European Centre for Medium Range Weather Forecasts

# ECMWF NEWSLETTER

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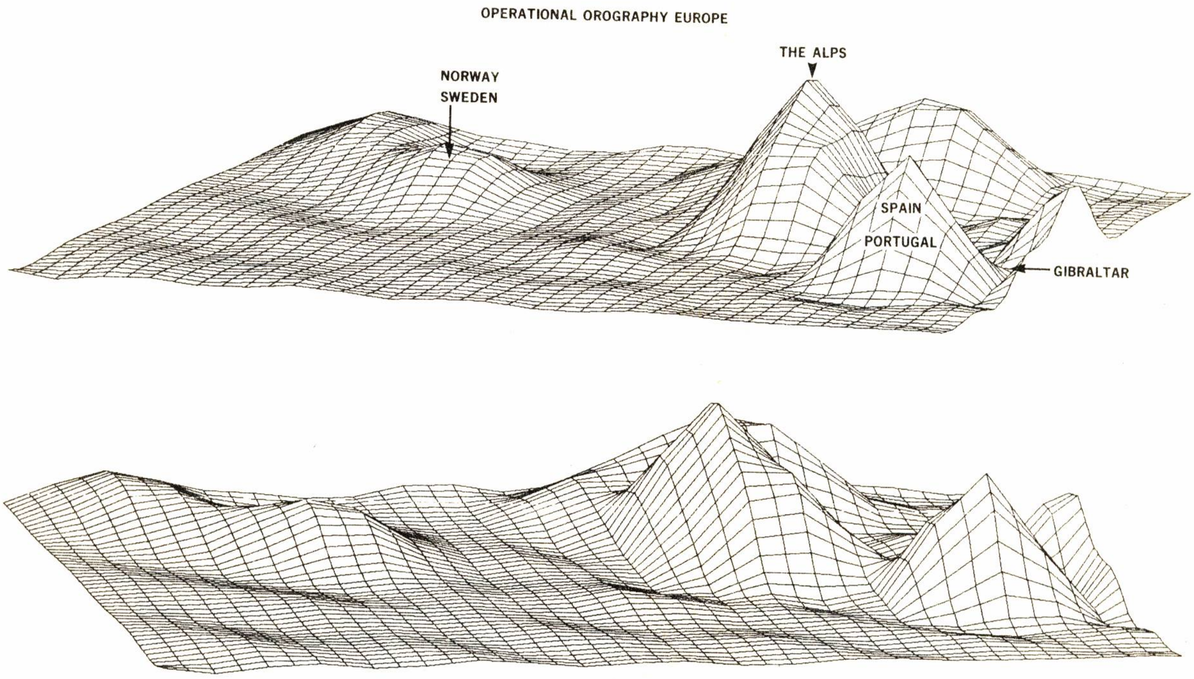

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## IN THIS ISSUE

### METEOROLOGICAL



### COMPUTING



### GENERAL



* NOTE: This article directly concerns the computer service; we recommend that computer users read it.

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COVER: A 3-D representation of the present orography over Europe used in the ECMWF model. Two different views are shown, the superimposed grid is half that used in the model. This orography was discussed in Newsletter No. 20 (April 1983) p.4.

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This Newsletter is edited and produced by User Support.

The next issue will appear in December 1983

# INITIALISATION

## Introduction

This article tries to explain in simple terms what initialisation is, and why it is needed. Use is made of examples and analogies and this leads to a straightforward physical explanation of normal mode initialisation and its benefits.

## Why initialisation?

Once an analysis scheme has provided initial values for the prognostic variables of the model, one is in a position to start a forecast. However, as Fig. 1 shows, the result will be quite disappointing. The surface pressure at this particular point (0°E, 52°N) shows unrealistic high frequency oscillations with considerable amplitude. By contrast, if the forecast is started from the initialised analysis (dashed), the behaviour is much better. When looking at the difference (initialised-uninitialised) between the two predicted surface pressure fields after 6 hours, a marked wave pattern is immediately evident. In order to cause the pressure oscillations shown in Fig. 1, these waves have to travel with a speed in the order of a hundred metres per second, which is the characteristic speed of gravity waves.

