European Centre for Medium Range Weather Forecasts

ECMWF NEWSLETTER

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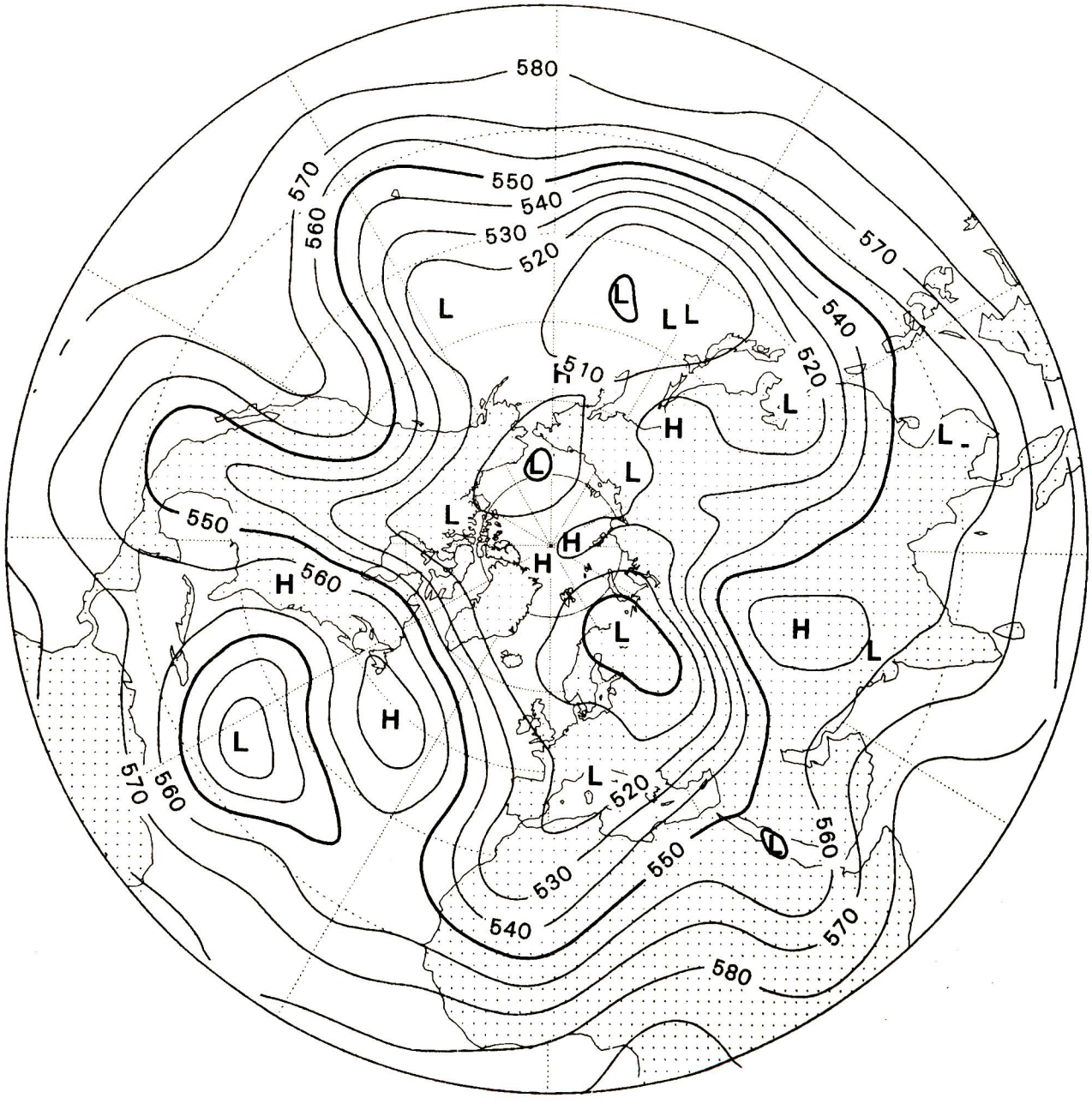

Page

IN THIS ISSUE

METEOROLOGICAL

COMPUTING

GENERAL

* NOTE: These articles directly concern the computer service; we recommend that computer users read them.

COVER: Contour map produced with CONICON and DISSPLA. The field is the same as that found in the examples in the ECMWF contouring package users guide; however, only one quarter of the grid points in the matrix was used as input to CONICON.

This Newsletter is edited and produced by User Support.

The next issue will appear in April 1983.

THE IMPACT OF ERRORS IN THE TROPICS ON MID-LATITUDE FORECASTS

In the tropics, the limit of useful predictability of the ECMWF forecasting system is generally reached within the first few days of the forecast. A series of experiments has been devised to see if the effect of these errors is confined to the tropics or if they may also have an impact on the quality of the forecast at higher latitudes. In these experiments, the values (temperature, wind, etc.) predicted by the forecast model in the tropics were replaced at each timestep by analysed values; these tropically relaxed forecasts were compared with standard control forecasts.

Seven cases were selected for these experiments, and all were taken from the FGGE year when analyses based on above-average data coverage in the tropics were available. Of these seven cases, one showed a dramatic improvement when analysed data were substituted in the tropics, three showed a small but significant improvement, two showed little impact and one was made worse.

In these experiments, the principal mechanism by which the tropical forecast errors influenced the quality of the forecast at higher latitudes appeared to be the interaction between real or spurious tropical features and major mid-latitude troughs. By altering the orientation and position of these troughs, the subsequent evolution of the flow at middle and high latitudes could be modified substantially.

The forecast from 12Z, 14.11.79, showed the greatest improvement when analysed data was substituted in the tropics. Between days 2 and 3 of this forecast, a high level vortex developed over the Caribbean, as can be seen from the 200mb wind field in Fig. 1. In the analysis, the maximum wind speed was 58 m/sec in a westerly jet to the east of Florida, where this vortex and a major mid-latitude trough reinforced one another. In the control forecast, the vortex was barely detectable, and the maximum wind speed in this region was 48 m/sec. As a result, the southern tip of the trough was moved approximately 15° further to the east in the analysis and the relaxed forecast than in the control run. The analysed trough remained symmetric, with a N/S orientation, while in the control forecast, the trough became tilted with a NE/SW orientation.

Over the next 3 days, this trough was treated very differently by the two forecasts. In the control forecast, its amplitude decreased steadily, giving zonal flow across the Atlantic by day 6. The corresponding surface forecast for day 6 was very poor for Western Europe, as can be seen from Fig. 2. In the relaxed forecast, however, the trough was correctly retained (although positioned 10° too far to the east), and a ridge over the Eastern Atlantic and a cut off low over Southern Europe were successfully developed at day 5. The surface forecast for day 6 (Fig. 2) shows that the ridge extending from the Azores to Southern Scandinavia and the low over Italy were captured quite successfully.

Energetic considerations suggest that for the tilted trough of the control forecast but not for the symmetric trough of the analysis or the relaxed forecast, there should be a net conversion of eddy to zonal kinetic energy. In this case, the flow in the control forecast did, indeed, become too zonal.

