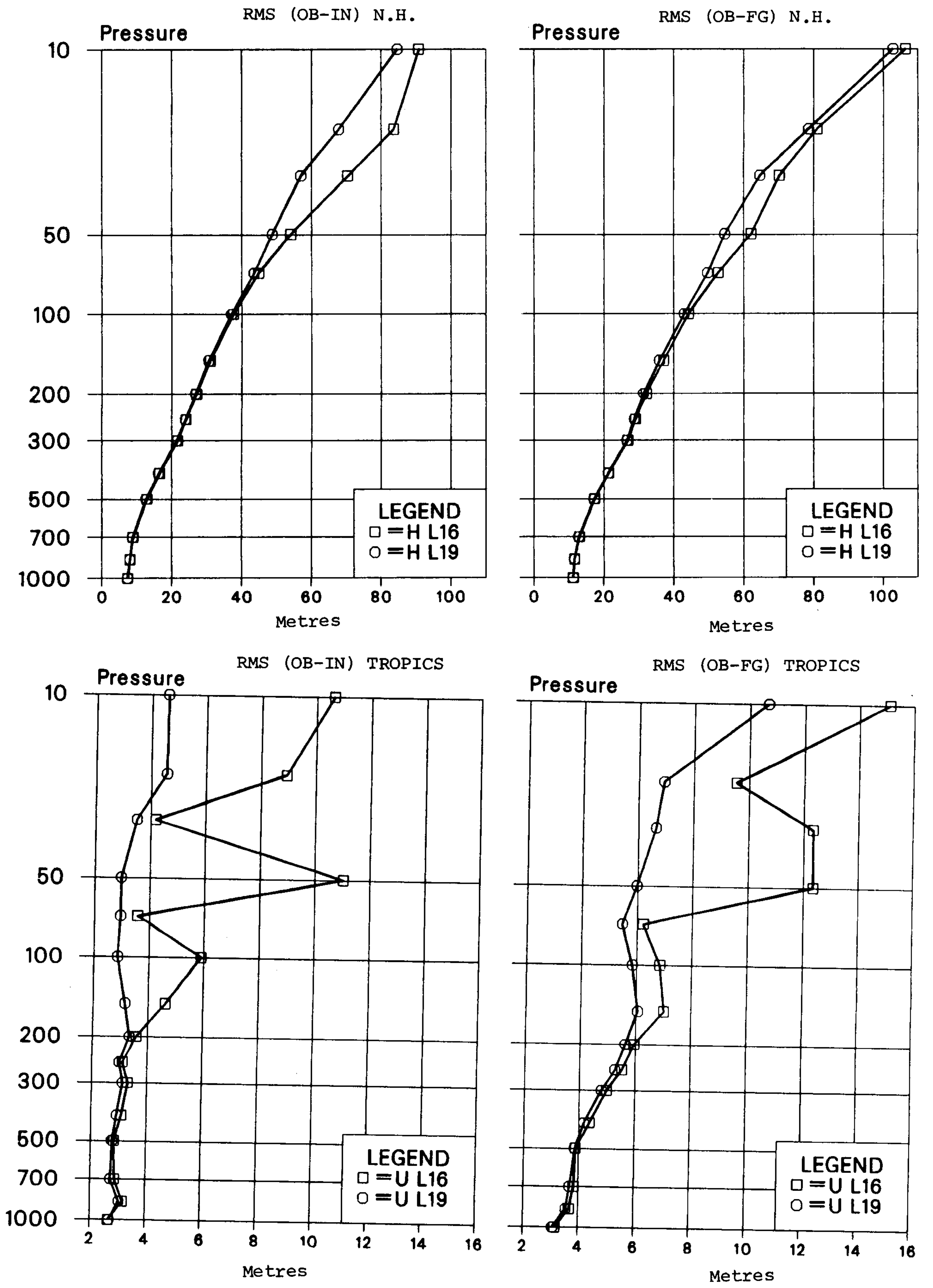


Fig. 1: Time mean (16.2. - 26.2.85, 00z), RMS fit of initialised analysis (left) and first guess (right) to radiosonde data. Upper panels are for northern hemisphere height fields and bottom for tropical zonal winds. The lines joined by circles are for the 19-level model and those by squares are for the 16-level model.

These procedures proved, however, to have some serious drawbacks. The use of the preceding analysis to provide the first-guess resulted in a tendency for incorrect structures to persist through many data assimilation cycles. In addition, the vertical coherence of the model first-guess was disturbed, resulting in large initialisation changes in the model stratosphere. Tidal signals were also mishandled. The Hough filtering gave rise to further problems, among them the removal of Kelvin waves, the weakening of strong gradients and a bias towards the acceptance of wind rather than height information.

The 19-level resolution was designed to remedy these problems by providing a model first-guess which could be used at all analysis levels. For all 19-level experiments reported here, no use of persistence and climatology was made in the formation of the first-guess, and no Hough filtering was applied.

