TECHNICAL MEMORANDUM

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Report on a trial production of ECMWF forecasts based on 00Z data, 10 September-30 November 1986

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December 1986 (revised January 1987)

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1. INTRODUCTION

ECMWF produces daily global analyses for the four main synoptic hours 00, 06, 12 and 18Z. Data collection times of up to 18 hours ensure that the global data coverage for each of the data assimilation cycles is as complete as can possibly be achieved within the operational constraints of a timely production of the forecasts. Within the present operational schedule ECMWF produces a ten day forecast based on 12Z data. The medium range products become available for further processing in the Member States with a delay of approximately 12 hours after data observation time. Previous ECMWF studies (Woods, 1981,1982) indicated that while forecasts based on 00Z analyses with a short data cutoff of three hours would have an operational advantage, there would inevitably be a loss of predictability of up to several hours depending on the variability of the data coverage and also other factors such as the flow pattern, the season and the forecast area and range. This adverse effect on the quality of medium range forecasts would partly offset the benefit of providing the more recent forecasts based on new data.

Following discussions in the ECMWF Council the Technical Advisory Committee and the Scientific Advisory Committee, the Centre set up a scenario for a trial production of ECMWF forecasts based on 00Z data. The operational arrangements of the trial and the evaluation of the results are presented in this document together with a summary of the responses received from the Member States, both on the operational usefulness and the quality of the 00Z based forecasts. The original reports from the Member States are reproduced in the Annex.

2. PREVIOUS ECMWF STUDIES

The arrival time of operational 00Z data at ECMWF and the impact of a reduced data coverage on the quality of forecasts based on 00Z data was studied by A. Woods for selected periods in 1981 and 1982 (ECMWF Technical Memorandum No.30 and 57).

As part of this study, the arrival of 00Z GTS data at ECMWF between 0230Z and 0330Z was monitored for the period 14 to 20 January 1981. While many important data, including Southern Hemisphere and Pacific data were received between 0230Z and 0300Z, many TEMP C and D (high level) reports were not available until after 0330Z. Data reception was found to be significantly reduced between 0300Z and 0330Z.

A series of experimental forecasts based on 00Z data with a 0300Z data cutoff time was run, five forecasts in May 1980, ten during February to April 1981 and a further thirteen for the period January to April 1982. While the first two test series were selected with several criteria in mind (in particular they included cases where there had been significant meteorological changes between two operational forecasts), the third series of experiments was based on a random selection. Similar results were obtained from all these experiments.

Combining the results of the ten 1981 experiments and the thirteen 1982 experiments a gain of 9.6 hours (±1 hour) in predictive skill was obtained from the Northern Hemisphere standard deviations score of 500 hPa height errors. For a limited area such as Europe the results exhibited more variability, with an average gain of 11.2 hours (± 3 hours), while for the Southern Hemisphere the reduced data coverage associated with the early cutoff time had an obvious impact on the forecast quality leaving a gain in predictive skill of only 6 hours (± 1.5 hours) compared with the operational forecasts based on 12Z data the day before.

3. ARRANGEMENTS OF THE TRIAL PRODUCTION

3.1 The schedule

The schedule of the trial production of the forecasts based on 00Z data is shown in figure 1, together with the schedule of the operational suite. The operational analyses with the long cutoff times were used in the assimilation cycles for the trial forecasts. In particular, the 18Z and 00Z analyses of the trial were routinely repeated, assimilating the additional data which reach the Centre after the early cutoff times. Note that the times indicated above the analysis boxes in figure 1 are data cutoff times, i.e. the time when the last decoding of GTS data is started. The data extraction from the ECMWF Reports Data Base follows after the decoding, and the actual analysis runs approximately 60 minutes after the cutoff time. The 10 day forecast takes 2 hours 40 minutes to complete on the Cray and is followed by the MARS archiving of the numerical output. Under optimum conditions archiving of the trial production was completed by 0900 UTC.

The trial production of the forecasts based on 00Z data started on 10 September 1986 and finished on 30 November 1986.

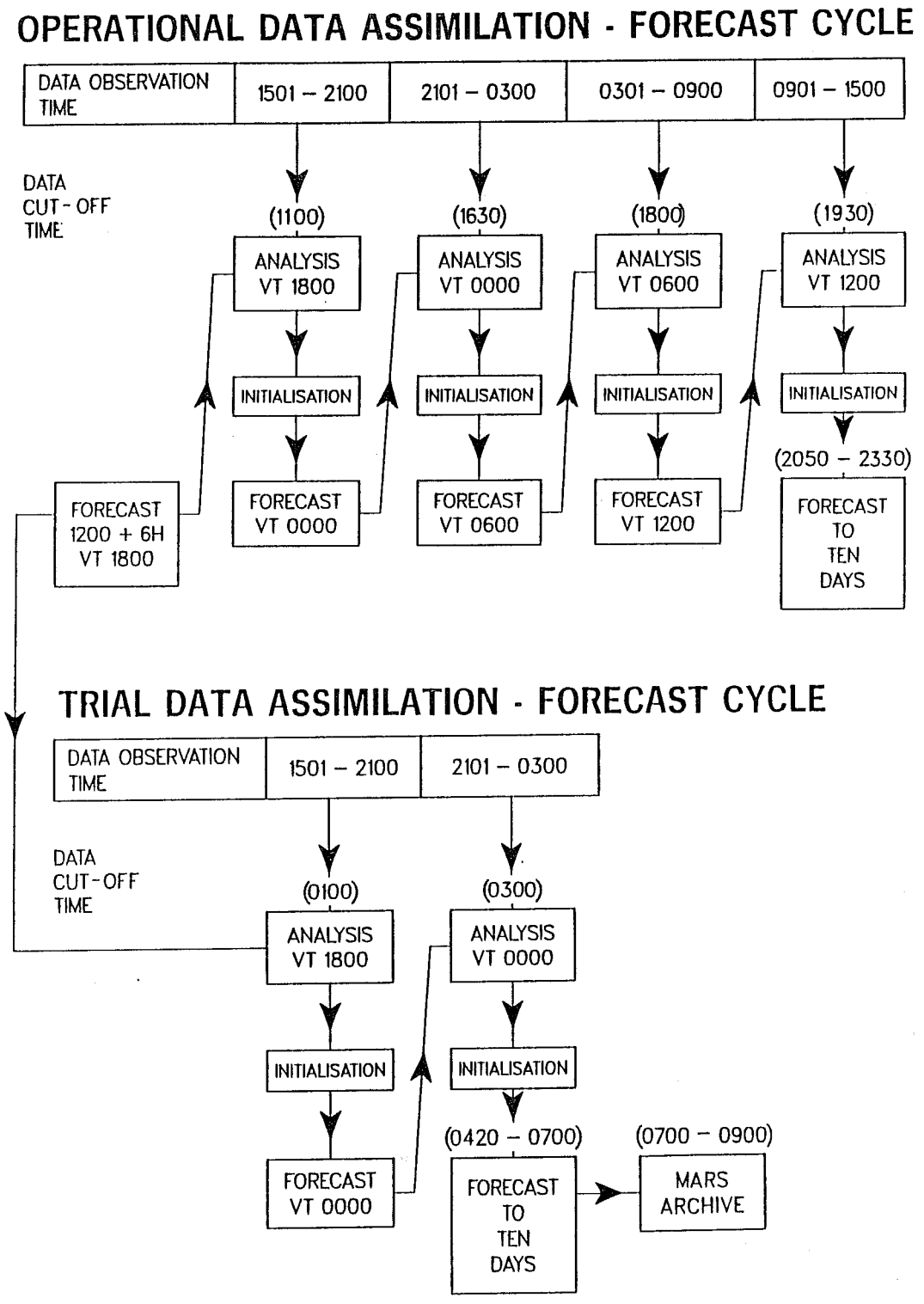


Fig. 1 Data cutoff and run times of the operational and trial data assimilations and forecast cycle during the trial production.

3.2 Data access by Member States

Member States wishing to inspect the results of the trial production were able to access the data via a pre-release version of the Centre's archiving and retrieval system MARS, which returns the data in GRIB code. Software giving examples of access to the MARS archives and of the decoding of the data was provided by the Centre. Additional advice was available from the User Support Section.

3.3 Dissemination of charts

Charts of 500 hPa height and temperature, together with the mean sea level pressure and 850 hPa temperature fields for the Atlantic-European area were disseminated to countries where telecopier installations are available. The charts were dispatched at the earliest possible time, out to forecast time 60 hours normally after 0600 UTC, and the remainder of the forecast normally after 0700 UTC. Although for practical reasons the area and the parameters plotted in the charts had initially to be fixed for all the recipients, it was possible to accommodate individual requests for selection of forecast steps.

4. RESULTS

4.1 Operational reliability

Fig. 2 summarises the CRAY run times of the forecasts during the trial production in October 1986. Completion of the forecast was scheduled for 0700 UTC. Production has been timely and the dissemination of charts via telecopier was provided regularly. Member States wishing to use MARS access had to wait until the completion of archiving. During the early days the trial archiving took, on occasions, an excessive time (in the order of several hours). Remedial action was taken to overcome these initial problems. Archiving was then normally complete between 0900 and 1000 UTC. In order to avoid several unsuccessful data access runs, Member States were, on request, informed in real-time of the completion of archiving by telex or other form of message. The operational work at the Centre and the timely production of the operational forecast had priority over the trial production. It was therefore unavoidable

that delays in the trial suite occurred. Users of the products from the trial had, on certain days, to accept a delay in access to the data, e.g. on Tuesdays, later changed to Wednesdays, or Saturdays, when preventive maintenance of the computer installation was scheduled. Between 10 September and 20 November (72 days) only two forecasts (2.8% as compared to the 12Z target of less than 10%) were late by more than 45 minutes leaving aside any scheduled delays.