- Jan Haseler

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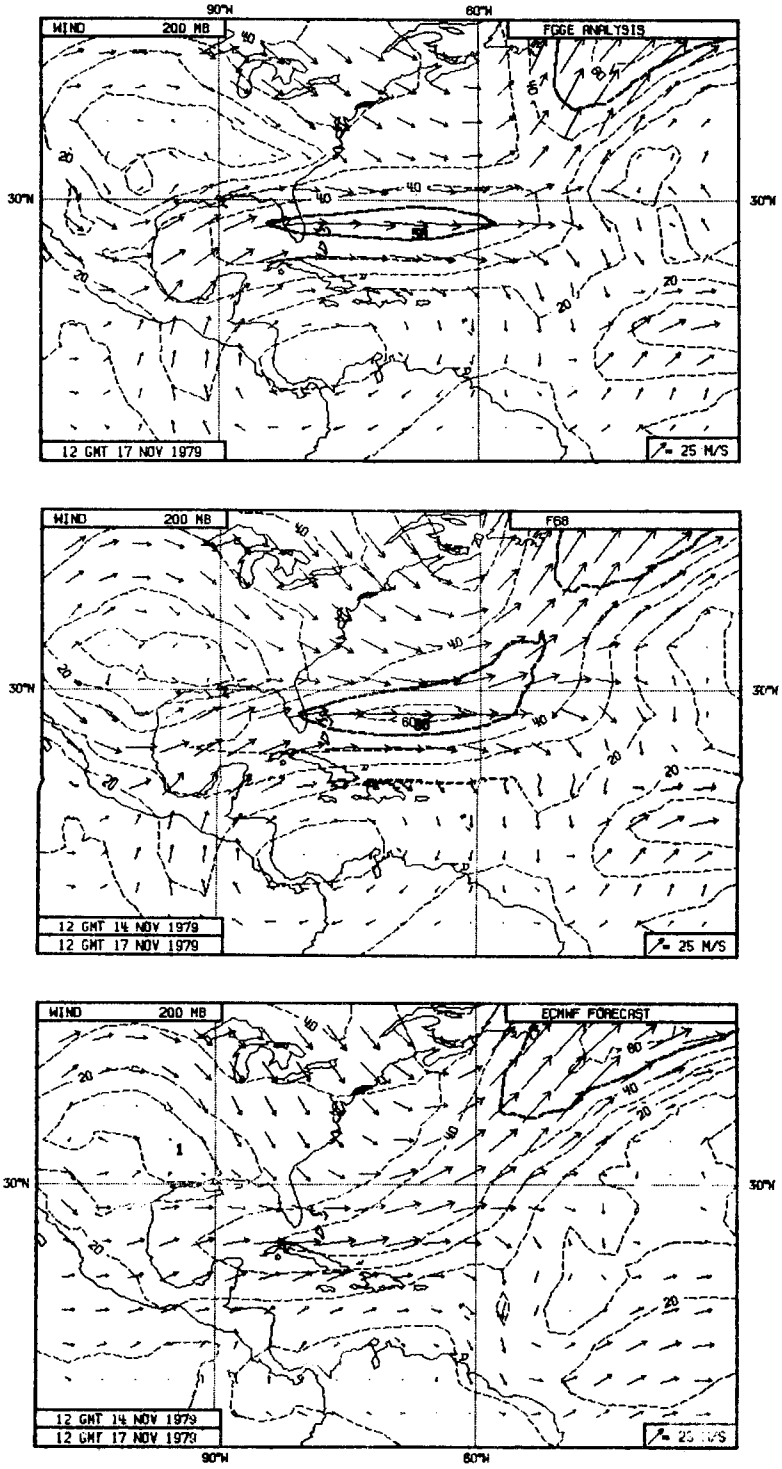

Fig. 1 Day 3: 200 mb wind field at 12 GMT 17 November 1979 for FGGE analysis (top), relaxed forecast (middle) and control forecast (bottom).

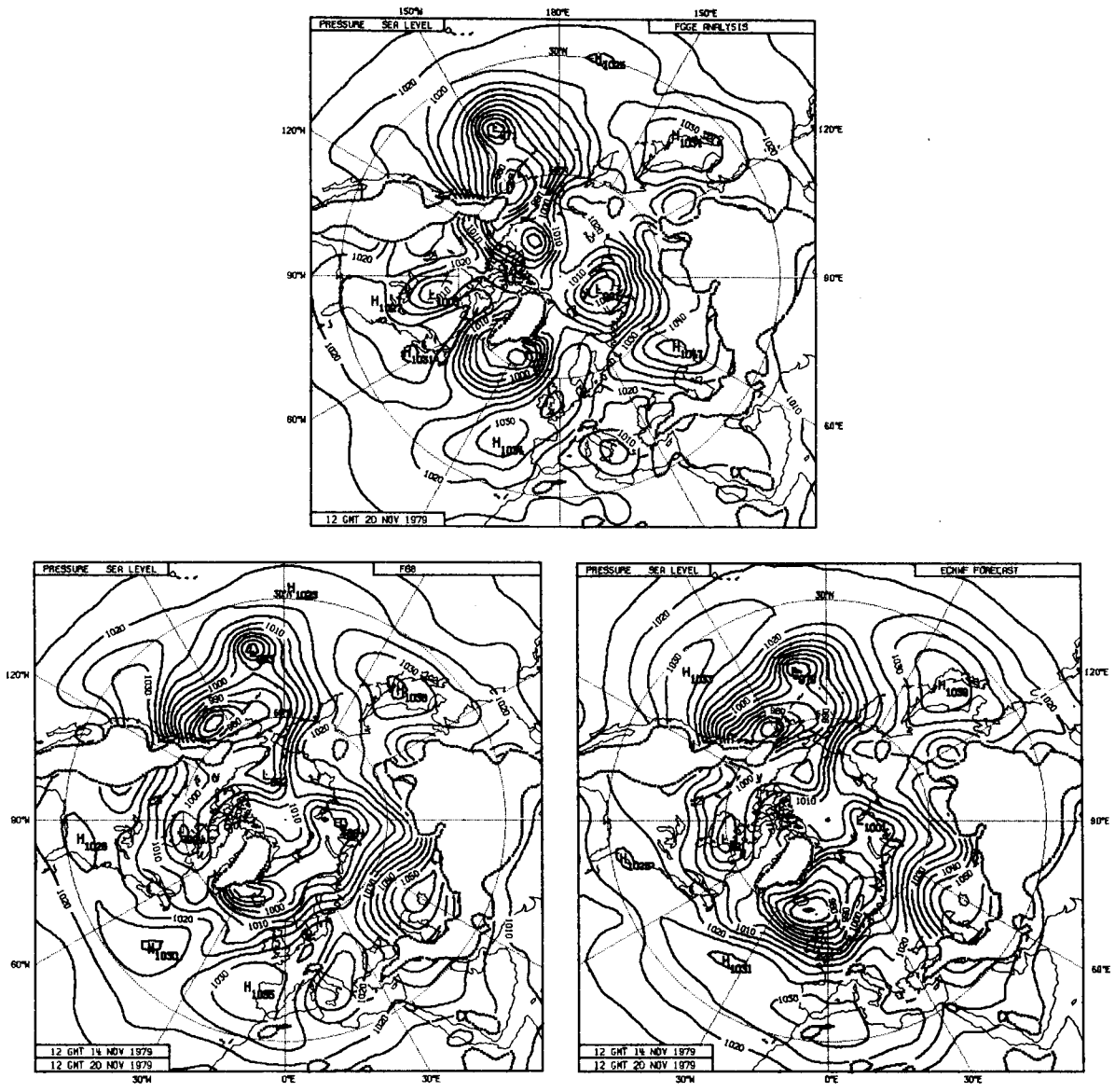

Fig. 2 **Day 6: mean sea level pressure at 12 GMT 20 November 1979 for FGGE analysis (top), relaxed forecast (bottom left) and control forecast (bottom right).**

PROBLEMS AND PROSPECTS IN TROPICAL PREDICTION

In the previous article, Jan Haseler describes how it has been shown that tropical circulations can influence significantly the extratropical flow in the medium range. Unfortunately, it is difficult to predict accurately the flow in the tropics. Investigations of monthly means of ECMWF forecasts show errors within the first 24 hours of up to 7 or 8 ms^{-1} in the wind field at 850mb and up to 11 or 12 ms^{-1} at 150mb. These errors continue to grow, although more slowly, for on average 7 to 8 days. Such large errors in the forecasts suggest problems associated with stationary forcing, i.e. mountains or large scale heating. These tropical errors are associated largely with the South American and African continents, with Africa being the dominant source of error. Fig. 1a shows the mean error in the wind field at 150mb in the African region - the monthly mean 24 hour forecast minus the monthly mean initialised analysis, for April 1981.