Examination of increased stratospheric resolution was also motivated by modelling considerations. Previous experiments had suggested that a better treatment of the largest scales of motion in the stratosphere could lead to small improvements in tropospheric forecasts in the second half of the 10-day range, and work at ECMWF and elsewhere had demonstrated a more pronounced sensitivity of the tropospheric circulation to the treatment of the stratosphere in extended-range integrations. A more realistic representation of the stratospheric drag associated with vertically propagating gravity waves, currently a subject of parameterisation research, was also anticipated.

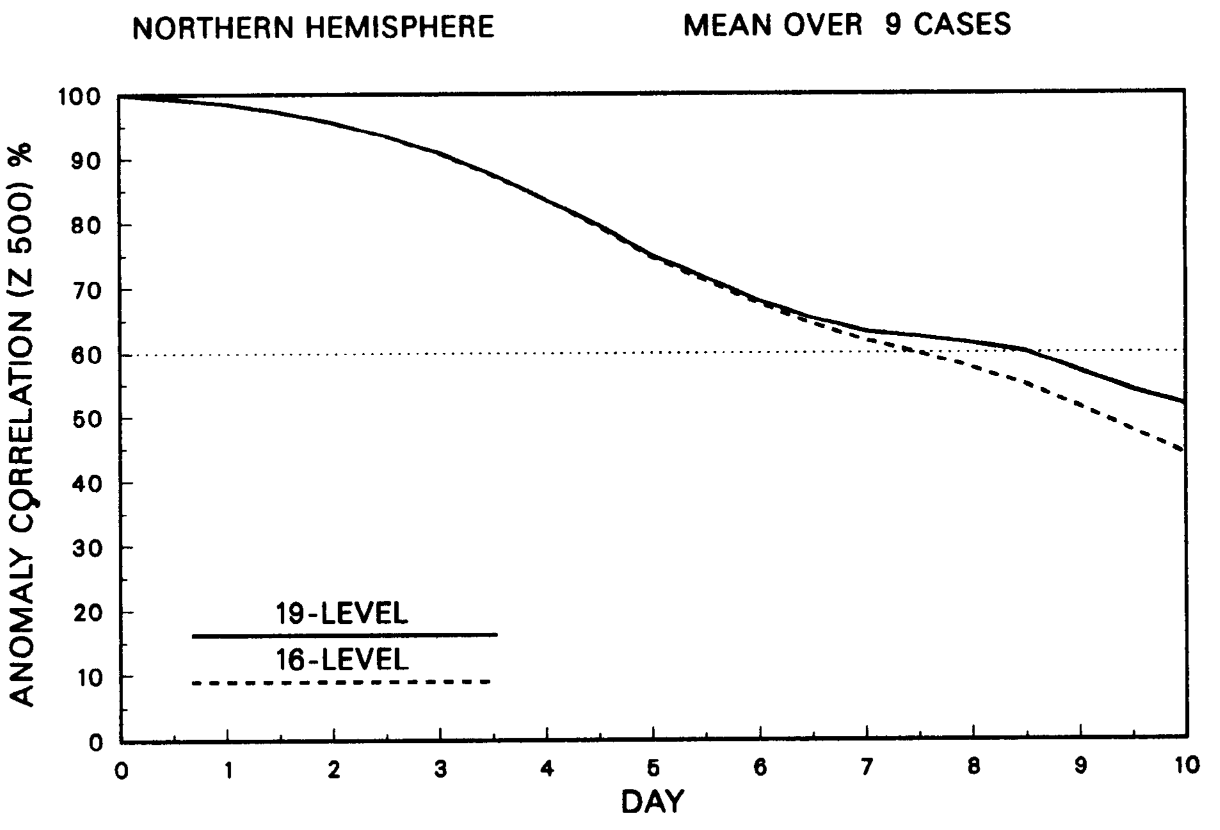
Preliminary Studies

(a) Data assimilation

The performance of the 19-level model in data assimilation was first tested in known "problem" cases. An earlier test of removing the use of persistence, climatology and the Hough filtering with the 16-level model showed that the geostrophic balance of the extratropical stratosphere could be destroyed by excessive interpolation between model and analysis levels. Repeating this test with the higher stratospheric resolution showed imbalances to be almost completely removed. In the tropics, the 16-level operational analyses were liable to exhibit spurious intense vortices in the stratospheric flow. Once present in the analysis, the use of persistence in the first-guess for the next analysis made it almost impossible for the system to remove these features, and manual intervention was required on several occasions in the recent past. An extreme case was repeated with two days of 19-level assimilation, which resulted in a successful removal of the erroneous vortices. In particular, an extreme local easterly flow maximum of 78 ms^{-1} at 50 hPa in the 16-level analysis was replaced by weak westerlies in the 19-level analysis. The latter were supported by two radiosonde observations which had been rejected by the 16-level system.