The crucial role of initialisation becomes most evident within a data assimilation scheme. Before the actual analysis is performed, the observations are checked against the first guess. If the deviations exceed certain limits, the data are rejected. If the first guess is contaminated with spurious oscillations, this can easily lead to unjustified rejection or acceptance of data. Such a degraded analysis leads to a degraded forecast which will deteriorate the next analysis and so on.

## What are gravity waves?

A simple example of gravity waves are the patterns originating from a stone thrown into a pond. The main processes leading to the propagation of these waves are sketched in Fig. 2. Once the surface of an incompressible fluid has been elevated at an arbitrary point B, gravity tries to bring the particles back into their original lower level. This leads to mass convergence in regions A and C which, in turn, results in an elevation of the surface, as shown in the lower part of Fig. 2. Two aspects are worth keeping in mind: the need for an initial disturbance and the importance of divergence.

For large scale gravity waves on a rotating planet, the Coriolis force cannot be neglected. Therefore, these waves are called inertia-gravity waves. Without them, the important geostrophic adjustment process cannot take place, which is why their careful modelling has proved to be important for an atmospheric model. In a stratified fluid, gravity waves can travel within the fluid as well as along the surface. These internal waves are responsible for the transport of momentum and energy, especially near mountains. They can sometimes be observed downstream of mountain ridges in the form of lenticular clouds which form in the wavetops where the particles reach the condensation level.

The question now remains: why do atmospheric models show the excessive gravity wave activity as seen in Fig. 1. This question can best be answered by referring to Fig. 2. Suppose we have a perfect model to predict the surface height of the fluid in a pond. To start the forecast, we need initial values of the surface height. Suppose we have 3 observations in points A, B and C. If, now, the observation in point B has a positive error, the model will start with