A very similar pattern can be seen in other months and in individual forecasts. This error pattern consists, on the large scale, of easterlies off West Africa, westerlies off East Africa and anti-cyclonic flow over North and South Africa. The mean error in the low level flow, shown in Fig. 1b for 850mb, is the reverse of this, with westerlies off West Africa, easterlies off East Africa and cyclonic flow over North and South Africa. This flow pattern is precisely what one would expect for a heat induced tropical circulation where the heat source is symmetric about the equator (Gill, 1980; Heckley, 1983). Fig. 2 shows the theoretical linear, steady response at low levels of a tropical atmosphere to localised heating, symmetric about the equator. The upper level response is the reverse of this. The solution corresponds to an eastward travelling, damped, Kelvin wave and a westward travelling, damped symmetric Rossby wave. The structure of the flow, and the timescales involved, agree with the evolution of the error field in the forecasts, suggesting that a substantial part of the forecast errors in the tropics are associated with erroneous large scale heating at the start of the forecast.

This result does not exclude mountains as a source of error since, for example, incorrect use of surface pressure data over high mountains would essentially appear as a spurious thermal source in the analysis. An obvious candidate for these errors is the adiabatic non-linear normal mode initialisation. The absence of diabatic forcing in the initialisation results in an initial data set for the model with very little tropical divergence. Starting a forecast from such an adiabatically initialised data set is like switching on a heat source. After the switch-on, the model "spins up" rapidly. Recent incorporation of the diabatic processes in the analysis has resulted in only a modest improvement in the forecasting of the tropical wind field.

Another possible source of error is the absence of a diurnal cycle in the forecasting system. There are large diurnal and semi-diurnal variations in near surface parameters, the semi-diurnal pressure tide being particularly strong in the tropics. The model, which provides the first guess for the analysis, does not simulate the semi-diurnal tide and therefore the first guess pressure field in the tropics can disagree with observations by up to a few mb according to the phase of the tide. The observational network over Africa consists mainly of a few SYNOP stations, and the 12Z observations coincide with a peak in the tide. This surface pressure data is accepted by the analysis scheme, resulting in temperature increases of several degrees at low levels, which produces an analysis with a very unstable vertical stratification. On starting a forecast, this instability is released in the form of very intense convection. Unrealistically large precipitation increases the soil moisture over the African continent which, in turn, allows the enhanced convection to become established, which could permanently change the model's large scale thermal forcing and hence the model's tropical climatology.

It is expected that a correct accounting for the diurnal cycles in the data will result in substantially improved tropical forecasts.

- Bill Heckley

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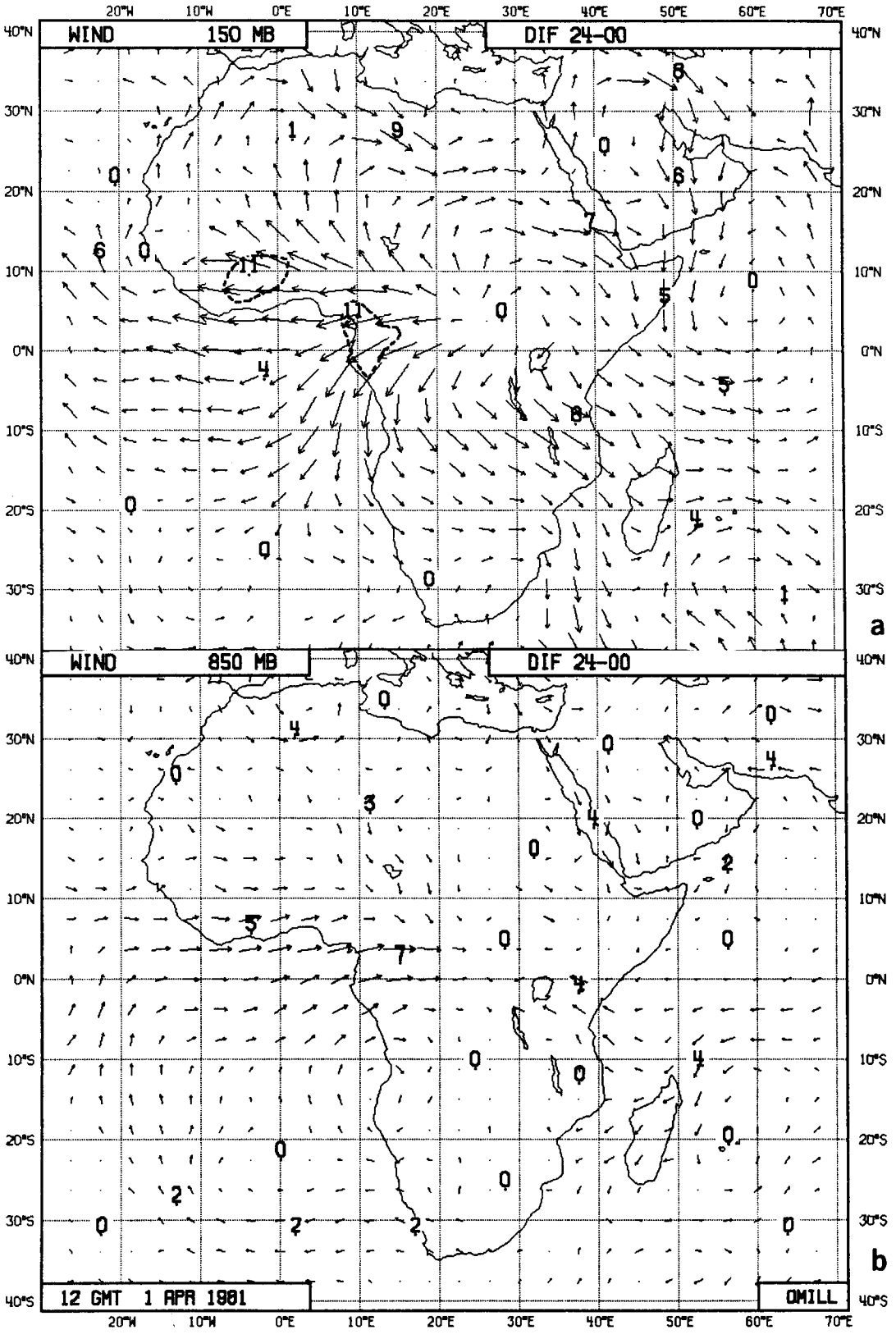

Fig. 1 April, 1982, mean 24 hour forecasts minus mean initialised analyses
a. The 150mb wind field over Africa
b. The 850mb wind field over Africa