(b) Forecast experiments

An initial series of 19-level forecasts was carried out using initial data extrapolated and interpolated from 16-level operational analyses. Some significant differences in medium-range forecasts were found which could be traced back to short-range differences at 30 hPa. In view of the poor quality of the initial analyses at this level, it was decided to base assessment of



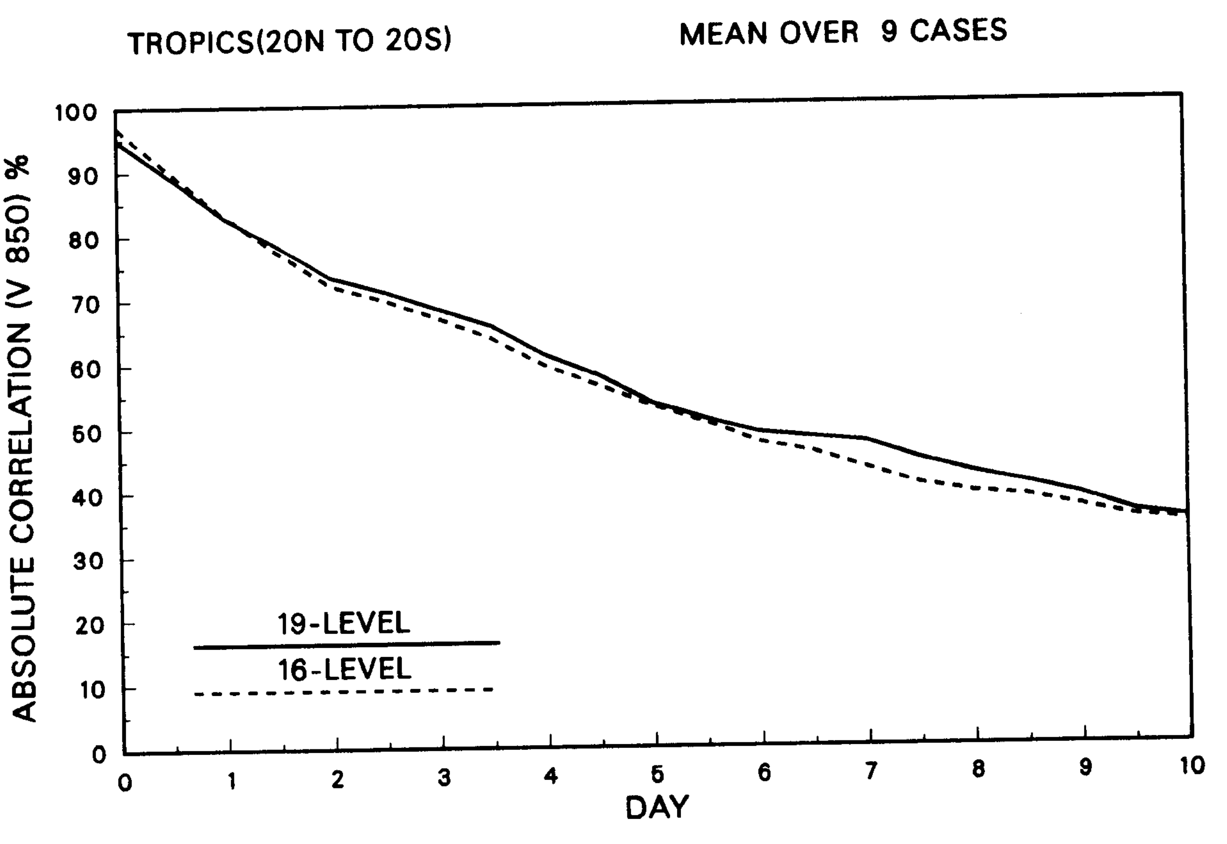


Fig. 2: Ensemble means of anomaly correlations of 500 hPa height for the extratropical Northern hemisphere (upper) and of absolute correlations of 850 hPa vector wind for the tropics (lower). The solid lines denote 19-level results and the dashed lines those for 16 levels. Operational analyses produced using 16 levels are used for verification.

19-level forecasts only on subsequent experiments from analyses produced using the 19-level model in data assimilation. The preliminary forecasts were nevertheless useful for adjusting horizontal diffusion coefficients to control (pending further investigation) a model "noise" problem which became more apparent with the increase in resolution. Moreover, in cases run for time ranges beyond 10 days, 19-level integrations exhibited some significant reductions in time-mean errors, especially when used in conjunction with the parameterisation of gravity-wave drag. In particular, simulation of splitting of the tropospheric jet stream over Europe was improved.

Extended Data Assimilations

Two series of extended data assimilations were carried out to test the longer-term stability of assimilations using the 19-level model, and to provide initial datasets for examining the impact of the resolution change on medium-range forecasts. The first comprised a 19-level test from 14 to 26 February 1985 using T63 horizontal resolution. The latest versions of the model and analysis codes were used, and a parallel 16-level assimilation was run to provide a strict control.