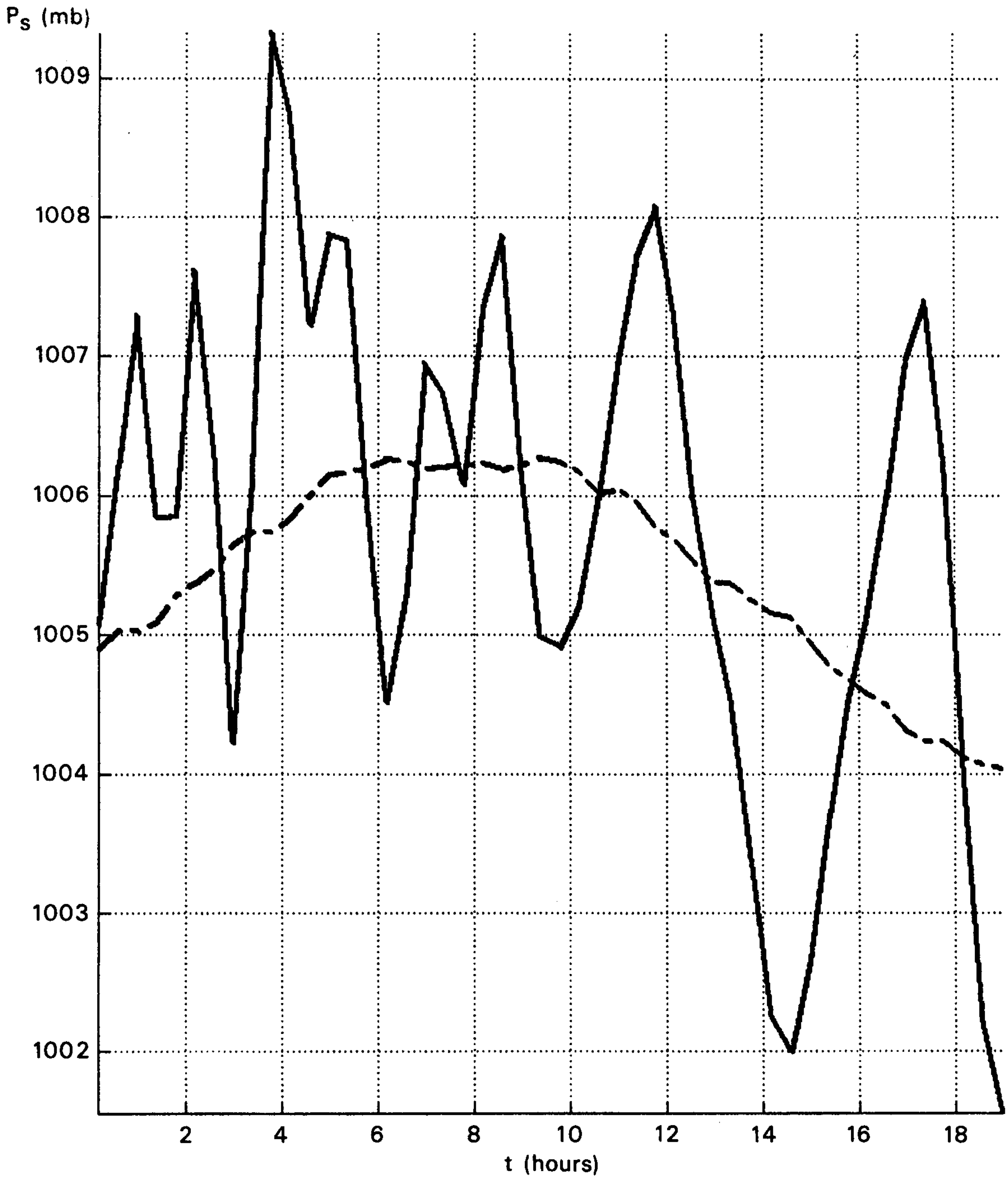


**Fig. 1 Surface pressure evolution at gridpoint 0°E, 52°N for forecast started from uninitialised (full) and initialised (dashed) analysis for 12 GMT 6 September 1982.**