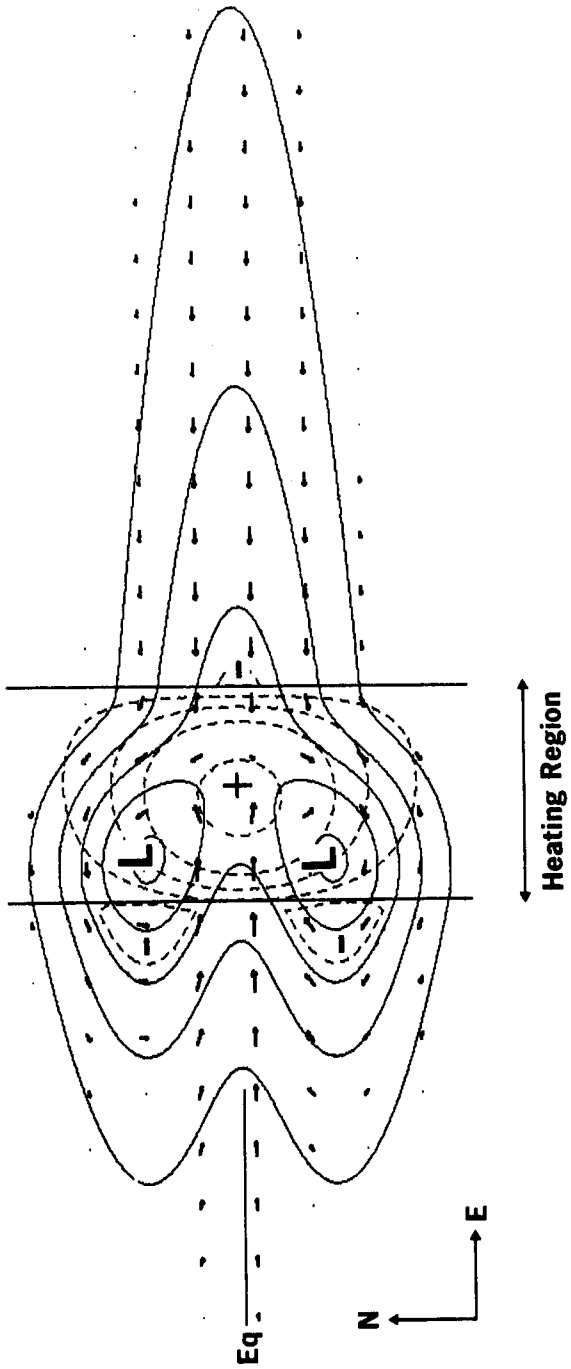

Fig. 2 The steady, linear response of a tropical atmosphere to localised heating symmetric about the equator. Solid lines are isolines of pressure perturbation, dashed lines are isolines of vertical velocity. The horizontal arrows are in the direction of the horizontal velocity, the length is proportional to the logarithm of the wind speed. '+' indicates ascent, '-' descent.

欧洲中期数值予报中心予报产的初步检验

A PRELIMINARY VERIFICATION FROM CHINA OF ECMWF 500mb NUMERICAL PRODUCTS

The following is extracted from a forthcoming Technical Memorandum of the same title by Zhang Jia-bo, et al., Weather Bureau of Xin-jiang, Uighur Autonomous Region, People's Republic of China, which was translated by Dr. Chen Shou-Jun, Visiting Scientist, ECMWF

1. Introduction

The Xin-jiang Weather Bureau, China, has received ECMWF 500mb numerical products since 2 August 1982. The forecast times available are 48, 72, 96 and 120 hours. The area is bounded from 20°N to 90°N and 0°E to 90°E, but 0°E to 180°E for the 120 hour forecast. First experiences of using the ECMWF products in the operational weather forecast from August to October 1982 were good, and so, since 5 October 1982, the Xin-jiang Weather Bureau has transmitted the ECMWF maps and some data to the county stations of the Region by facsimile and broadcast.

2. Prediction of variations of the circulation pattern

Variations of the large scale circulation are most important in weather prediction. A "weather process" is composed of a combination of the large-scale circulation pattern, influencing synoptic systems and local weather phenomena. It is most important to verify the model's ability to predict the weather process.

There were five weather processes during August 1982 in Xin-jiang:

i. 4.8.82 12GMT - 7.8.82 12GMT. The west European ridge was maintained, and under the influence of a disturbance in the southern jet, moderate rain was recorded.

ii. 7.8.82 00GMT - 12.8.82 00GMT. This process was accompanied by a change in the long waves. The southern European ridge developed, the low over Novaya Zemlya (Kara Sea) moved southward, and the trough over the Ural mountains moved eastward.

iii. 12.8.82 00GMT - 17.8.82 00GMT. The polar high moved westward to the Kara Sea. The trough over Europe weakened and moved eastward to Xin-jiang.

iv. 17.8.82 00GMT - 24.8.82 12GMT. Accompanied by a change of long waves, the trough at the European Atlantic coast developed; the ridge over Europe moved eastward to the Urals and developed into a closed high. A trough oriented west to east on the south side influenced Xin-jiang.

v. 25.8.82 00GMT - 31.8.82 00GMT. This was the strongest weather process. A large area of precipitation over southern Xin-jiang occurred and, in the later stage, a pronounced temperature drop was recorded in northern Xin-jiang. On 25 August, the east-west trough over central Asia was cut off and a cold vortex was formed. The Indian low developed and interacted with this vortex. At the same time, the Pacific sub-tropical high developed and extended westward. Heavy rainfall occurred over the south western part of Xin-jiang. On 29 August, the cold vortex weakened and moved into Xin-jiang and caused a temperature drop in northern Xin-jiang.

ECMWF's forecasts for these five weather processes were essentially correct, especially for those of 11-12 August, i.e. the redevelopment of the European ridge, 23-24 August, the forming of the middle Asia level trough, and 25-31 August, the cut-off cold vortex. The meteorologists in Xin-jiang were deeply impressed by the forecasts.

To verify further the model's ability, the area was divided into four principal parts: 1) 20° - 50°E, 50°N northward. 2) 50° - 80°E, 50°N northward. 3) 10° - 35°E, 50°N southward. 4) 45° - 65°E, 50°N southward. These four areas are the key areas for the Xin-jiang weather forecast.

For these four areas, we calculated the error of the model forecast; the results are shown in Table 1.

HOURS	AREA NO.	DATE 4	6	11	16	23	25	27	29	Correct frequency	Wrong f/c
48 hr Forecast	I	-8	<-4>	<-4>	-4	-4	-4	-4	4	7/8	0
	II	<-4>	-4	0	-4	-8	-4	-4	-4	7/8	0
	III	-4	<-4>	-4	4	-4	4	-8	-4	7/8	0
	IV	-4	-4	<-4>	-4	4	-8	0	-4	7/8	0
120 hr Forecast	I			4	-16	-8	-12	-16	-12	1/6	4/6
	II	NO	NO	-12	12	-16	8	-8	-8	0	3/6
	III	DATA	DATA	-8	-4	-4	4	-8	-4	4/6	0
	IV			-4	-4	4	-4	-8	-4	5/6	0

Table 1 The forecast error (10 gpm) of the model in 4 key areas. <-4> means that the error is less than -4.

If we define an absolute error of 40 gpm or less to be correct, and an absolute error larger than 80 gpm to be wrong, Table 2 shows that the 48 hour forecasts are all correct and, for the 120 hour forecasts in key areas III and IV, they are also essentially correct. This indicates a high prognostic ability in the ECMWF model.

3. Concluding Remarks

3.1 From the three months' (August to October 1982) experience of using ECMWF's products, we feel these products have a good ability to forecast the weather systems in westerlies.

3.2 Although there are some weak points in ECMWF's products, they are found useful in the man-machine combination to provide a good weather forecast.

- Austin Woods

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MONTHLY VERIFICATION OF ECMWF FORECASTS OVER EUROPE; 1980, 1981 AND 1982 COMPARED

Results of operational verification of forecast fields for the European area are presented in Figure 1 (opposite), which shows anomaly correlation scores at three levels for 1980 and 1981 (left) and 1981 and 1982 (right).

Large month-to-month variations are evident in the scores for D+5 and D+7 (as would be expected in these scores for the small area verified, 36-72°N, 12°W-42°E). In 1982, D+5 500mb forecasts scored 0.60 or better in each month except October. In general, however, it is difficult to detect a significant overall difference between the 1981 and 1982 scores (although both are clearly better than the 1980 scores, shown by the dashed lines in the left column).