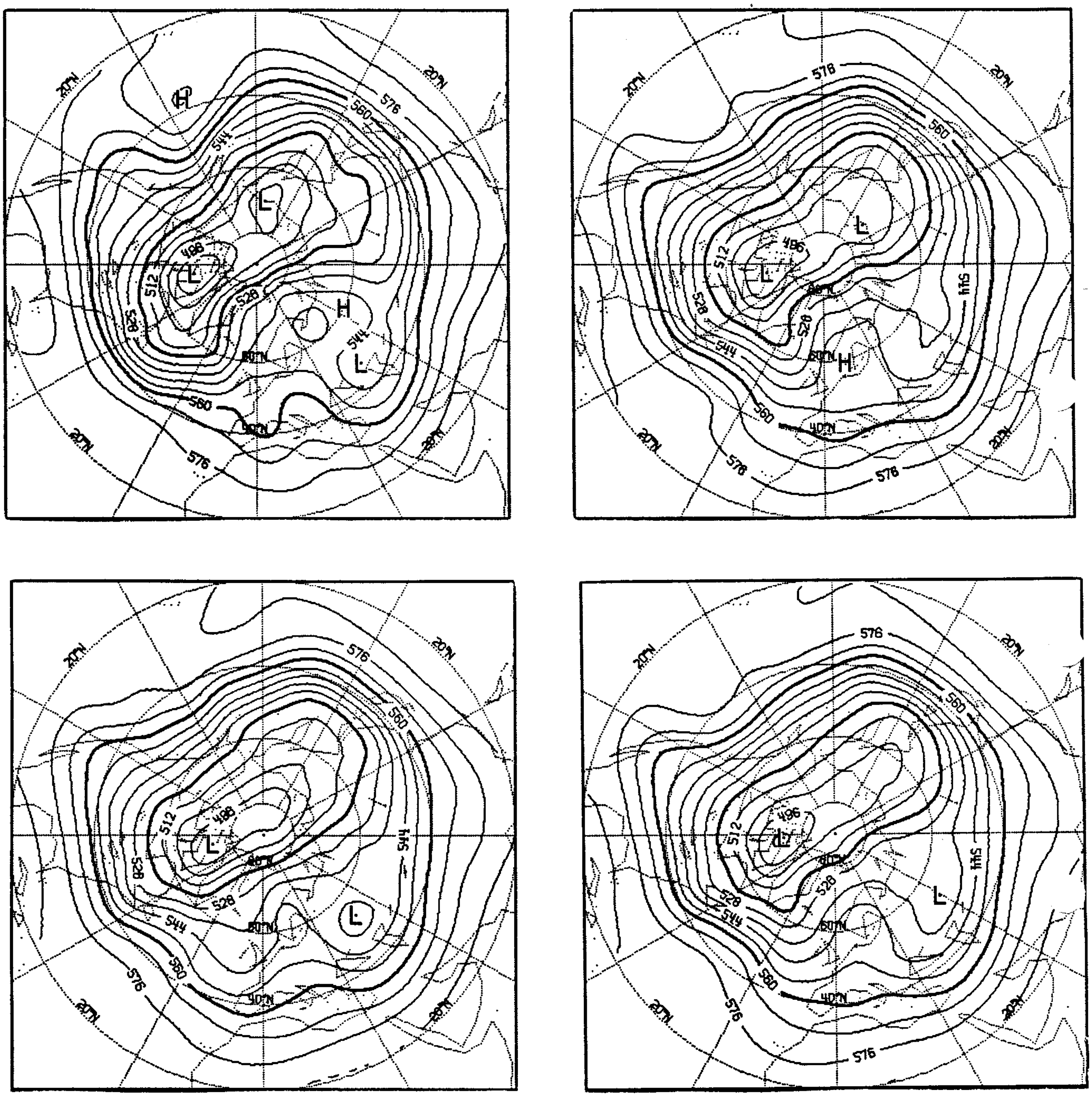
Because of large interpolation and extrapolation errors it took about 2 days for the 19-level assimilations to become well established. Results thereafter are summarised in Fig. 1, which shows root mean square fits of initialised analyses (left) and first-guess fields (right) to radiosonde data, for the northern hemisphere heights (upper) and tropical zonal winds (lower). The figures represent 10-day averages; no sign of a systematic drift of the assimilation was apparent over this period. The fits to data in the stratosphere are clearly significantly improved by use of the 19-level model, particularly in the tropics, where some benefit is seen almost down to the surface.

The second series was run in parallel to operations at T106 resolution. The period chosen was 24 to 30 March 1986. The results were qualitatively similar to the ones discussed above. Moreover, the fit to tropical height data was even better. This is because a special handling of the tides in the initialisation used for this series "sees" a vertically more coherent tidal signal with the 19-level model. Synoptic assessment showed the 19-level assimilation to be free from spurious tropical stratospheric vortices, as in the preliminary test.