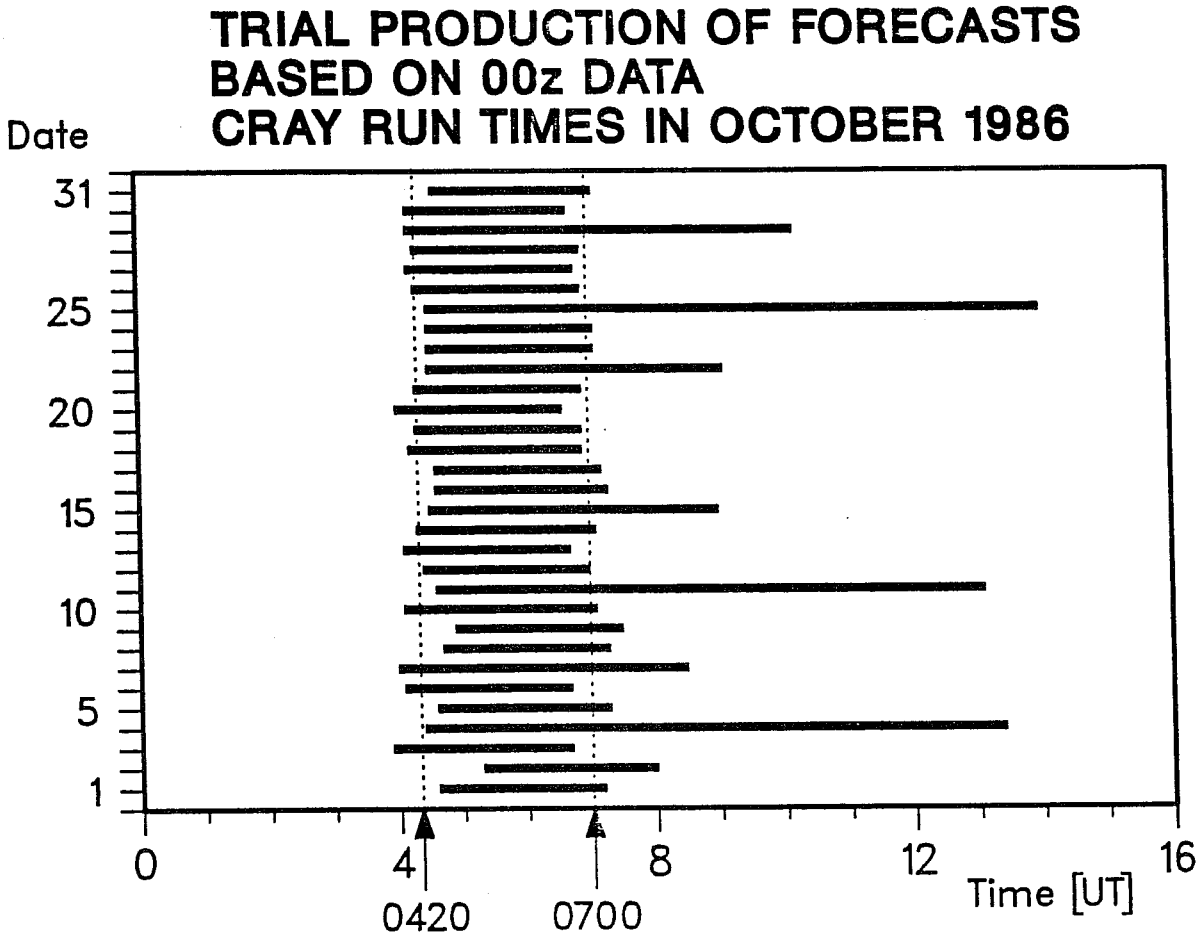


Fig. 2 CRAY run times of the 10-day forecast with 3 hour cutoff during the trial production.

4.2 The data coverage at early cutoff time

Table 1 gives the average number of observations for all data types used in the 00Z analysis at three hour cutoff time compared with the volumes of data used at the operational run time. The period of the comparison is 10 representative days in October 1986. The reception rate is very consistent from day to day. Only the arrival of satellite sounding data (SATEM and TOVS) can vary considerably both for the early and operational cutoff times.
The following points should be noted:

(i) ECMWF applies a data time window of six hours from 2101 to 0300 for the 00Z analysis. The 03Z SYNOP data will normally be received at the time when the operational 00Z analysis runs. However, with a data cutoff at 0300Z, no data with that observation time will be available. 03Z SYNOP observations are redundant in the present data assimilation system and will be discarded if the 00Z data is available for the same stations; the same is true for other asynoptic surface data, such as drifting buoy surface pressure reports (DRIBU). Therefore only the volumes of observational data that were actually used in the analysis (without the discarded data) are compared in table 1.

Data type	Average number of data		
	Normal cutoff time	Early cutoff time	Percentage
SYNOP/SHIP	3189	2663	84%
AIREP	615	420	68%
SATOB	1187	712	60%
DRIBU	135	118	87%
TEMP/TEMP SHIP	639	563	88%
PILOT/PILOT SHIP	186	160	86%
SATEM (500 km)	144	350	16%
TOVS (250 km)	3683	249	

Table 1: The average number of observations used in the 00Z analyses of the experimental and the operational run during the 10-day period, 21-30 October 1986.

(ii) The availability of 88% of TEMP data at 03Z cutoff time does not imply that all four parts of the TEMPs have been received. Part A and B of the TEMP complement each other and either part provides similar information for the present ECMWF analysis system. Stratospheric data is often missing.

(iii) SATEM and TOVS data complement each other in the ECMWF analysis system. TOVS (satellite soundings at 250 km resolution) are used with priority, while SATEM (subset of the TOVS soundings at 500 km resolution) are normally received first and used if the TOVS are not available. That explains the shift towards the use of SATEM data at early cutoff.

The data reception at ECMWF after 00Z observation time for ground based observation types including upper air soundings for the 10 day period 21 to 30 October 1986 is shown in Figure 3. The reception rates up to 03Z cutoff time agree with the percentage figures given in table 1. While the reception of SYNOP data has reached a plateau after three hours, upper air data is still arriving at a high rate. Also, an average 25% of the surface observations from ships are still missing at 03Z.

In order to explore the regional distribution of data deficiencies at early cutoff, global data coverage maps were inspected regularly during the period of the trial production.

The example of the global data coverage for the early and the operational 00Z analyses of 26 October 1986 (figures 4,5 and 6) shows SYNOPs missing at 03Z over Asia, Africa, and South America and over the Oceans. The TEMP and PILOT coverage appears to be more homogeneous with data missing mainly from southern and central Asia, Africa and central America. Note that all stratospheric data is missing from North America and most parts of south-east Asia in figure 4.

Coverage of aircraft observations is reduced globally. Satellite wind data from the western Pacific (HIMAWARI) is never received in time, while METEOSAT and GOES data is fairly complete. Satellite sounding data at 500 km resolution (transmitted in SATEM code) is regularly available; coverage of soundings at 250 km resolution (TOVS) is significantly reduced.

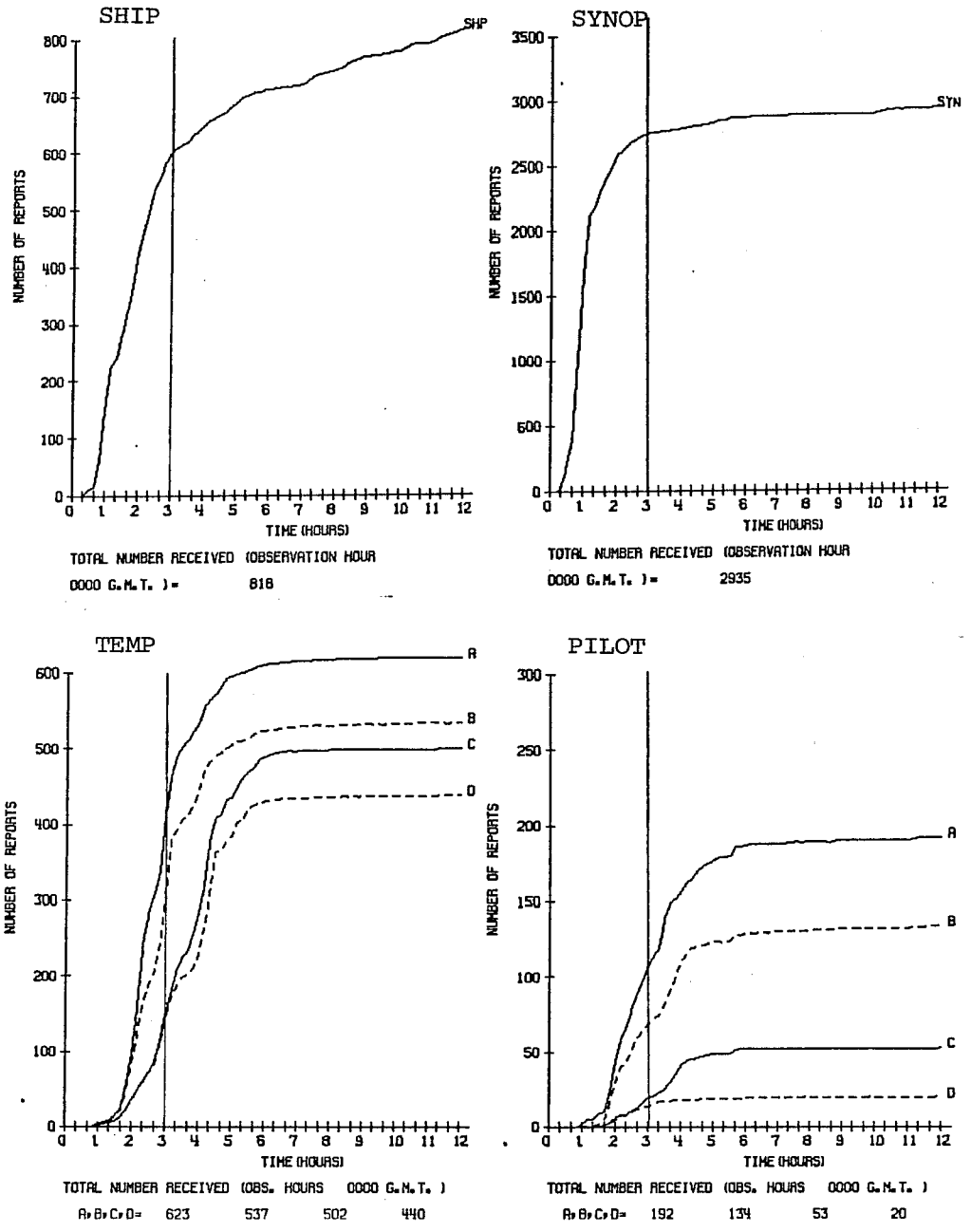
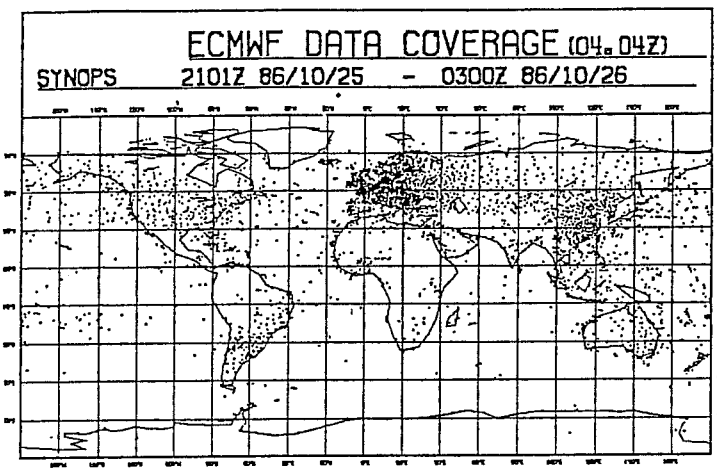
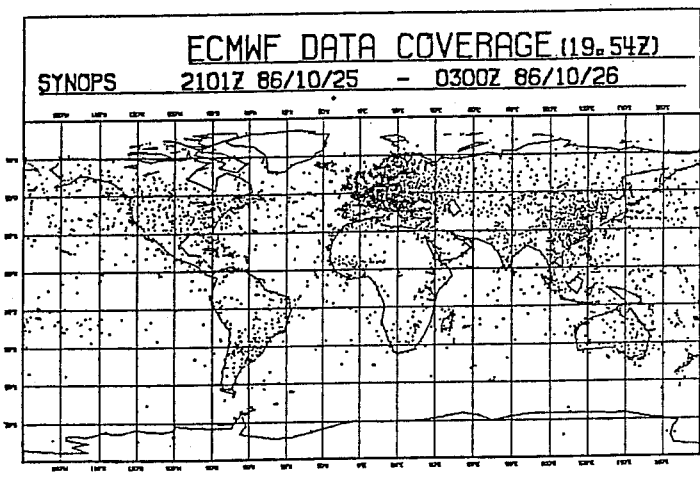
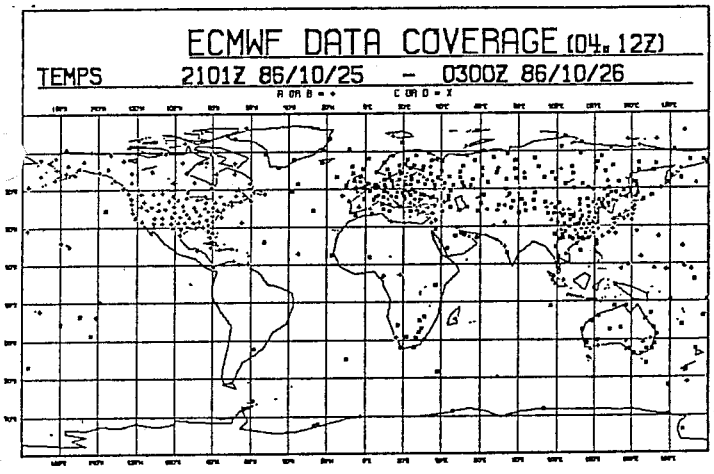
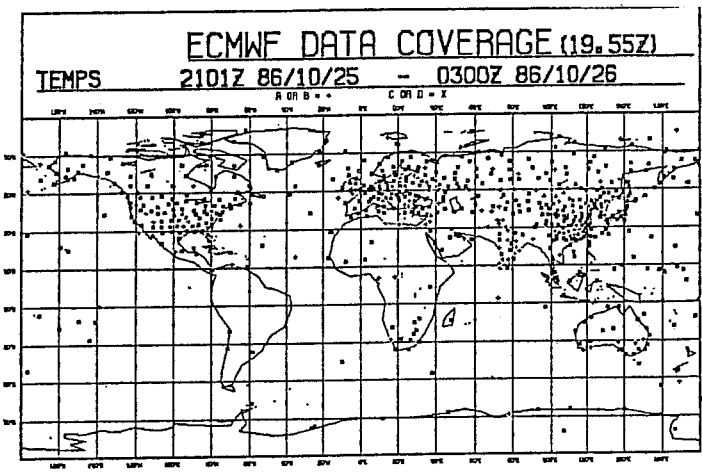