- Rauno Nieminen

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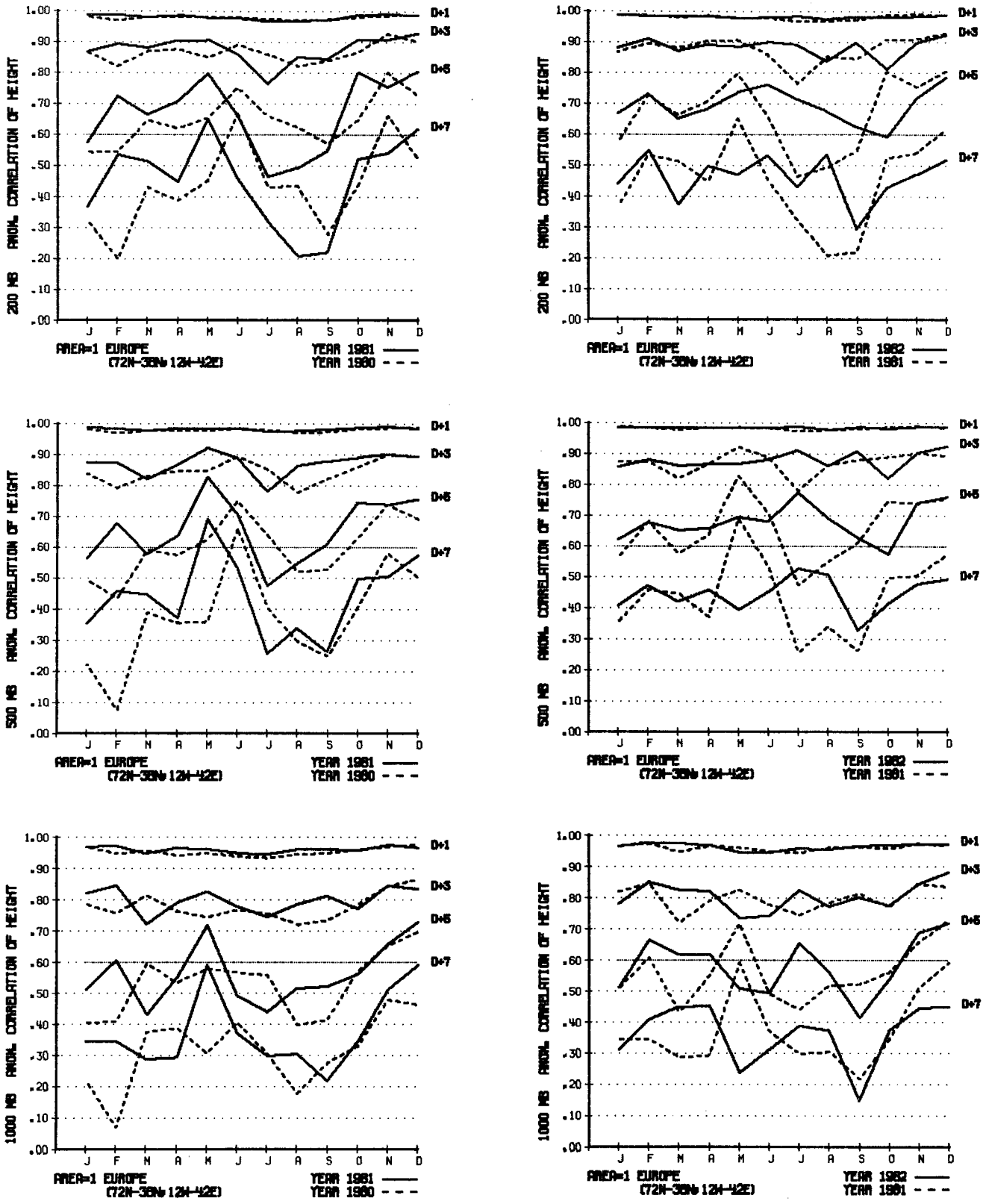
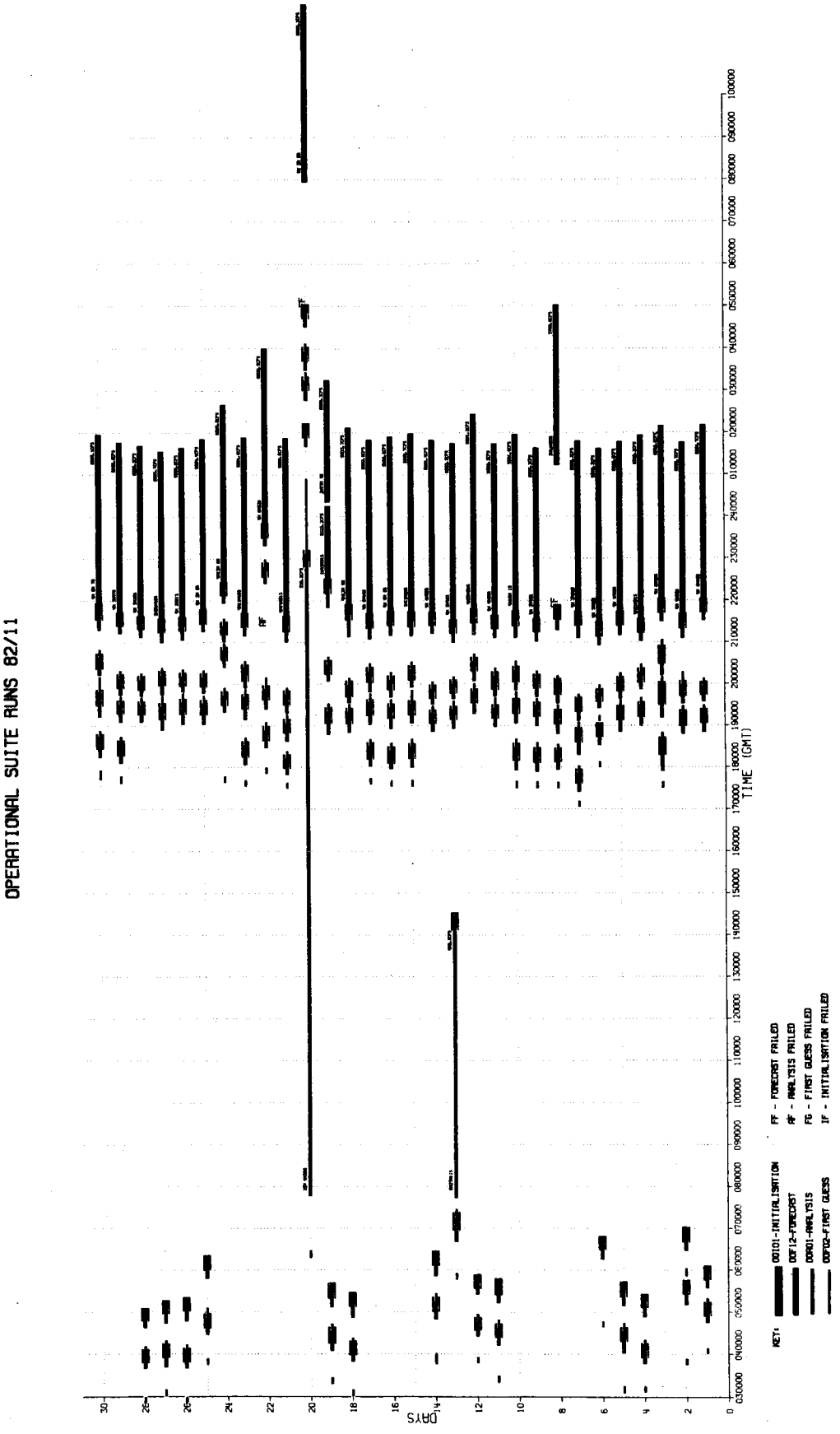
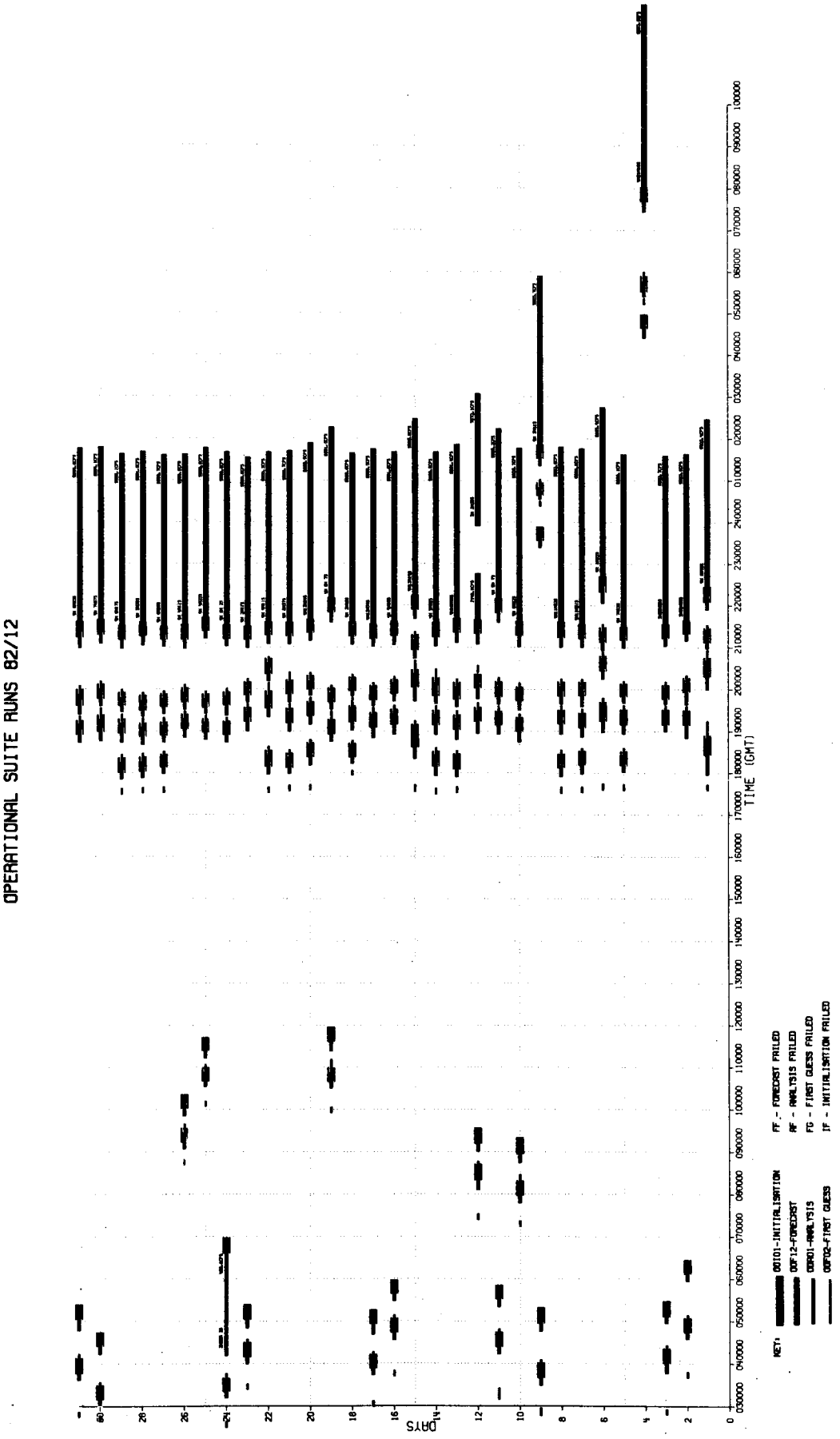