Medium-Range Forecasts

Forecasts from both series of extended data assimilations were run at two-day intervals starting from the second day of each assimilation. This gave 9 pairs comprising 16-level forecasts from 16-level assimilations and 19-level forecasts from 19-level assimilations. These have been verified objectively, and some results averaged over the 9 cases are shown in Fig. 2. The upper plot presents anomaly correlations for the extratropical 500 hPa field of the Northern Hemisphere. It shows little impact of the resolution increase in the first half of the forecast range, but a quite substantial improvement beyond day 6. Examining individual forecasts reveals improvement in all but one case beyond day 7. The improvement is mainly due to a better representation of the planetary scales.

a) b)



c) d)

Fig. 3: Ensemble-mean 500 hPa heights for a) verifying analyses, b) 19-level D+10 forecasts from the 19-level assimilation, c) 16-level forecasts from the 16-level assimilation, d) 16-level forecasts from the 19-level assimilation.

Forecast quality is much lower for the Southern Hemisphere in these cases, but the 19-level resolution has a similarly beneficial impact.

Initial analyses were improved more substantially in the tropics by the use of the 19-level model, and this is reflected in the forecast verification. The lower plot of Fig. 2 shows mean absolute correlations of 850 hPa vector wind. These clearly favour the 19-level system, despite a penalty from using 16-level analyses for verification, which results in spuriously higher initial scores for the 16-level version.

Subjective assessment of the forecasts reveals a distinct improvement over Europe in the latter half of the 10-day range. This is found in many individual cases, and shows clearly in ensemble-average maps. Fig. 3 presents, from the first series of data assimilations, 6-case average 500 hPa heights for 3 sets of day 10 forecasts and for the corresponding verifying analyses. The latter are shown in the upper left panel. Upper right is the mean 19-level forecast from the 19-level assimilation, and lower left the 16-level forecast from the 16-level assimilation. Improvements in the Atlantic jet, the jet split and the downstream ridge and trough are evident. The six cases which comprise the average shown here were also used for 16-level forecasts using initial data from the 19-level assimilation. The lower right panel of Fig. 3 shows the corresponding mean D+10 forecast, which captures most, but not all, of the improvement. Objective verification confirms that the benefit of the 19-level system for medium-range prediction comes principally from the better defined initial state.

Concluding Remarks

Use of the 19-level model to provide directly the first-guess at all analysis levels results in stratospheric analyses which are qualitatively more realistic and which agree more closely with the available observational data. This was seen clearly in the test assimilations, and has been confirmed by the experience of the first few days of operational implementation. The prediction experiments point to significant improvements in forecast quality for the later medium range in the extratropics, and earlier in the range in the tropics. It should be borne in mind that the tests were carried out for two particular late-winter periods, and that the impact on forecast accuracy may well vary with the synoptic situation and season. It would, however, be surprising if the significantly improved stratospheric analyses were not to result in some general improvement in quality of the operational medium-range forecasts.

- Werner Wergen
  Adrian Simmons

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ECMWF FORECASTS OF SEVERE WEATHER CONDITIONS IN ITALY, WINTER 1986

The Director of ECMWF, Dr. L. Bengtsson, recently received the following report from the Director of the Italian Meteorological Service, Generale A. Nania.

In late January and early February 1986, the whole Italian peninsula was affected by very severe weather conditions. This was due to an "explosive" deepening of a low pressure area in the western and central Mediterranean basin. Very heavy rainfall occurred, practically over the whole country, reaching record levels at some stations, mostly on 21 January. Sudden floods followed in several areas including Rome. Winds ranging from strong gales to storm intensity developed over the central Mediterranean, bringing about huge damage along Italian coasts, mainly in the Adriatic sector. An exceptionally high tide flooded Venice, while a very strong Bora was lashing Trieste and the northern Adriatic sea.

The ECMWF forecasts, used and post-processed by our Service, allowed us to advise the country in good time about the expected sudden deepening of the depression and its subsequent persistence. In particular, on 27 January, the Italian Meteorological Service was able to provide early warnings to the Civil Protection Department and to the Press.

A second spell of severe weather occurred in the period 7-12 February, when a cold outbreak affected the central Mediterranean, giving rise to heavy and extensive snowfalls over Italy. About 20 cm of snow was recorded at Rome. - A snowfall of such intensity has only happened once previously, in 1740! - In this case also, ECMWF's products were highly valuable and effective for outlining the overall pattern of the development, allowing the Meteorological Service to issue early warnings.

In the two cases mentioned, both the 700 hPa fields and the 850 hPa thermal patterns were extremely useful from the synoptic point of view and as a support to the statistical post-processing, for assessing the intensity of the predicted phenomena.

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VERIFICATION OF ECMWF T106 MODEL FORECASTS IN CHINA

The following report is condensed from a paper received from Dr. Li Ze Chen, Director of the National Meteorological Centre of the State Meteorological Administration, People's Republic of China.

ECMWF forecast products disseminated over the GTS have been widely used in China during the past few years and have been greatly appreciated. The success of the ECMWF forecast model in predicting zonal flow patterns and also the onset of blocking has been much appreciated. During the reception of the T63 spectral model a number of systematic errors were also recognised:

(i) A negative bias in geopotential height forecasts, particularly over Europe and eastern Asia in January, and over northern Europe and the Pacific in July.

(ii) The forecast development of trough/ridge systems in the Tibetan Plateau area tends to be too intense and their movement too fast.