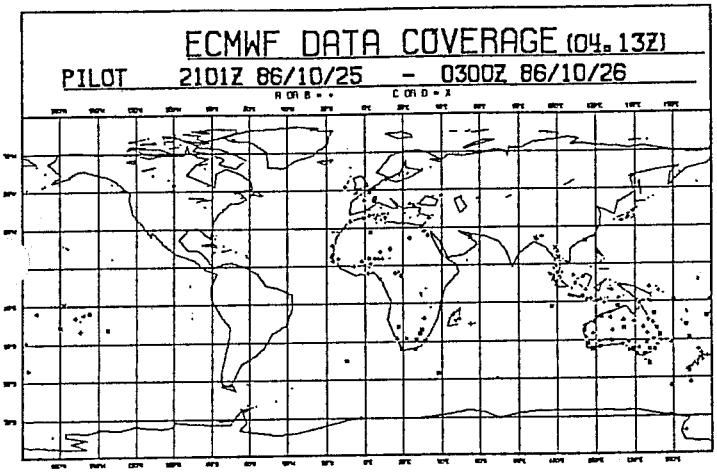
Figure 3: Accumulated data reception at ECMWF with 00Z observation time (no off-time data) for SYNOP, surface SHIP, TEMP and PILOT. Number of reports gives daily average over the period 21-30 October 1986. Cutoff time (vertical line) is marked at 03Z.











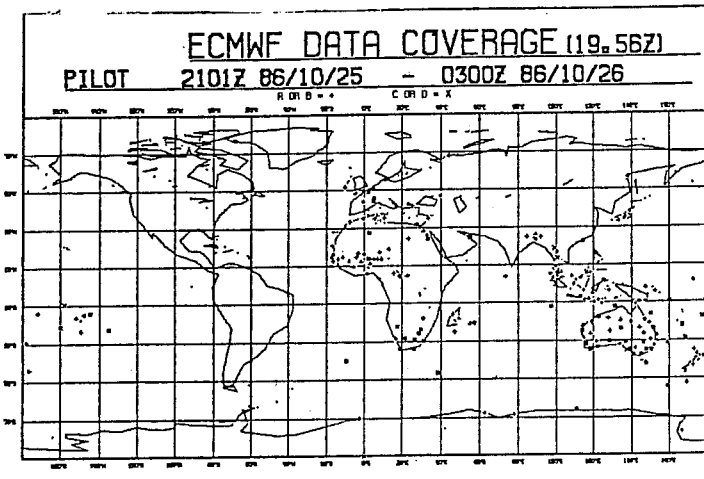
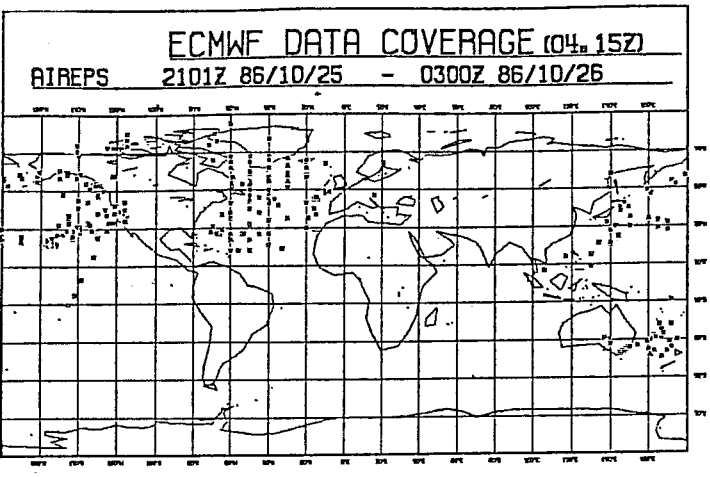
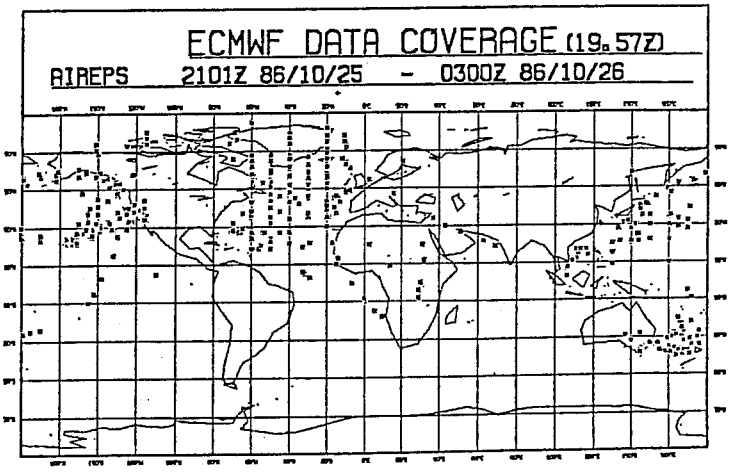
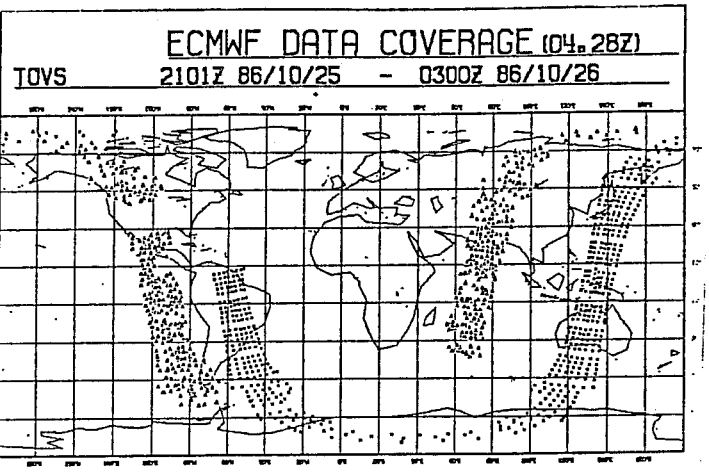
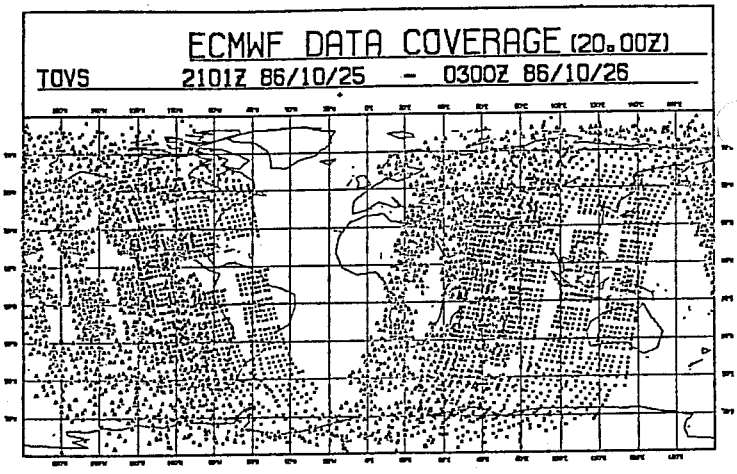


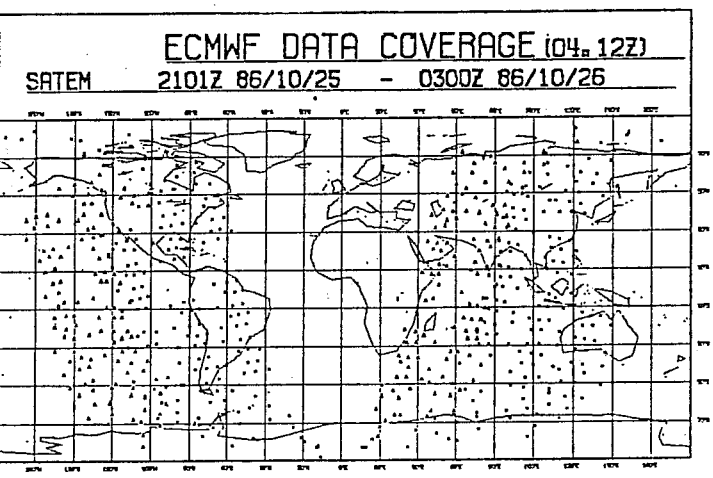
Figure 4: Data coverage at 00Z on 26 October 1986 with 3 hour cutoff time (left) and with more than 18 hours delay after observation time (right) for SYNOP, TEMPS and PILOTS (top to bottom).