Fig. 1 Anomaly correlation of geopotential height for the European area for 1980 and 1981 (left column) and for 1981 and 1982 (right column) for 1000mb (bottom row), 500mb (middle row) and 200mb (top row). The solid lines are for the later forecasts.

OPERATIONAL SUITE RUN DIAGRAMS



The plots show run times for the major Cray components of the daily forecast run for November and December respectively. The plotted lines show the elapsed time of each program in different thicknesses, for each day of the month. The major delays to the forecast on 8 and 20 November were associated with Cray problems.



The delays on 4 and 9 December followed the reloading of the Cyber filebase due to disc failure.

AN ADDITIONAL AID FOR MONITORING CRAY USER I/O PERFORMANCE

With the introduction of COS 1.11 on Cray, an important and useful aid is now available for monitoring I/O performance. Figures may be obtained giving details, for each data set used by a job, of:

a. file names

b. file location

c. file length in words

d. number of I/O requests (user requests)

e. number of blocks read/written

f. transfer time

To obtain these statistics, code

```
OPTION, STAT=ON
```

near the beginning of the job.

I suggest that this option be used to optimise the I/O of frequently run Cray jobs. It adds almost nothing to the time the job takes to execute, but can result in considerable saving of Cray time if the statistics are properly used.

- Rex Gibson

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*BEWARE: FETCH GIVES UNIQUE ACCESS

Users are reminded that using FETCH interactively to attach a file gives unique access to that file, so any batch job, or another interactive user, has to wait until the file is returned, or until you logout, before they can use it. This has caused problems, especially when users let the system time out their terminal: when this happens, the file remains attached for 45 minutes after the user last uses his terminal.

To attach files, you are recommended either to use ATTACH specifying MR=1, or use the ATT procedure (from PROCLIB, see ECMWF Computer Bulletin B6.5/1). By default, ATT attaches your file without giving you unique access.

Alternatively, if the file you are FETCHing was catalogued originally with a password (i.e. XR parameter) then using FETCH does not give you unique access. Many common system files have been catalogued in this way, as it is a sensible method if many people read the file, but very few need to change it. The disadvantages are:

- whenever you create a new cycle or purge an existing one, you must specify the same password, using the PW parameter (not XR!);
- if you amend the file using EDIT and have not attached it specifying PW then you cannot use the END command to save the amended version. You must use SAVE followed by a CATALOG specifying the password again.

In summary, BEWARE: FETCH gives unique access -
use ATT instead.

- Andrew Lea

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*SUBROUTINE/FUNCTION CALLING SEQUENCE CHANGE WITH CFT 1.11

The 1.11 release of CFT will optionally alter the FORTRAN calling sequence. This means that the way in which arguments are passed to routines will change. The current method of passing arguments is to store their addresses in locations 'EP-n', where 'EP' is the address of the main entry point of the called routine and 'n' is the position of the parameter in the 'CALL'. The new method of passing arguments is to build a table containing a header word followed by the addresses of the arguments, and to pass the start address of this table into register 'A6'.

Initially CFT 1.11 will, by default, produce code which conforms to the old calling sequence. However, a version of CFT 1.11 (and associated libraries) which conforms to the new calling sequence will be made available. Providing no major problems are found, this version will become the default compiler before CFT 1.12 comes onto the scene.

For CFT programs and routines, this change should be fairly transparent. The three main problems foreseen are:

1. The need for all code (programs and libraries) to be re-compiled. It will not be possible, for obvious reasons, to run programs which were compiled using the new calling sequence with libraries compiled using the old one, and vice versa. LDR will be modified to prevent this.

2. Argument association across CALLs will no longer work. This is the (non-ANSI) practice of calling a subprogram with fewer arguments than on a previous occasion and assuming that those arguments not supplied still retain the values given in the previous call.

3. The maximum number of COMMON blocks allowed in any one subprogram unit is reduced from 124 to 123. (This could reduce to 119 in a later version of CFT).

For CAL programs and routines, this change may be less transparent:

1. For those codes which make use of the ENTER/EXIT/CALL/ARGADD macros all that will probably be required is to re-assemble them using the new version of CAL. However, there may be a problem if ARGADD is used after register 'A6' is destroyed (this is not yet clear).

   N.B. Codes not already using these macros should be converted to use them NOW!

2. The new calling sequence reserves 3 B-registers that were formerly available to users:

   B02 - pointer to B/T save area
   B66) - reserved for future needs
   B67)

3. Under the old calling sequence some library routines accepted optional parameters. These were I/O routines such as OPEN, CLOSE, INQUIRE etc. CAL routines which call these may need modifying.

A method to enable the smooth transition from the old calling sequence to the new is currently being worked out. You can help yourselves now, before CFT 1.11 arrives, by checking for any of the problems mentioned earlier and altering your code to remove the problem. If you experience difficulty in doing this, User Support should be contacted.

The reason for changing the calling sequence is not, as may appear, to cause maximum confusion to the CRAY user community but to pave the way for new machines such as the CRAY X-MP and CRAY 2 which have multiple CPUs and also to allow for new features such as re-entrant code, PASCAL routines, etc.

More information will be released nearer the date of CFT 1.11 implementation, but please do not wait until then to convert your programs. The sooner you identify possible problems and fix them, the less work there will be when the change occurs.

- Neil Storer

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GRAPHICS NEWS

This article follows up the plans described in an article published in Newsletter no. 17, October 1982.