(iii) The intensity of the predicted West Pacific Subtropical High (WPSH) is usually too weak, its centre too far to the north, and its westmost extent too far to the east.

However, since the introduction of the high-resolution T106 forecast model in May 1985 a significant improvement in the prediction of the WPSH has been widely recognised by Chinese forecasters.

In order quantitatively to assess the improvement in forecast skill following the introduction of the T106 model, the 500 hPa geopotential height forecasts in the west Pacific subtropical area were verified during May-August 1985 and the results compared with those for the corresponding forecasts in 1983. Table 1 shows the prediction errors in the north-south locations of the ridge of the WPSH at 120°E and 140°E for July 1983 and July 1985. In this table, both the mean error (M) and the mean absolute error (A) are shown, in units of degrees of latitude. Positive and negative errors correspond to a predicted position of the ridge too far to the north or south, respectively. It is clear from the table that the predicted position of the ridge is usually quite good, and also that there has been a general improvement in the 1985 performance as compared with 1983, especially for the D+3 forecasts.

Some further errors have been noted in predicting the westward advance and development of the WPSH, although its subsequent eastward regression and decay are usually well forecast. The overall conclusion is that the T106 model performs significantly better in forecasting the WPSH than the earlier T63 model.

		120°E				140°E			
		EC_{48}	EC_{72}	EC_{96}	EC_{120}	EC_{48}	EC_{72}	EC_{96}	EC_{120}
M	83	-0.1	0.5	0.5	1.2	0.2	0.8	1.1	1.2
	85	0.5	0.2	-1.0	-0.6	-0.4	-0.5	-1.6	-1.9
A	83	1.8	1.8	2.0	2.3	1.7	1.9	2.2	2.1
	85	1.6	1.1	2.0	2.8	1.2	1.8	2.1	2.3

Table 1: Prediction errors in the north-south locations of the ridge of the WPSH at 120°E and 140°E in July in 1983 and 1985 respectively. Negative (position) means the prediction is to the south of the corresponding observation.

M: Mean errors
A: Mean absolute errors
Unit: latitude interval.

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A SUMMARY REPORT ON ECMWF FORECASTS

The report below was recently received from the Malaysian Meteorological Service.

This is a summary of the performance of the ECMWF forecast model over the region of south east Asia during the period October-December 1985. It is based on the subjective evaluation of the analyses and forecasts of the tropical winds, at 850 and 200 hPa levels, and the precipitation forecasts covering a 3 month period, from October to December 1985.

At 850 hPa, the positions of the monsoon troughs or the near-equatorial troughs are well predicted by the forecast model. The prediction of the tropical disturbances embedded within the monsoon trough show considerable skill, though it has a tendency to overpredict their westward movement. However, the model is not capable of predicting the recurvature of tropical storms/typhoons over the western Pacific. It is also observed that the predictions are better when the disturbances/storms are located west of 120°E, perhaps a manifestation of data problems over the western Pacific Ocean.

The trade winds in the tropical Pacific and Indian Oceans are predicted reasonably well, even on the occasional development and subsequent translation of the easterly waves. The useful range of forecast on the arrival of cold surges over the northern part of the South China Sea well exceeds 3 days, possibly in the range of 5-7 days ahead, depending on the intensity of the surge. The assessment of the model's downstream interactions between the cold surges and the near-equatorial disturbances are hampered by the incorrect easterly phase speed of the latter.

Overall, the precipitation forecasts give a somewhat useful approximation in the larger scale but the descriptions on the smaller scales are far from satisfactory. Over the "Maritime Continent", the predicted rainfall show a general underestimation. Low level dynamic ascents over mountain ranges appear to produce excessive rainfall. The precipitation associated with the passage of cold surges over northern part of the South China Sea appears to be over-estimated.

The performance of the model at the 200 hPa level is much more satisfactory. The location of the Subtropical High, the formation of large amplitude westerly troughs and their extension towards the equator, the mid-latitude to tropical wave interactions over the oceanic regimes are important synoptic features simulated. Upper tropospheric transient eddies are not infrequent over the "Maritime Continent", these are obviously not predicted and lead to the prediction of more zonal upper level equatorial easterlies. The ability of the model to simulate the intensification of divergent circulation (local Hadley and east-west circulations) following a surge is difficult to assess and more detailed evaluations are required.

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EXPERIENCES OF T10 FILTERED PRODUCTS FOR 10-DAY FORECASTS

As mentioned in an earlier note in Newsletter No. 33, the Swedish Meteorological and Hydrological Service (SMHI) has for many years supplied the icebreaking service with wind and temperature forecasts out to 10 days. The 5-day mean temperature forecasts are made in so-called Namias classes, 1-8, each having a climatological probability of 12.5%. The scoring table gives 100% for perfect forecasts and 50% for pure guesses.