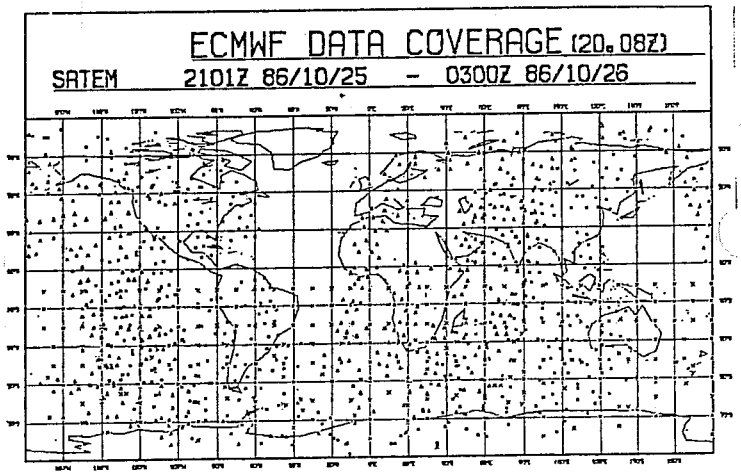
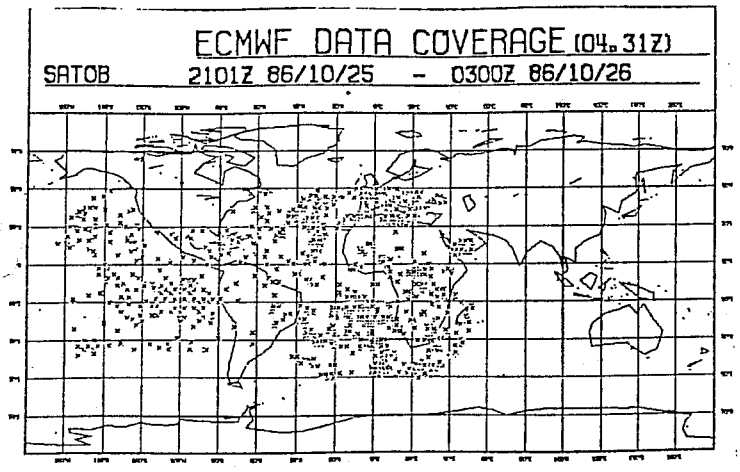
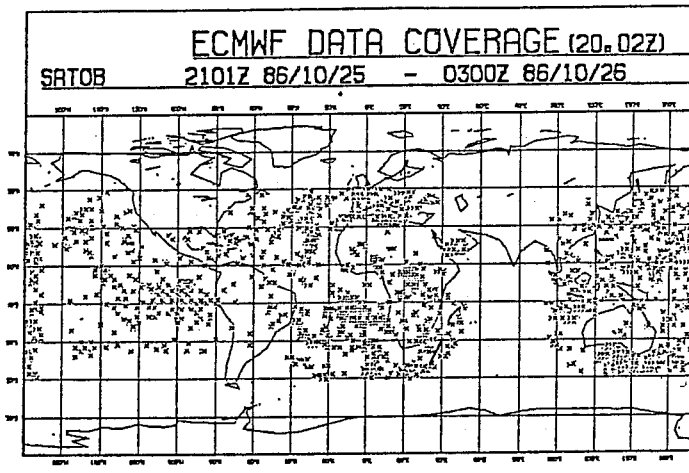
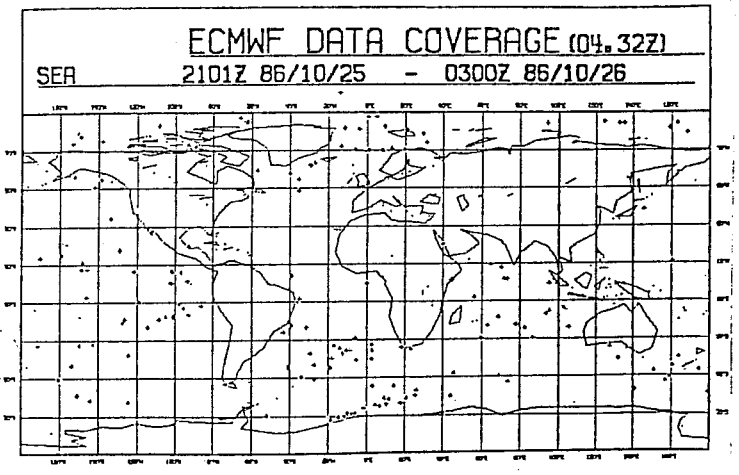


Figure 5: As figure 3 but for AIREPS, TOVS (satellite sounding data at 250km resolution) and SATEM (500 km resolution).







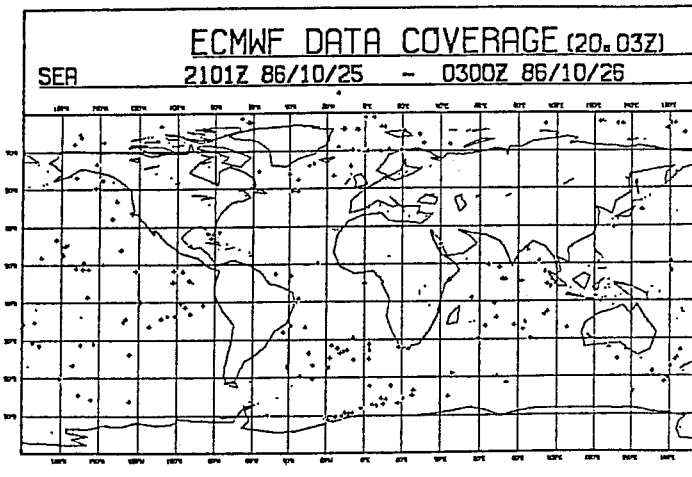


Figure 6: As figure 3 but for SATOB and DRIBUs

4.3 Objective Verification

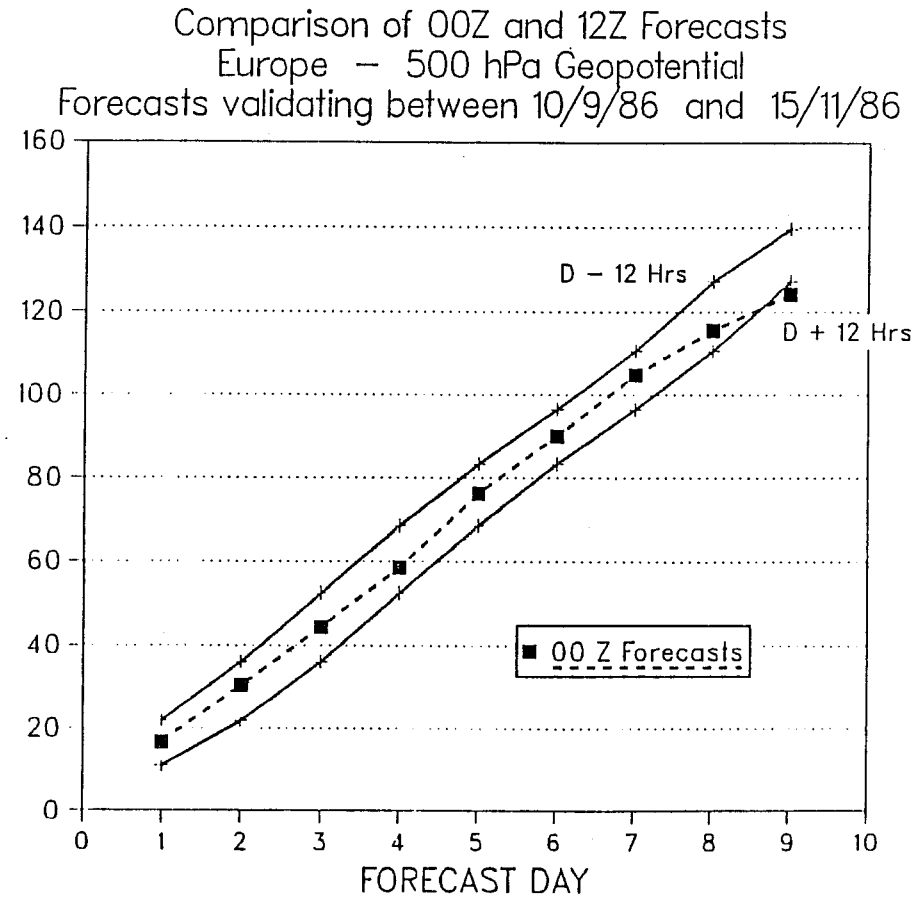
RMS scores for the 00Z forecasts were computed in three areas - Europe (36°-72°N, 12°W-42°E), Northern Hemisphere (18°-78°N) and Southern Hemisphere (18°-78°S). These scores were compared with the corresponding scores from the 12Z forecasts starting 12 hours earlier (D-12) and 12 hours later (D+12). The operational 00Z analyses were used for all verifications.

Fig. 7 (top) shows the results of the comparison for the 500 hPa forecasts of geopotential height validating between 10 September 1986 and 15 November 1986 in Europe. The corresponding plot for 1000 hPa geopotential height is shown below. Fig. 8 is similar to Figs. 7 but for the Northern Hemisphere, while Fig. 9 shows the results for the Southern Hemisphere.

In the early stages of the forecasts out to day 3 a gain in predictive skill of 8 to 12 hours is obtained for the forecasts based on 00Z data when compared with the previous operational run. Details for the three areas Europe, the Northern and Southern Hemispheres, for the two levels 1000 and 500 hPa are shown in table 2. Further into the forecast an increasing loss of predictive skill is observed for the Northern Hemisphere leaving only a gain of 5 to 7 hours at 1000 hPa and 6 to 8 hours at 500 hPa at days 5 to 7 compared with the previous 12z runs. For Europe and the Southern Hemisphere this trend is not so pronounced, with the 00Z forecast maintaining its advantage well into the medium range. It is difficult to discuss the benefit of the 00Z run after six days into the forecast when most of the products approach their limit of usefulness.