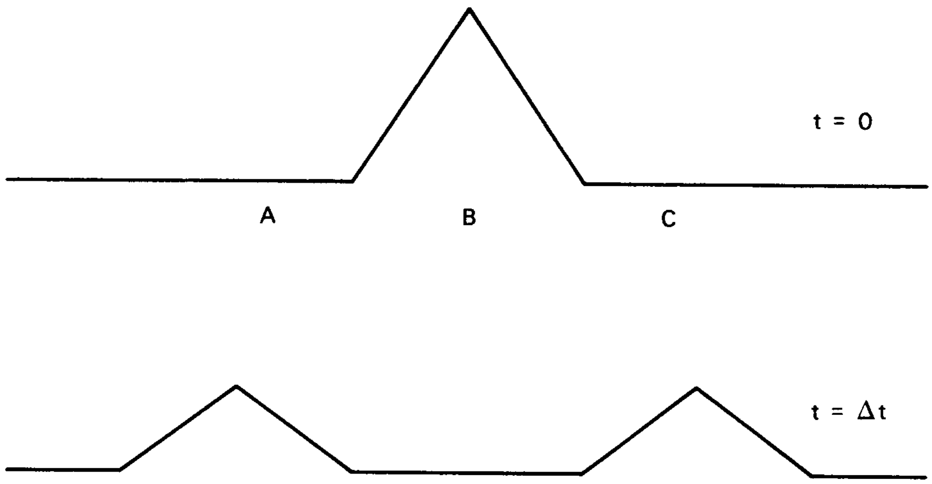


**Fig. 2 Prototype gravity wave**

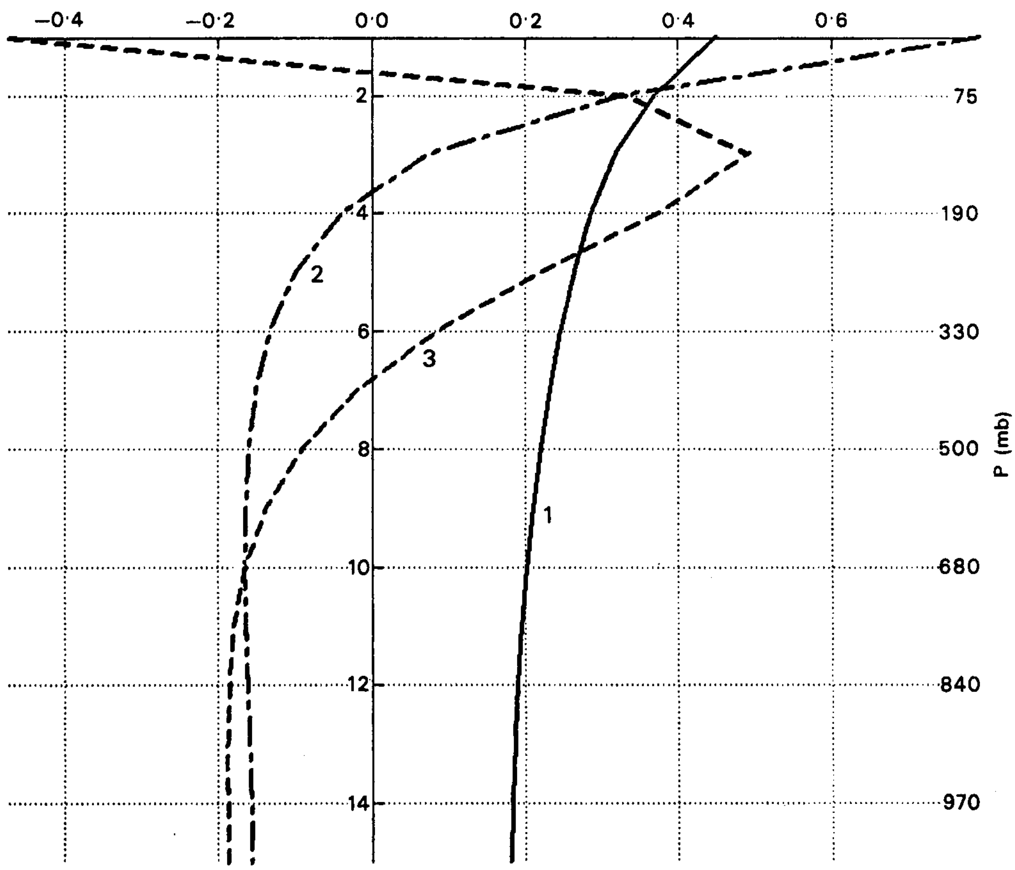


**Fig. 3 First 3 vertical modes for isothermal (300K) basic state. Rounded pressure values in mb are valid for $p_s$ = 1000 mb**

an initial state similar to the one sketched in Fig. 2, thus immediately leading to excessive gravity wave activity. A further source for unrealistic initial amplitudes for gravity waves is the analysis system used to interpolate the irregularly spaced observations to regular grid points. Even with perfect observations, an erroneous initial state might result from errors in the analysis scheme. A third cause is the model itself, which, although presented with a perfect initial state, can generate gravity waves because it is only an approximate description of the fluid. Generally, all 3 causes contribute to unrealistic gravity wave amplitudes in the initial state.

## What is initialisation?

In quite general terms, initialisation tries to define a reasonable initial amplitude for inertia-gravity waves. (For the simple example in Fig. 2 it would mean setting the amplitude at point B to zero). A number of methods have been used in the past. In the early days of numerical weather prediction, gravity waves were excluded altogether from the models by modifying the governing equations. Therefore, no initialisation was required. However, it was soon realised that these filtered models are inferior to the primitive equation models. Early initialisation methods used for these models all tried to control gravity wave activity by a suitable diagnostic definition of the initial wind field using various kinds of approximate relations. The most simple approach is to use the geostrophic relation. A higher degree of approximation can be achieved by the "balance equation" which yields a non-divergent wind field from the analysed mass field. Thus, the observed wind information is not used. Furthermore, the diagnostic relations are extremely simplified. For instance, there are considerable divergent motions in synoptic systems, which are suppressed initially when the balance equation is used. A third shortcoming is that there is sometimes a need to modify the analysed height field for mathematical reasons.