The day 1-5 forecasts have been of high quality during recent years, mainly due to the guidance based on statistical interpretation of ECMWF products (in the range +36 to +156 hours). The day 6-10 forecasts issued by SMHI did not exhibit much skill; not only are they based on model output for the later stage of the forecast range (from +156 hours onwards), but they also exceed the +240h forecast range by 36 hours. Verifications over the years have shown the day 6-10 forecasts to score 63% (± 2%), compared with 67% (± 3%) for persistence (the five days preceding the day the forecast was issued).

Last winter 1985/86, the spectrally filtered forecast fields of 500 hPa geopotential, sea surface pressure, 850 hPa temperature and anomalies were used by the forecasters when they prepared the day 6-10 outlook (without any statistical interpretation). The meteorological staff had been specially educated and trained in the use of these new products.

With the icebreaking season almost over in late April, the verification shows significant improvements compared to earlier achievements: 74% for the subjective forecasts against 68% for persistence.

The skill compared with persistence becomes even more evident when verification is performed for different weather types. When the same weather type persisted over the whole 10-day period (1/8 of the time), persistence scored 94%, the operational day 6-10 forecast 85%. For the cases with a change in the weather type, which accounts for half of the events, persistence scored 55% (close to random), the operational forecast 72%.

Forecasted trends

Observed trends	-4	-3	-2	-1	0	+1	+2	+3	+4
+6	.	.	.	.	.	.	1	.	.
+5	.	.	.	1	2	1	2	.	.
+4	.	.	.	.	4	7	9	2	.
+3	.	.	.	.	7	28	5	3	.
+2	.	1	2	8	18	21	8	2	1
+1	.	3	4	12	45	34	20	.	1
0	1	.	7	33	78	53	19	3	.
-1	.	.	8	20	39	25	9	.	.
-2	.	1	6	18	26	12	1	.	.
-3	.	1	6	9	14	3	.	1	.
-4	.	.	2	1	3	.	.	.	.
-5	.	.	4	.	.	.	.	.	.
-6	.	.	1	.	.	.	.	.	.

Table 1: Contingency table of the trends in Namias classes from day 1-5 to day 6-10. Forecast values on x-axis, observed on y-axis.

As can be seen from Table 1, extreme errors in forecasting temperature changes (more than two categories away from the diagonal), in the later stages of the medium range, are limited to 15%.

Recent improvements of the ECMWF model have moved the range of optimal usefulness of the filtered products from +96/+168 hours in 1983-84 to +120/+192 hours in 1985-86.

- Anders Persson
S M H I

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THE OPERATIONAL INTRODUCTION OF THE NEW TELECOMMUNICATIONS SYSTEM

From the beginning of ECMWF daily operations, telecommunications links with Member States have been controlled and powered by the Regnecentralen Network Front End Processor (NFEP). This equipment, originally designed to disseminate 10 million octets of data during a 10 hour dissemination period, has been endeavouring, in recent months, to disseminate over 30 million octets during a 5 hour period each night. That the equipment, both hardware and software, has performed well is in no doubt. Indeed, it is a credit to the total system that it has been possible to meet a requirement 6 times the original specification in terms of throughput. Nevertheless, the NFEP had become a bottleneck, and it would not be possible to plan for the dissemination of the higher resolution data resulting from higher resolution forecast models without a more powerful replacement.

The contract for a new telecommunications (NTC) system was awarded to Software Sciences Limited (SSL) in 1985. It comprised a hardware solution based on a cluster of 4 DEC VAX-750 computers coupled with software to support facilities identical to the NFEP at first, expanding to enhanced capabilities later. (See ECMWF Newsletter No. 31, September 1985, for a fuller description of the new system.) By design, the NTC system will be capable of a throughput of 3 to 4 times the capacity of the NFEP. Additionally, some 25% of the processing power has been reserved for dissemination applications.

The first phase of the NTC implementation is now complete. The hardware is in place; the initial software is running; preliminary tests with Member States have taken place. The NTC system can now begin to take over the handling of the telecommunications network. It is planned to switch lines from the NFEP to the NTC system in a phased manner. Migration from the NFEP to the NTC will begin early in June and is planned to be complete by the end of July.

Dissemination software at ECMWF has been modified to minimise migration problems during the change. Although the format of dissemination products reaching Member States will not change, the ECMWF dissemination system has to prepare and send files to the NTC in a slightly different way from those destined for the NFEP. This has been achieved by coupling the extra code to a table depicting which line is attached to which telecommunication system. By altering a table entry and simultaneously moving the line connection from the NFEP to the NTC, dissemination or repeat dissemination can be correctly configured. It is thus a simple process to configure dissemination from the NFEP to the NTC.

Member States' batch jobs submitted via the NTC will be routed to the correct front-end computer at ECMWF and output returned, as has been the case with the NFEP. The ROUTEDF command, used to return files to Member States, has been modified, in line with the dissemination code, to support both the NFEP and the NTC. There are a small number of changes to the operator interface, which apply to computer operators using the console liaison; documentation detailing these has been sent to the Member States concerned. For the general user, every effort has been made to reduce the impact of the change to a minimum. We hope that the only significant result of the change-over will be a faster, more efficient service!