There has been much progress in the graphics area, though as yet, there are few results to show. The most noticeable area of change is the software area. Following an evaluation of the various software packages available, it was decided to purchase DISSPLA, a package from ISSCO Corporation of San Diego, California. The package was installed on the Cybers early in November, and a short course was given to Centre users. A bulletin describing DISSPLA's facilities is now in preparation. DISSPLA has very extensive graph drawing facilities and it is currently being used for a variety of applications requiring graphical output.

Although DISSPLA provides mapping and contouring facilities, they are inadequate for the needs of the Centre, and so another contouring package has been installed and interfaced to DISSPLA. This contour package, CONICON, is the result of work undertaken by the School of Mathematics at the University of Bath, U.K. The front cover of this Newsletter gives an indication of the quality achievable using DISSPLA and CONICON.

CONICON is designed to draw the contours of continuously differentiable fields. The method used is to approximate the field by a function G whose mathematical form is such as to allow the explicit solution of the equation $G(x,y)=h$ and then to draw the contours of G. Internally, G is based not only on the grid for the field but also the gradients for the grid points (can be estimated by CONICON). Because of the use of value and gradient matching, the quality of the approximation is high, and accurate contour maps can be produced without the need to use a very fine grid.

G is constructed by breaking each cell of the grid into 16 triangular patches, and for each patch a quadratic function is used to approximate the field.

The contours themselves consist of pieces of conic sections (ellipses, parabolas, hyperbolas) joined as continuously differentiable functions (thus smoothing is never needed). These conic segments can be drawn to any desired degree of accuracy on a graphics device.

New facilities worth mentioning are that the user can specify the levels to be contoured and these need not be at regular intervals. Also, crosshatching between the contour lines can be performed by the package.

Though CONICON and DISSPLA produce very high quality output, the computer resources required to run them are higher than was the case for the existing ECMWF Contour Package, and thus CONICON and DISSPLA are not suitable for producing large volumes of contour plots from, for example, the operational

suite. For this reason, it is proposed to produce a compatible, high performance contour package which produces lower, but acceptable, quality output for large volume applications.

Work to integrate CONICON and DISSPLA and to make the result available for use is well advanced and should be complete within the next 2-3 months.

The second major area of progress is in the enhancements to the Graphical Subsystem. In order to provide support for a wider range of graphical devices, a VAX 11-750 minicomputer was installed in mid December. Device independent DISSPLA output files will be transferred to the VAX, initially using magnetic tape, but eventually using the local area network, and the VAX will transform the data into a device dependent form and will drive the various graphical devices. A pen plotter, to be used mainly for publication quality, low volume, plots will be installed and connected to the VAX, and will be available by mid 1983. It is also planned to have one of the Versatec plotters switchable between the Cybers and the VAX, for higher volume output; eventually, all graphical output will come via the VAX.

The VAX will also have an interactive graph drawing package, called TELL-A-GRAF, installed to provide interactive generation of plots.

During the past year, the primary emphasis of the graphics project has been towards the evaluation of requirements and the procurement of hardware and software. Now that the equipment and software is being delivered, the emphasis is turning to implementing the planned facilities. This process will take considerable time, and users are warned against having early, high, expectations. However, as the detailed planning becomes clearer, more information will be given.

- Peter Gray

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*PROCEDURE LIBRARY CHANGES

The following additions and changes to the interactive procedure library have recently been implemented:

a. New procedures

CONTROL	sends ASCII control characters to a terminal allowing screen blanking, cursor control, etc.
RELOAD	recovers SYSSET permanent files which have been purged on the same day.

b. Modifications

AUD	Output can be directed to a local file.
SELDECK	Will generate a job to compile the deck using FTN, FTN5 or CFT.
REFORM	Generates form feed at end of document.
FICHE	Interfaces to MFICHE. Several bugs fixed.

- David Dent

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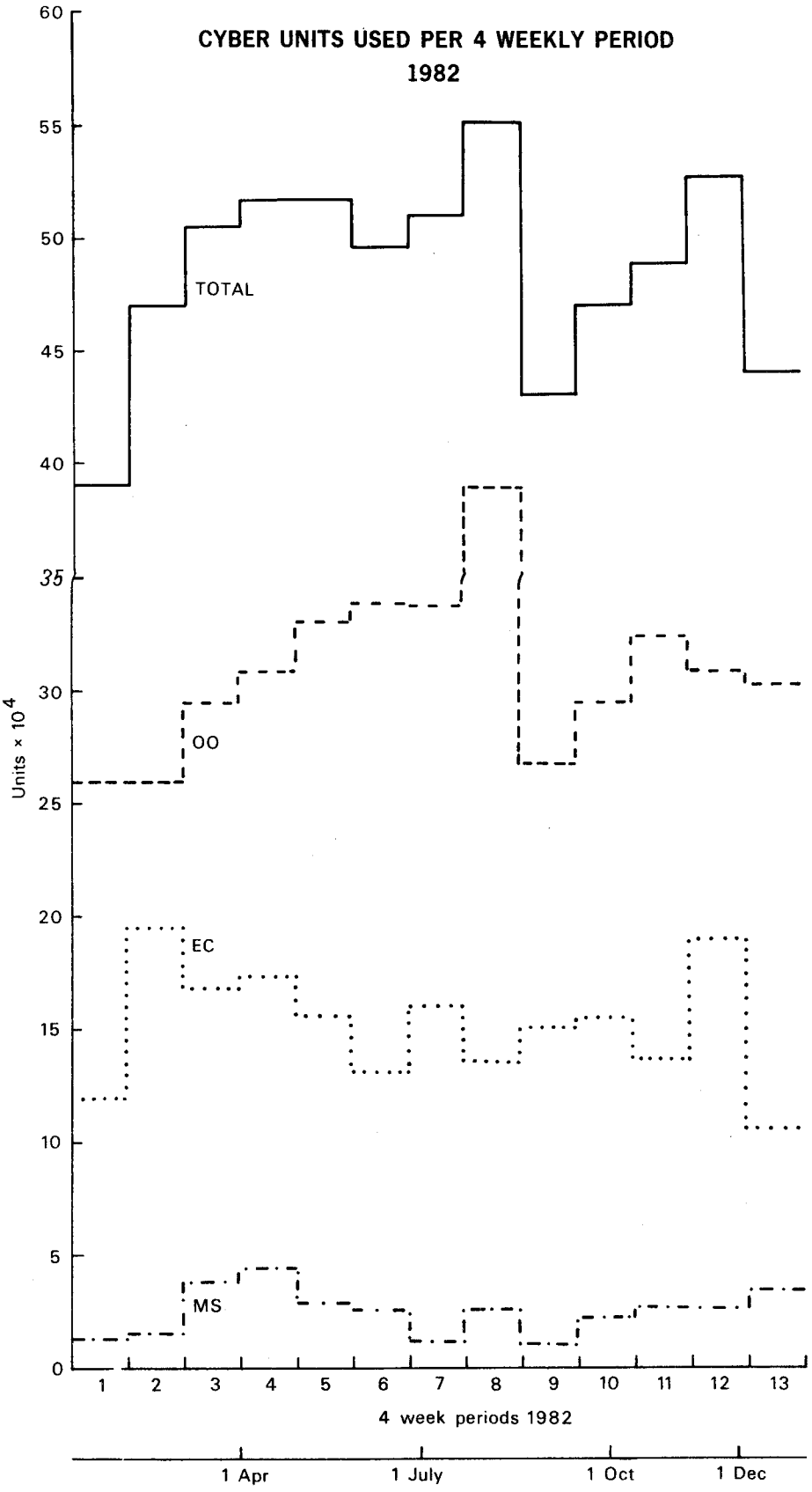
COMPUTER USAGE STATISTICS