It should be noted that the verification scores of the 00 and 12Z forecasts do not exhibit any significantly different variability during the trial period. The time series of the 500 hPa rms height errors were analysed for each forecast step for both the 00Z and 12Z forecasts, and the standard deviations for the scores from both runs were found to be similar during the first few days of the forecast, but slightly increased in the range of days 4 to 6 for the 00Z run.

The results are qualitatively in agreement with those from earlier experiments (Woods 1981, 1982) bearing in mind the difference in the samples and other influences such as the season, data availability, model and analysis changes.



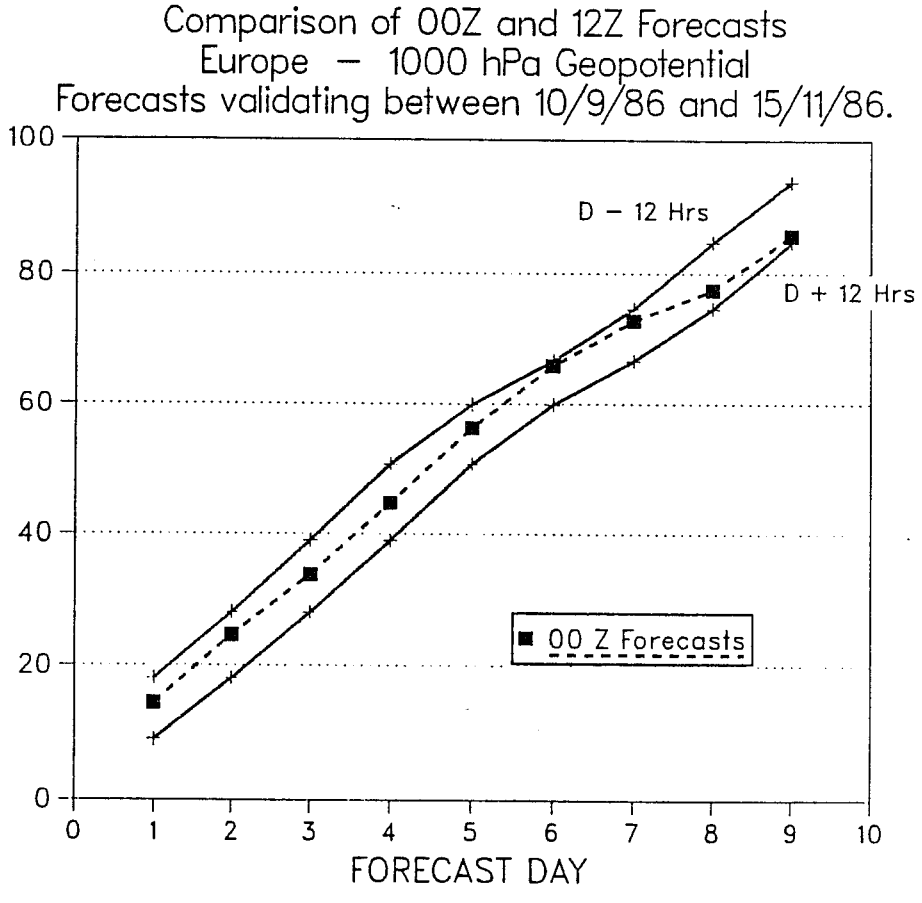
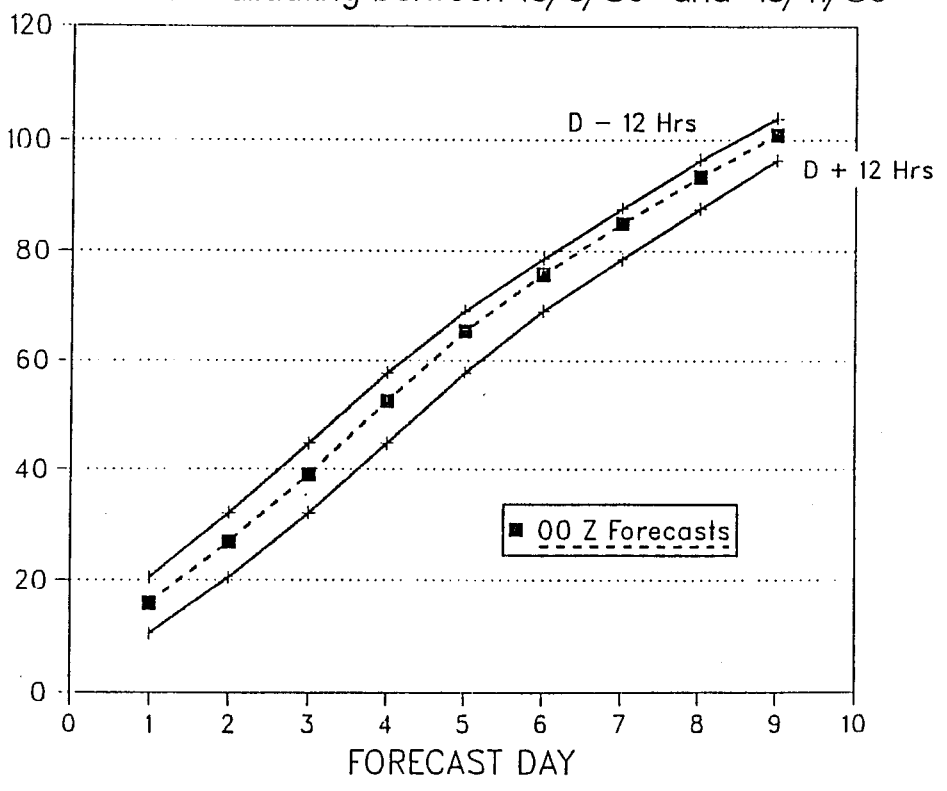


Fig. 7 RMS height errors at 500 (top) and 1000 hPa height over Europe for the forecasts based on 00Z data and the adjacent operational forecasts during 10 September 1986 to 15 November 1986.



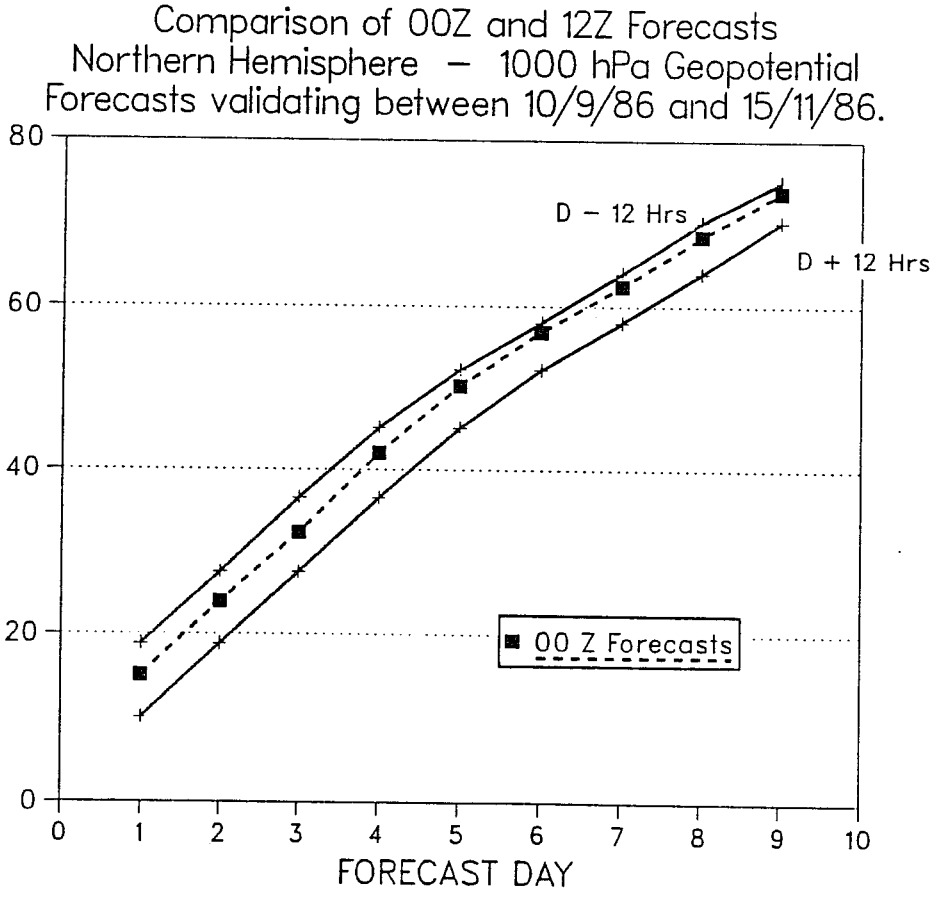
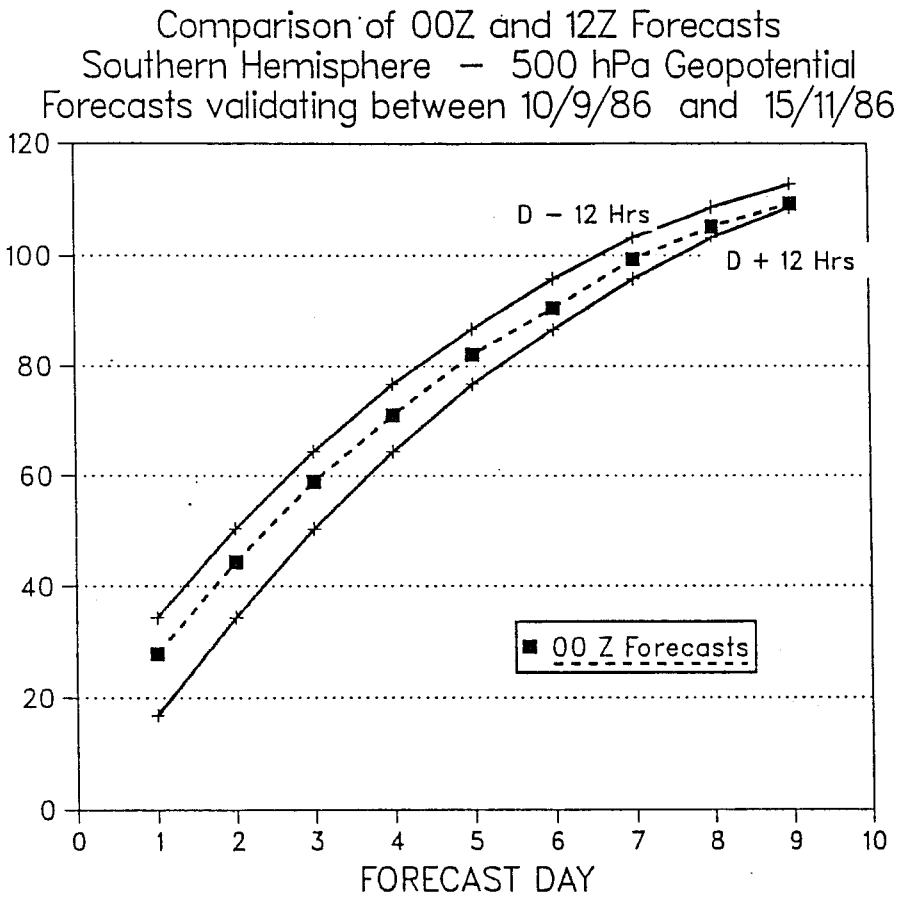