The initial benefit of the NTC system should be to remove a bottleneck between ECMWF and Member States' users. This should lead to faster receipt of dissemination products and quicker transfer of files and batch output to users.

Once the initial change-over is complete, work to improve and enhance the services offered will continue. Facilities to enable users to edit, prepare and submit jobs and store and manage files directly on the NTC VAX system will be added. Dissemination will be enhanced to provide a new range of high resolution products in WMO FM 92 GRIB form. The data base for the enhanced dissemination will reside on the NTC, enabling users to obtain products on demand. A MARS interface will be provided to enable data from the MARS archives to be requested directly from the NTC. The feasibility of enabling users access to the MAGICS graphical system, returning results in standard METAFILE form will be explored.

We are very conscious that Member States' users judge ECMWF according to the quality of the services offered. In an ideal world, a Member State user should have the same facilities of access to the ECMWF computer system as an in-house user. While the NTC will not provide such an ideal situation over night, future developments will be aimed at achieving as much of that goal as is possible within the resources available.

\- Rex Gibson

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TEMP DISK SPACE

Recently, some users have stored huge amounts of data on the TEMP disks. In many cases they have been using GETDATA or FINDATA. The total TEMP disk space is five 885 disk packs, (approximately 315 million words). This is a maximum because up to two of these disks are "spares", i.e. if any other essential disk set (e.g. SYSSET) fails, then one of the TEMP disks is removed. Therefore, on average, there is only 4 million words per active user.

To improve the present situation, users are requested to:

(i) purge TEMP files immediately they are no longer required, rather than waiting for the automatic purge to delete them;

(ii) inform the operators of jobs requiring more than 4 million words, so that such jobs can be scheduled at an appropriate time. Internal users are requested to supply such information on the pink job information cards. External users should supply User Support with the information and a pink job information card will be completed on their behalf.

In future, if users create such files without informing the operators, those files may be purged without warning.

Note to GETDATA/FINDATA users - 4 million words is equivalent, for example, to a global field in grid form at a resolution of 1.875 (T63) for 5 levels and 4 parameters for 1 synoptic hour for 10 days.

- John Greenaway

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EFFICIENT USE OF THE SSD

Many jobs which use the SSD reserve slightly more SSD than they use. When the SSD is no longer required, the used portion is released for other users, but the unused portion remains reserved until the end of the job. Although this may be only in the order of a few thousand words, it can be enough to prevent other SSD jobs from executing. Since many such jobs perform tidying-up operations, such as disposing to tape, before terminating, this can prevent other SSD jobs from initiating for some time.

To circumvent this problem, a new control card 'FREESSD.' has been made available. When your SSD job has finished with the SSD, use FREESSD to release any remaining SSD which may be reserved by your job.

```
e.g.  .
      .
      .
    LDR.        step using SSD for dataset SSDFILE.
   RELEASE(DN=SSDFILE)
   FREESSD.
      .
      .
      .
   remaining steps e.g. DISPOSEs.
      .
      .
      .
```

\- **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 188). 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
167	CFT 1.13 improvements
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
182	NOS/BE level 627
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

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ECMWF CALENDAR OF EVENTS

15-19 September	Seminar: Observation, theory and modelling of orographic effects
19-20 September	Workshop: Representation of orography in NWP models
29 September- 01 October	14th session of the Scientific Advisory Committee
01-03 October	11th session of the Technical Advisory Committee
06-09 October	Information meetings on Archiving and Retrieval (MARS), Graphics (MAGICS) and new telecommunications system (NTC)
06-08 October	37th session of the Finance Committee
09-10 October	Member States' Computer Representatives meeting
03-04 December	24th session of the Council
08-10 December	Workshop: Using multiprocessing for meteorological applications

ECMWF PUBLICATIONS

TECHNICAL MEMORANDUM N°. 114:	Statistical assessment of an observing system experiment based on frequency distributions of 500 hPa differences.
TECHNICAL MEMORANDUM N°. 115:	Energy Conserving Galerkin Finite Element Schemes.
TECHNICAL MEMORANDUM N°. 116:	A standardised verification scheme for local weather forecasts.
TECHNICAL MEMORANDUM N°. 117:	First report on comparison between bulletins transmitted on the GTS and those received at ECMWF (period 1-5 October 1984).
TECHNICAL REPORT N°. 54:	Finite element schemes for the vertical discretisation of the ECMWF forecast model using linear elements.
TECHNICAL REPORT N°. 55:	Finite element schemes for the vertical discretisation of the ECMWF model using quadratic and cubic elements.

WORKSHOP on High Resolution Analysis (24-26 June 1985)

RESEARCH MANUALS:	Model documentation - Updates for Volumes 1, 2 and 3.
DAILY GLOBAL ANALYSIS:	October - December 1984.
ECMWF FORECAST & VERIFICATION CHARTS:	to 28 February 1986.

INDEX OF STILL VALID NEWSLETTER ARTICLES

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.

*T indicates the original Technical Newsletter series

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	-	Alan Radford	OB 006	345
	-	Liam Campbell	OB 003	348
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