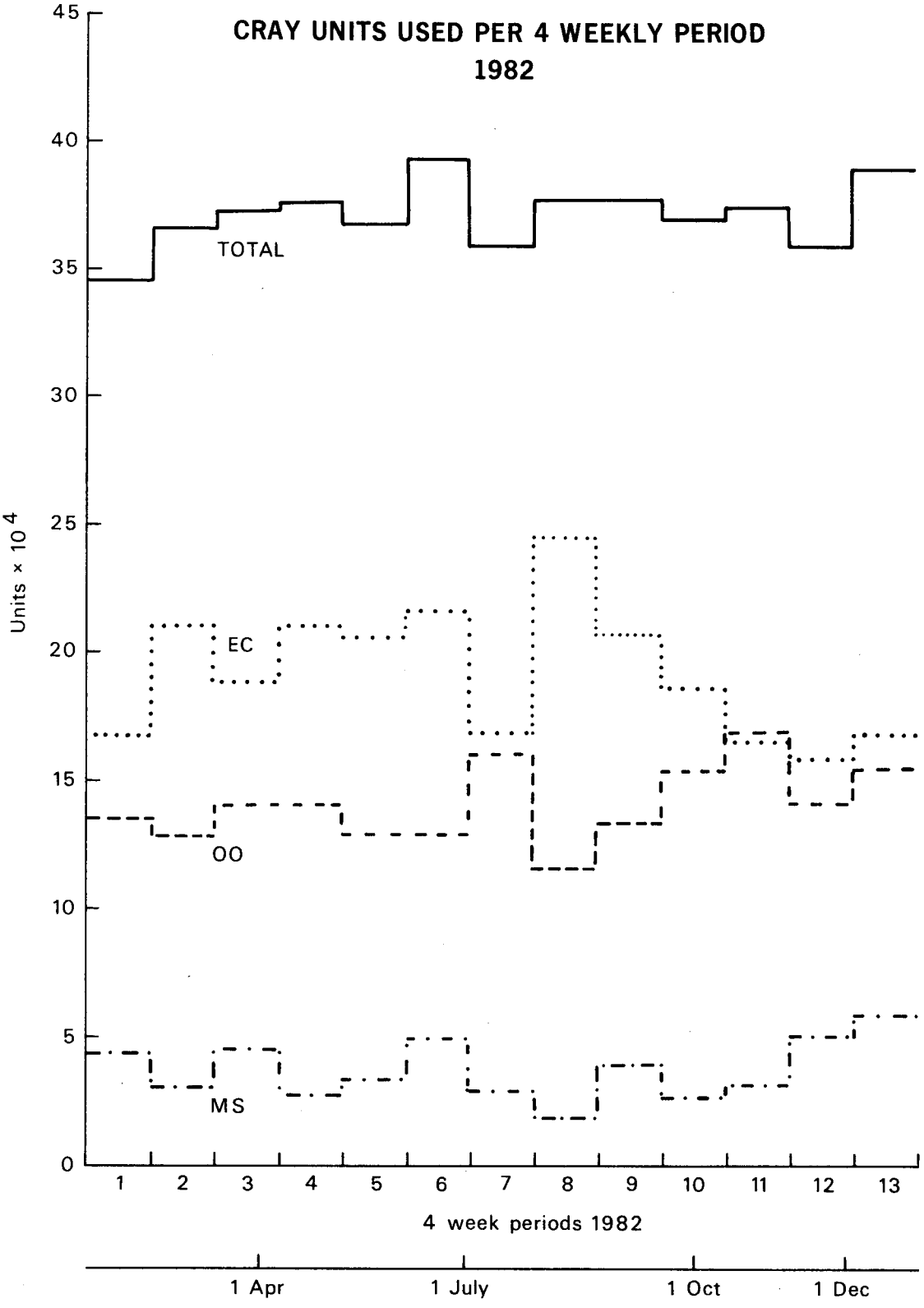


Total = total usage less those jobs classed as systems overheads

OO = operational suite running

EC = Centre users

MS = Member State users, including Special Projects



*MICROFICHE

A new system for the generation of microfiche is now available. It is based on a spooling mechanism; files to be written on microfiche enter a special queue. A sequencer job removes files from this special queue on a regular basis and transfers them to microfiche via magnetic tape. As this process is handled completely by the system, the user no longer needs the parameter PE1 on the job card, and the fiche program may be executed interactively.

The new command, MFICHE, acts in many respects like a ROUTE command with the DEF parameter. Additionally, it writes a header record to the file, containing information for titles and control commands for the COM (Computer Output Microfiche) system. It is intended that the command be issued before anything is written to the file, to ensure that the COM control information and titles are at the beginning. However, MFICHE will work (albeit less efficiently) even if there is data on the file. In this case, it will write the header information to a new file, copy the contents of the old file and rename the new file to the old file name.

All indexing is performed by the COM system and, therefore, it is not possible for MFICHE to generate a paper index as is currently produced by the FICHE program.

Parameters to MFICHE are similar, but not identical, to FICHE parameters. The Computer Bulletin describing fiche facilities (B8.5/1) has been revised and will be distributed shortly. Please refer to this bulletin for a description of parameters.

Note that MFICHE may also be used directly in a Cray job and that the PROCLIB procedure FICHE now uses MFICHE.

Please convert all usage of FICHE to MFICHE as soon as possible. FICHE will be removed from service in the near future.

- Gary Harding

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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 (up to News Sheet 141). 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)
47	Libraries on the Cray-1
53	Writing 6250 bpi tapes (EEC parameter)
54	Things not to do to the Station
56	DISP
67	Attention Cyber BUFFER IN users
73	Minimum Cyber field length
89	Minimum field length for Cray jobs
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The following News Sheets can be discarded since this list was last issued: 138, 139.

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ECMWF PUBLICATIONS

Technical Report No. 34	The impact of cloud track wind data on global analyses and medium range forecasts.
Technical Memorandum No. 68	A note on prime factor FFT algorithms.
Technical Memorandum No. 69	Benchmark exercises on CRAY X-MP.
Technical Memorandum No. 70	Point verification and simple statistical adaptation of ECMWF model forecasts of dewpoint (2m).
Technical Memorandum No. 71	Fast mixed radix real fourier transforms
Technical Memorandum No. 72	A preliminary verification from China of ECMWF 500mb numerical products.
Seminar October 1981	Graphical Applications in Meteorology
ECMWF Forecast and Verification Charts	to 30 November 1982 to 19 December 1982

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CALENDAR OF EVENTS AT ECMWF

22-23 February 1983	Meeting of the TAC subgroup on new computing facilities.	
7-10/11 March 1983)	Computer user training courses.	(B)
14-18 March 1983)		(C)
21-22 March 1983	Fifth session of Technical Advisory Committee	
23-25 March 1983	29th session of Finance Committee	
20-21 April 1983	17th session of Council	

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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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- COMFILE (See Bulletin B1.5/1)				
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Communications & Graphics Section Head	-	Peter Gray	OB 227	448
COMPUTER OPERATIONS				
Console	-	Shift Leaders	CB Hall	334
Reception Counter)				
Tape Requests)	-	Jane Robinson	CB Hall	332
Terminal Queries	-	Norman Wiggins	035	209
Operations Section Head	-	Eric Walton	CB 023	351
Deputy Ops. Section Head	-	Graham Holt	CB 024	306
DOCUMENTATION	-	Pam Prior	OB 016	355
Libraries (ECMWF, NAG, CERN, etc.)	-	John Greenaway	OB 017	354
METEOROLOGICAL DIVISION				
Division Head	-	Frédéric Delsol	OB 008	343
Applications Section Head	-	John Chambers	OB 007	344
Operations Section Head	-	Austin Woods	OB 107	406
Meteorological Analysts	-	Ove Akesson	OB 106	380
	-	Veli Akyildiz	OB 104A	379
	-	Horst Böttger	OB 104A	378
	-	Rauno Nieminen	OB 104A	378
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RESEARCH DEPARTMENT				
Computer Coordinator	-	Rex Gibson	OB 126	384
Systems Software Section Head	-	Claus Hilberg	CB 133	323
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User Support Section Head	-	Andrew Lea	OB 003	348

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* CB - Computer Block
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