Fig. 8 Same as Fig. 7 but for the Northern Hemisphere



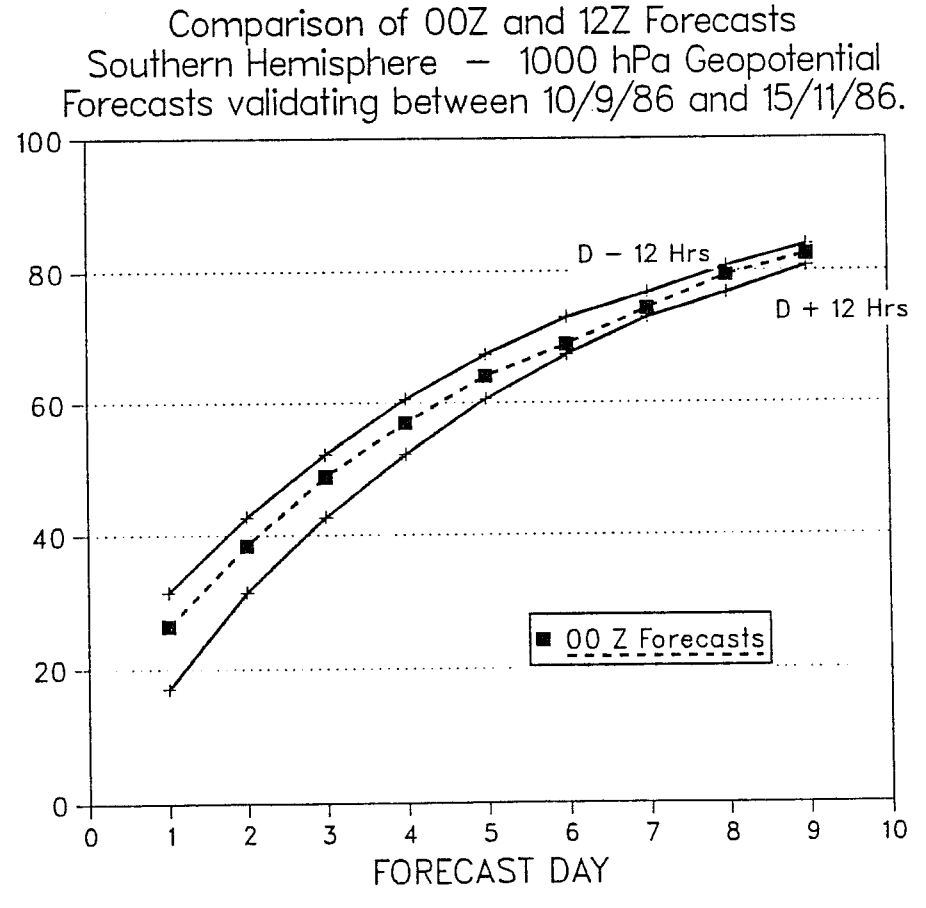


Fig. 9 Same as Fig. 7 but for the Southern Hemisphere

	1000 hPa height					
	D+2	D+3	D+4	D+5	D+6	D+7
Europe	8	12	12	10	3	5
Northern Hemisphere	9	10	8	7	5	6
Southern Hemisphere	9	9	10	11	16	18

	500 hPa height					
	D+2	D+3	D+4	D+5	D+6	D+7
Europe	9	11	13	11	12	9
Northern Hemisphere	10	10	9	8	8	6
Southern Hemisphere	9	9	11	11	13	12

Table 2: Gain of predictive skill in hours comparing the forecasts based on 00Z data with the previous operational forecasts from 12Z. Measure of skill is the rms error of height at 1000 hPa (top) and 500 hPa (bottom) for the forecasts between 10 September and 15 November 1986.

Europe

	D+1	D+2	D+3	D+4	D+5	D+6	D+7
Forecast 12 hours	4.7	8.6	12.0	19.7	24.9	25.8	28.6
Forecast 00Z	4.0	7.3	11.4	14.9	22.4	25.9	28.1

Northern Hemisphere

	D+1	D+2	D+3	D+4	D+5	D+6	D+7
Forecast 12 hours	2.3	4.1	5.5	6.8	8.2	10.5	12.4
Forecast 00Z	1.9	3.7	5.5	7.9	9.9	11.3	12.2

Southern Hemisphere

	D+1	D+2	D+3	D+4	D+5	D+6	D+7
Forecast 12 hours	7.0	10.5	11.6	11.4	11.9	13.4	13.3
Forecast 00Z	5.1	9.1	11.6	12.2	12.4	12.3	13.1

Table 3: Variability of 500 hPa rms height errors of forecasts based on 00Z data compared with the previous operational run from 12Z. The variability is measured by the standard deviation over the time series of the rms scores.

4.4 Response from Member States

Several countries sent their comments and evaluations on the operational use and the quality of the forecasts produced during the trial. Their reports including graphs of subjective and objective verification results are reproduced in full in the annex.

In summary, the following points should be highlighted:

(i) All the countries commented on the operational aspect of the trial. The pre-release version of the retrieval system from archive (MARS) was used successfully for local processing of the 00Z products in some Member States, feedback was provided on the difficulties which were encountered with the use of MARS retrievals. However, for the real-time use of the forecasts most countries relied on the special dissemination service via telecopier from the Centre. The distribution of the charts was found to be very useful and was much appreciated. The maps reached the forecast offices in the majority of the cases in time for the formulation of the medium-range forecasts, although Sweden pointed out that the reception of the charts was too late for operational work.

(ii) The forecasts were evaluated subjectively, either in real time or with some delay and were compared with the operational products from the previous 12Z run. Several countries comment on the consistency of the forecasts from the operational and the trial production. Sweden and Switzerland quantify this evaluation by indicating that 60 to 63% of the forecasts were consistent with each other, 25% of the 00Z production were found to be significantly better, but also 12% clearly worse in the medium-range after 72 hours (subjective assessment - see report from Sweden). Consistency between successive forecasts raises the forecasts confidence in the products.

The Netherlands evaluated the impact of the 00Z forecasts on the results from the KNMI post-processing package for local forecasting. End products were found to be consistent and little affected when based on the 00Z run.

(iii) Subjective and objective verification results from Sweden and the United Kingdom in the range out to six days indicate that for the United Kingdom and Scandinavian verification area a gain in predictive skill between 9 and 12 hours is on average obtained from the 00Z forecasts compared with the quality of the operational products. The United Kingdom points to a discrepancy in the objective verification against observation for the sea level pressure and the 500 hPa height. While the 500 hPa height errors for both runs are almost identical, marked but unexplained differences are observed for the mean sea level pressure at 00 and 12Z. These differences appear to originate from a poorer fit of the 00Z analyses to the surface observations compared with the fit of the 12Z analyses. This problem will require further investigation.

5. Summary and conclusions

ECMWF carried out a trial production of forecasts based on 00Z data during 10 September to 30 November 1986. In connection with the operational data assimilation cycle, additional 18 and 00Z analyses were produced with shorter data cut-off times. The data collection time for the 00Z analysis of the trial production was limited to 3 hours, resulting in a significant reduction in the availability of satellite data, and also surface and upper air observations over the oceans, Asia, Africa and South America.

Although priority was given to the routine operational work at the Centre the production of the 00Z forecasts proved to be very reliable. Leaving aside delays due to scheduled maintenance work, out of 72 forecasts only 2 were late by more than 45 minutes. Member States had access to the results through a pre-release version of the MARS retrieval facility from archive. Plotted fields were made available on request by distribution via telecopier. Member States response to the arrangements of the trial production was very positive and complimentary.

The forecast products from the trial were evaluated both subjectively and objectively at the Centre and in some Member States. During the first three days of the forecast the verification results for Europe, the Northern and Southern Hemisphere at 1000 and 500 hPa indicate a gain in predictive skill in the range of 8 to 12 hours for the 00Z products compared with those based on 12Z

data. By days 5 to 7 this advantage for the 00Z forecast is reduced to 5 to 8 hours for the Northern Hemisphere. Verification results from Member States for limited areas qualitatively agree with these objective scores from the Centre. Depending on the verification area and the range of the forecasts a variability in the verification results is observed and expected.

Most countries report on the operational benefits from an 00Z forecast with early cut-off. Although the distribution of the forecast products during the trial did not reach operational standards with respect to timeliness and availability, medium range forecasts were, on many occasions, successfully updated and adjusted to the more recent forecast.

References

Woods, A. 1981, Comparison of ECMWF forecasts starting from 00Z data with operational forecasts from the preceding 12z data. ECMWF Technical Memorandum No. 30.

1982, Experimental forecasts from 00Z data with a 3-hour cutoff compared with operational ECMWF forecasts. ECMWF Technical Memorandum No. 57.

ANNEX

Reports from Member States on the trial production of forecasts based on 00Z data including the assessment of the results

Reports and comments on the trial production were received from seven countries

Germany
Ireland
Italy
Netherlands
Sweden
Switzerland
United Kingdom

They are reproduced in this annex with minor editorial changes.

GERMANY

Due to some internal difficulties we only could receive the trial forecasts 500 hPa and surface pressure via telecopier.

1. Many thanks to ECMWF for making the transmission possible.

2. The forecasts have been and still are used in the analysis and forecast centre for comparison purposes.

3. Our Impressions:

   - in some cases minor differences to the run based on preceding 12 UTC data were recognised even with respect to short-range forecasts.

   - the forecasts are considered to be very useful in order to get an impression on the confidence of the latest run of our own model by means of the direct comparison.

IRELAND

ECMWF Experimental 00Z Forecast Suite

SUBJECTIVE ASSESSMENT

The value of guidance given by the Operational 72hr, 96hr, 120hr and 144hr forecasts was compared with that given by the 60hr, 84hr, 108hr and 132hr forecasts from the succeeding Experimental 00Z run.

Forecasts were submitted to a rigorous evaluation of their success in indicating weather conditions that were subsequently experienced in Ireland. Predicted surface pressure patterns were considered (absolute values, gradients, configuration) and the implied air mass types and frontal locations. ECMWF analyses were used for verification of pressure fields.

Scoring, according to the following scale, was made by a team of experienced forecasters, accustomed to the use of ECMWF products for medium range forecasting.

5 = Excellent
4 = Fairly good
3 = Useful
2 = Poor
1 = Misleading

The assessment was conducted on 20 days within the period 29 October and 25 November.

Comments

1. Just under 49% of Experimental forecasts were considered excellent or fairly good, compared with 35% of corresponding Operational forecasts.

2. Nearly 33% of Operational forecasts were considered poor or misleading, compared with 25% of corresponding Experimental forecasts.

Ireland strongly favours the extension of this experiment for longer term evaluation.

COMPARISONS: 20 FORECASTS

	OPERATIONAL	SCORE	EXPERIMENTAL

A.

	72 HOUR		60 HOUR
	6	5	9
	8	4	9
	6	3	-
	-	2	2
	-	1	-
TOTAL SCORE	80		85

B.

	96 HOUR		84 HOUR
	1	5	2
	6	4	9
	7	3	4
	4	2	4
	2	1	1
TOTAL SCORE	60		67

C.

	120 HOUR		108 HOUR
	-	5	1
	5	4	3
	4	3	10
	5	2	5
	6	1	1
TOTAL SCORE	48		58

COMPARISONS: 20 FORECASTS

D.

	144 HOUR		132 HOUR
	-	5	1
	2	4	5
	8	3	7
	7	2	6
	3	1	1
TOTAL SCORE	49		59

E.

	COMBINED		COMBINED
	7	5	13
	21	4	26
	25	3	21
	16	2	17
	11	1	3
TOTAL SCORE	237		269

ITALY

Although telefax acquisition has not always been reliable some conclusions may be drawn on the quality of ECMWF forecast based on 00Z data. For some specific weather patterns a marked difference may be observed among products having the same time of validity. Although it has been taken into account that conventional ECMWF output are received on a lower resolution grid and are usually presented using 60 M (and not 40 M) as contour interval, there is the general feeling that 00Z runs produce more intense gradients for geopotential and temperature in the Mediterranean area. Sometimes forecast of characteristics and persistence of weather phenomena over Italy were substantially different when based on products from 00Z run with respect of those based on corresponding output of 12Z run.

NETHERLANDS

Due to staff problems it was not possible to study these trial products in an operational mode, therefore the products based on 00Z data were retrieved from the MARS system later in the day and evaluated subjectively on the next day. The trial products were checked for consistency with preceding and following 12z products and for significant changes in the end products (i.e. weather forecasts) compared with the preceding 12Z forecasts. Up to now the trial products mainly proved to be consistent and indicated only slight changes in the end-products.

SWEDEN

Introduction

At SMHI we have had access, via telecopier, to some of the trial production of ECMWF forecasts based on 00Z data; mainly mean sea level pressure and 500 hPa height fields.

T+24, T+36, T+48 and T+60 forecasts were, on average, received between 07 and 08 UTC. T+84, T+108, T+132 and T+156 forecasts were in most cases available between 08 and 09 UTC.

The trial forecasts have been used in the forecast production as an important complement to the operational products based on 12Z.

The forecasters have on several occasions received better guidance, compared with ordinary 12Z forecast guidance. However, the trial products have reached the forecasters somewhat late which is a disadvantage. Many of the end users which receive tailor made forecasts from SMHI need medium range weather information rather early in the morning. This means that the manual work to produce user specified forecasts have to start at 06 UTC (07 local time) and be finished at the latest at 09 UTC. This weather information is to a high degree, based on ECMWF products, which consequently have to be available to the forecasters early in the morning.

Verification results; comparison between ECMWF 00Z and 12Z forecasts

Scores ranging from 1 to 5 were subjectively given to the two ensembles of ECMWF forecasts valid at the same time. The results are shown in the attached figure.

In general a gain of 9-12 hours in predictive skill is obtained for Scandinavia and the surrounding area.

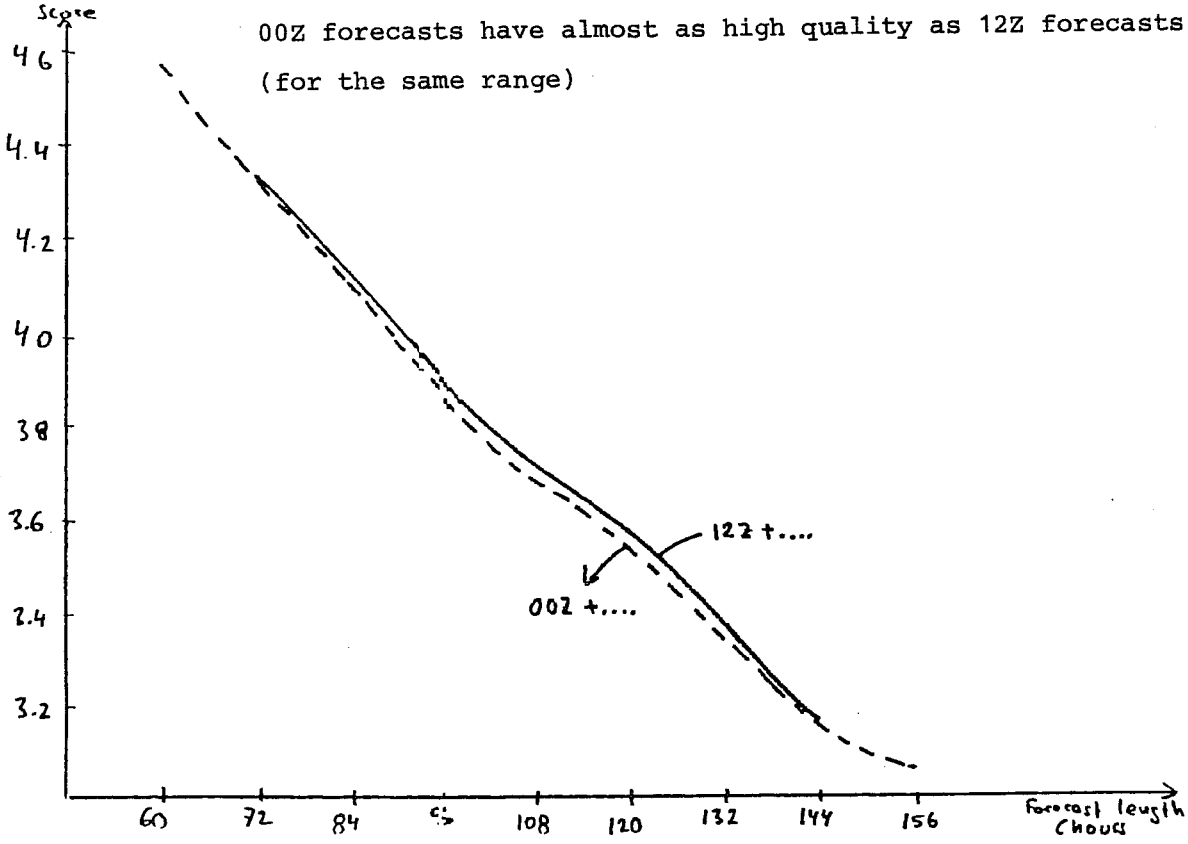
One reason that the difference is somewhat less than 12 hours might be the earlier data cutoff for the 00Z analyses.

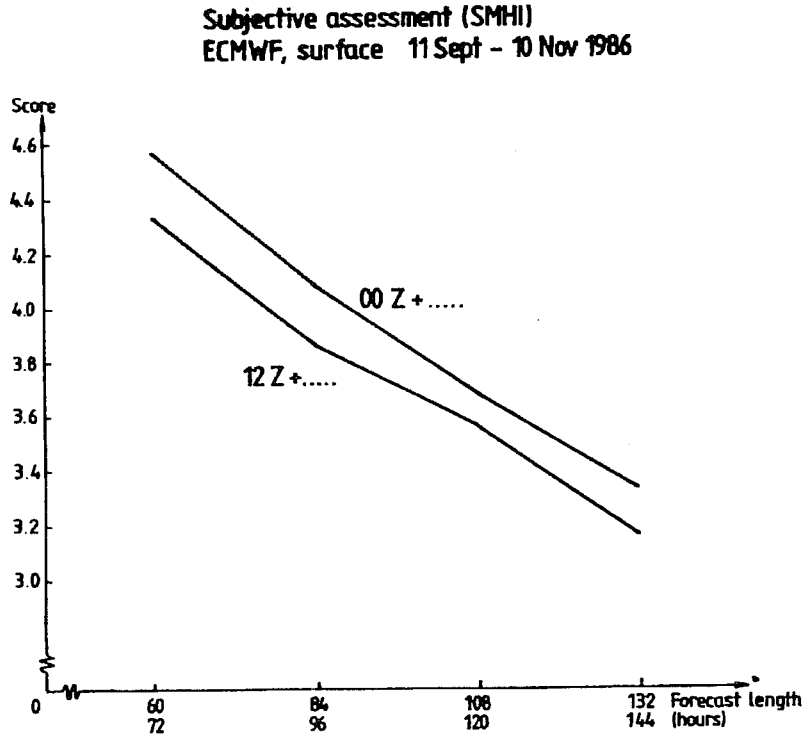
Subjective assessment (SMHI) ECMWF, surface 11 September - 10 November 1986

Note the high quality of the forecasts

00Z forecasts have almost as high quality as 12Z forecasts

(for the same range)





Supplementary verification results regarding forecasts based on 00Z ands 12Z data respectively (the two ensembles of forecasts are valid at the same time)

00Z+ forecasts are significantly better (⩾1 score unit) than 12Z+ forecasts		12Z forecasts are significantly better (⩾1 score unit) than 00Z+ forecasts	
Forecasts from date:	Forecast range (hours)	Forecasts from date:	Forecast range (hours)
10-11/9	72-144	18-19/9	132-144
14-15/9	108-144	26-27/9	132-144
19-20/9	108-120	1-2/10	108-144
22-23/9	132-144	12-13/10	108-120
27-28/9	72-144	26-27/10	108-120
22-23/10	132-144	7-8/11	120-144
23-24/10	72-144		
26-27/10	108-120		
30-31/10	132-144		
1-2/11	72-144		
2-3/11	72-120		
3-4/11	96-144		
9-10/11	132-144		
13 cases; that is 25% of total 52 runs from 12Z resp 00Z		6 cases; that is 12% of total runs	

Regarding the remaining forecasts (63%) the difference in reliability between the two ensembles of forecasts is less than 1 score unit.

SWITZERLAND

Die Schweizerische Meteorologische Anstalt hat nur eine A4-Karte der über Telefax verfügbaren Dokumentation übermittelt erhalten (500 hPa Geopotential und temperatur, Bodendruck und 850 hPa-Temperatur H+48). Diese Unterlage hat sich trotzdem als sehr nützlich erweisen, um die Zuverlässigkeit der vorliegenden Mittelfristkarten zu beurteilen.

In diesem Sinne wurde aus den bisher vorliegenden Erfahrungen die folgenden Stellungnahmen der direkt Betroffenen zusammengefasst.

Vergleich 500 hPa Höhe/Temperatur 12Z+60h mit 00Z+48h

Termine: 51 Tage, Karten gültig für 12.9.-1.11.86, 00Z
8 Tage mit mindestens einer fehlenden Karte

Ausgangsmaterial:

43 Tage mit vollständigen Kartenparen = 100%

Vergleichsresultate:

26 Tage mit 12z+60h = 00Z+48 = 60%
für die Schweiz keine
wesentlichen Unterschiede

17 Tage mit 12Z+60h ≠ 00Z+48 = 40%

im Detail:	7 Tage Achsen schneller/langsamer	16%
	3 Tage Tiefzentrum anders	7%
	3 Tage Rücken un-/deutlicher	7%
	2 Tage Trog spitzer/flacher	5%
	2 TAge Bessere Auflösung (2 statt 1 Trog)	5%

Auswirkungen:

An 5 Tagen führte die Berücksichtigung der 00Z-Ausgabe zu einer Änderung, beziehungsweise Anpassung des Prognosentextes (laut Notizen auf dem Tagebuchblatt LWZ: 25./26./27.9. und 16./26.10. als Gültigkeitstermine).

An 9 Tagen hätte man die zeitliche Folge anpassen müssen.

An 8 Tagen hätte man die Aktivität von Fronten, Hoch- und Tiefdruckeinflüssen anpassen müssen. *)

*) Sofern man statt dem 12Z- nur den 00Z-Ausgangstermin berücksichtigen würde und sonst keine anderen Unterlagen.

Zusatzbeobachtung

Trotz der Verkleinerung der übermittelten EZ-Karten auf weniger als das halbe Format unserer Contouring-Karten traten an sehr vielen Tagen deutlich sichtbare Details auf, die durch die Glättung oder die 300 km Maschenweite auf den SMA Karten nicht erkennbar gewesen wären. Eine Umstellung auf 150 km Grid und ein neues Contouringprogramm ist daher dringlich.

Bericht über Verwendung und Nutzen der zusätzlichen NVK:

Seit Mitte September 86 werden praktisch regelmässig NVK des 00 UTCC-Laufes vom EZMW via Telefax an die LWZ übermittelt. Nach geringfügigen anfänglichen Übermittlungsschwierigkeiten treffen die gewünschten Karten um 8 Uhr morgens ein. Es sind die +48h Vorhersagen der Geopotentiale und Temperaturen der 500 hPa und 850 hPa Flächen.

Im Schweizer Wetterdienst werden zu Vorhersagezwecken im Kurz- und Mittelfristbereich zur Hauptsache die NVK des EZMW bis +168h verwendet. Sie umfassen die Geopotentiale und Temperaturen der 500 und 850 hPa-Flächen. Zusätzlich werden die +36h und +60h für den Mitternachtstermin gezeichnet. Daneben werden auch die NVK des DWD und US-NPC für die verschiedenen Gültigkeitszeichen konsultiert.

Die zusätzlichen +48h Karten lassen sich nun direkt mit den +60h Vorhersagen vergleichen, da sie denselben Gültigkeitstermin haben. Da der 12 UTC-Lauf die Hauptgrundlage für die Mittelfristprognose bildet, kann damit bereits ein Qualitätsvergleich erhalten werden. Wenn in dieser Zeitspanne bereits Unterschiede auftreten, liegt die Vermutung nahe, dass auch die weiterführenden Termine nicht mehr übereinstimmen. Kürzerfristig wären kaum Differenzen festzustellen. Zu einer effektiven Umformulierung der Mittelfristprognose kommt es dann, wenn die anderen num. Modelle ebenfalls eine anderweitige Entwicklung aufzeigen. Entsprechend werden diese zusätzlichen Karten von den Prognostikern gechätzt.

Die Verfügbarkeitszeit am Morgen ist ebenfalls sehr günstig. Die Mittelfristprognosen werden gegen Mittag verfasst. So bleibt genügend Zeit, die Karten zu interpretieren und zu vergleichen. Dabei liess sich auch feststellen, dass unser Plotterprogramm zum Teil stark glättet.

Auf diesen Zeitschritt ist besonders im 850 hPa-Niveau eine detailliertere Darstellung des Alpenraumes sehr nützlich.

UNITED KINGDOM

Assessment of trial of ECMWF 00Z forecast

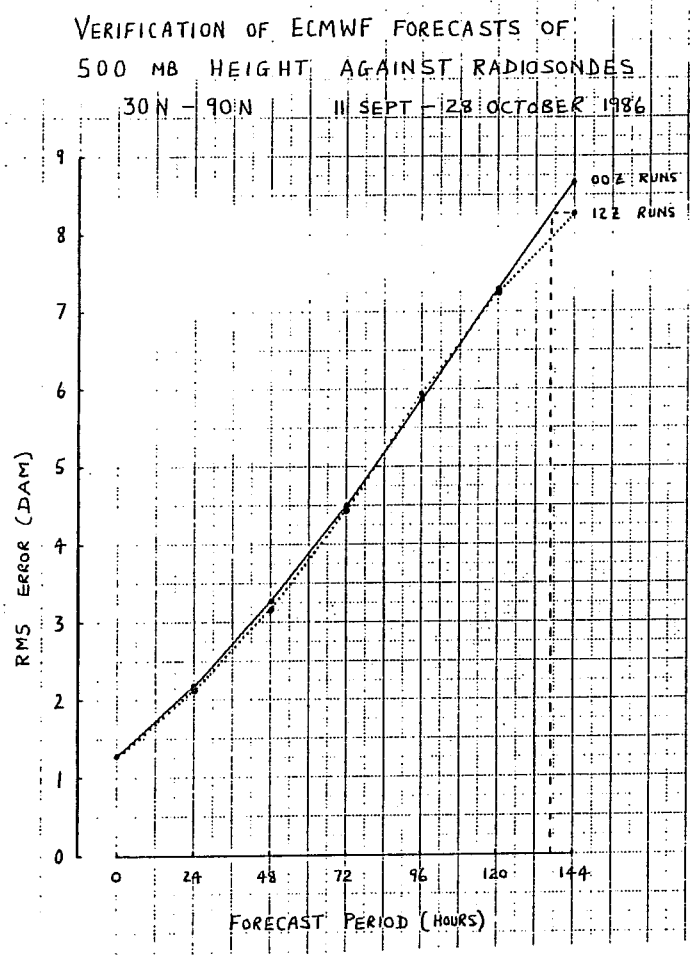
1. Fields from the ECMWF 00Z trial forecast have been brought to Bracknell on tape and verified against observations in the same way as are the operational 12Z fields. Sea level pressure forecasts have been verified against reported values from synops and ships and 500 mb height forecasts against reported values from radiosondes, at 24 hour intervals out to the 144 hour forecast, for the region 30° - 90°N, and for the period 11 September - 28 October. The observations used are all those arriving at Bracknell within about 11 hours of 00Z and 12Z respectively and which pass a generous quality control check against the Bracknell analysis.

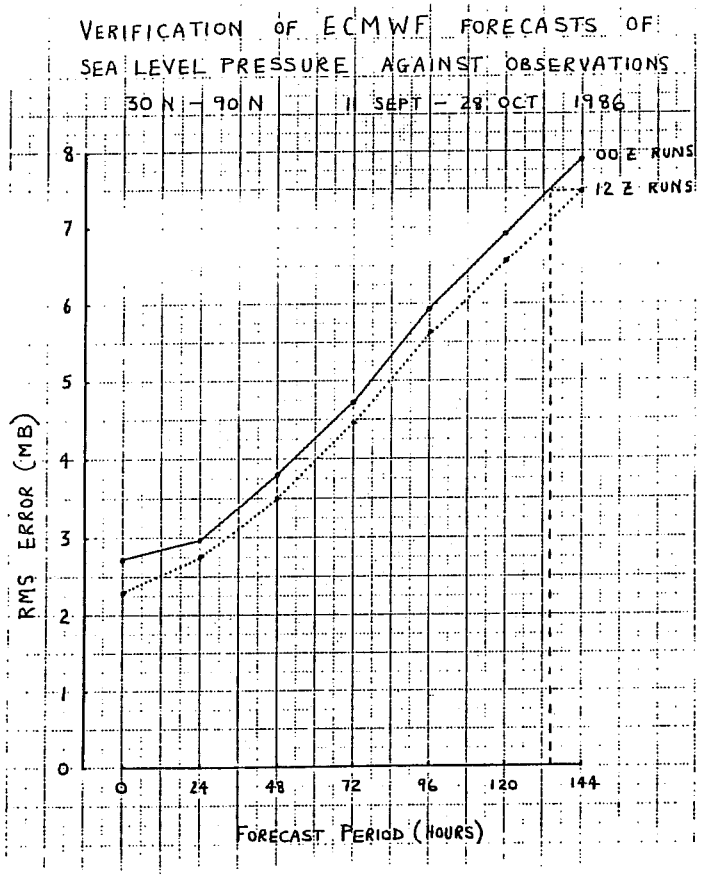
The rms errors of the ECMWF 00Z and 12Z runs are compared in the attached diagrams.

For sea level pressure the 00Z analysis fits the observations less well than the 12Z analysis but the difference in the rms values is about halved by T+24. Thereafter the difference is maintained and grows larger in the latter part of the 144 hour period. The lower rms errors of the 12Z forecasts at T+144 represents an increase in predictive skill of 9.2 hours compared with the 00Z runs.

For 500 mb height the closeness of fit to the observations is almost identical at 00Z and 12Z and the differences in the rms values remain small out to T+120. Between T+120 and T+144 the values diverge, with the lower rms errors of the 12Z forecasts at T+144 representing an increase in predictive skill of 6.8 hours compared with the 00Z runs.

The charts from the 00Z run, received by telecopier, have been subjectively assessed by forecasters in the Central Forecasting Office. The charts have been marked for evolution and phase errors, the 12Z and 00Z runs being merged for the same validity periods so that there is a built-in 12 hours penalty for the 12Z runs. The assessment is limited to the immediate UK area, and concerns the forecast sequences out to day 5. During October, the operational ECMWF 12Z run achieved 68% of the total possible marks, but the trial 00Z runs only 64%


VERIFICATION OF ECMWF FORECASTS OF
500 MB HEIGHT AGAINST RADIOSONDES
30 N - 90 N 11 SEPT - 28 OCTOBER 1986
00Z RUNS
12Z RUNS
RMS ERROR (DAM)
0
1
2
3
4
5
6
7
8
9
0
24
48
72
96
120
144
FORECAST PERIOD (HOURS)


VERIFICATION OF ECMWF FORECASTS OF
SEA LEVEL PRESSURE AGAINST OBSERVATIONS
30 N - 90 N 11 SEPT - 28 OCT 1986
00Z RUNS
12Z RUNS
RMS ERROR (MB)
0
1
2
3
4
5
6
7
8
0
24
48
72
96
120
144
FORECAST PERIOD (HOURS)