It is therefore no surprise that alternative methods have been developed. One of them is dynamical initialisation, where the model itself is used to derive a suitable initial state. Usually, the model is integrated forward and backward in time and gravity waves are damped by heavy time and space filtering. However, the filter operators cannot damp gravity waves selectively, they also influence the meteorologically important flow. Because of the backward integration in time, irreversible physical processes cannot, in general, be included. Furthermore, the method is expensive in terms of computer time. Recently, a third method, normal mode initialisation, has successfully been applied. This method will be outlined in the following sections.

## What are normal modes?

Normal modes are the free motions of a system capable of vibrations. A typical example is a guitar string. Once it has been excited, it starts to vibrate in a way characteristic for that particular string. Therefore, these vibrations are called "own" or "eigen" vibrations, or - in mathematical terms - normal modes. Another example is the surface waves on a pond. They are the eigenvibrations of the physical system "pond". Usually, there is an infinite number of eigenvibrations, each having a particular scale. If a stone is thrown into a pond, only a subset of these modes is excited, depending on the initial shape of the disturbance caused by the stone.

The eigenvibrations of atmospheric models fall into two classes: the Rossby modes and the gravity modes. Every mode shows a specific 3-dimensional structure of mass- and windfield. The vertical structures are identical for Rossby and for gravity waves. They differ, however, considerably in their horizontal structure and in the relation between mass and wind field. Fig. 3 gives some examples of vertical structures. The first vertical mode, the external mode, represents fields which are nearly constant throughout the atmosphere. It therefore describes the barotropic component of the mass and wind field. The second mode, also called the first internal, changes sign near the tropopause, thus accounting for the differences between stratosphere and troposphere. In general, vertical mode $\ell$ has $\ell$-1 sign changes. With increasing order $\ell$, the region of maximum amplitudes moves towards lower levels.

The horizontal structure of an external Rossby mode is shown in Fig. 4. The prominent feature is the approximately geostrophic relation between geopotential and wind in the extra-tropics. In the tropics, where the geostrophic relation is not applicable, normal modes still define a relation between mass- and windfield. In fact, they are the only means to establish globally valid coupling. The Rossby mode shown in Fig. 4 can be characterised by 3 indices: - the vertical mode number - the zonal wavenumber - the meridional index. As Fig. 4 shows an external mode, it means that at every point the wind components and the geopotential all have the same vertical structure as the curve labelled 1 in Fig. 3. The meridional index in Fig. 4 is 1, which means that this mode has the largest meridionally symmetric scale. Obviously, the zonal wavenumber is 1.

When looking at a gravity mode (Fig. 5) with the same indices (vertical mode 1, zonal wavenumber 1, gravest symmetric), the ageostrophic structure of these modes is immediately evident. In the extra-tropics, strong winds are not supported by a height gradient. In the tropics, the flow is highly divergent. Gravity waves can further be separated into two groups: the eastward and westward travelling waves. Fig. 5 shows a westward travelling gravity wave.

For the same combination of indices, Rossby and gravity waves have very different phase speeds (and periods). For example, the free period of the Rossby wave in Fig. 4 is 4.7 days, whereas the westward gravity wave in Fig. 6 has a free period of only 12.7 hours. Apart from a few exceptions, gravity wave periods decrease with increasing zonal wavenumber and meridional index. In contrast, large scale Rossby waves have shorter periods than small scale ones. For both types, the periods decrease with increasing vertical mode number. Therefore, a large scale internal gravity mode may have the same period as an external small scale Rossby mode. That is why the period is not a useful tool to distinguish between Rossby and gravity modes; nor is the wavelength, as is apparent from Figs. 4 and 5. The only way to make a proper distinction is to look at the 3-dimensional structure of both the mass- and the windfield.

## What is normal mode initialisation?

In normal mode initialisation, the unique features of normal modes are efficiently used to remove unwanted gravity wave amplitudes from the analysis.

First of all, the normal modes have to be computed. This is done by linearising the model equations around a simple basic state and solving the resulting set of equations. The result of these computations are the Rossby and gravity modes discussed in the previous section. This computation needs to be done only once; the normal modes are then stored for subsequent use.

The first step in the initialisation procedure itself is the identification of those structures in the analysed fields which lead to the excitation of gravity waves. Speaking mathematically, the analysis is projected on the gravity modes. This guarantees, that the most important part described by the Rossby modes is not touched at all.

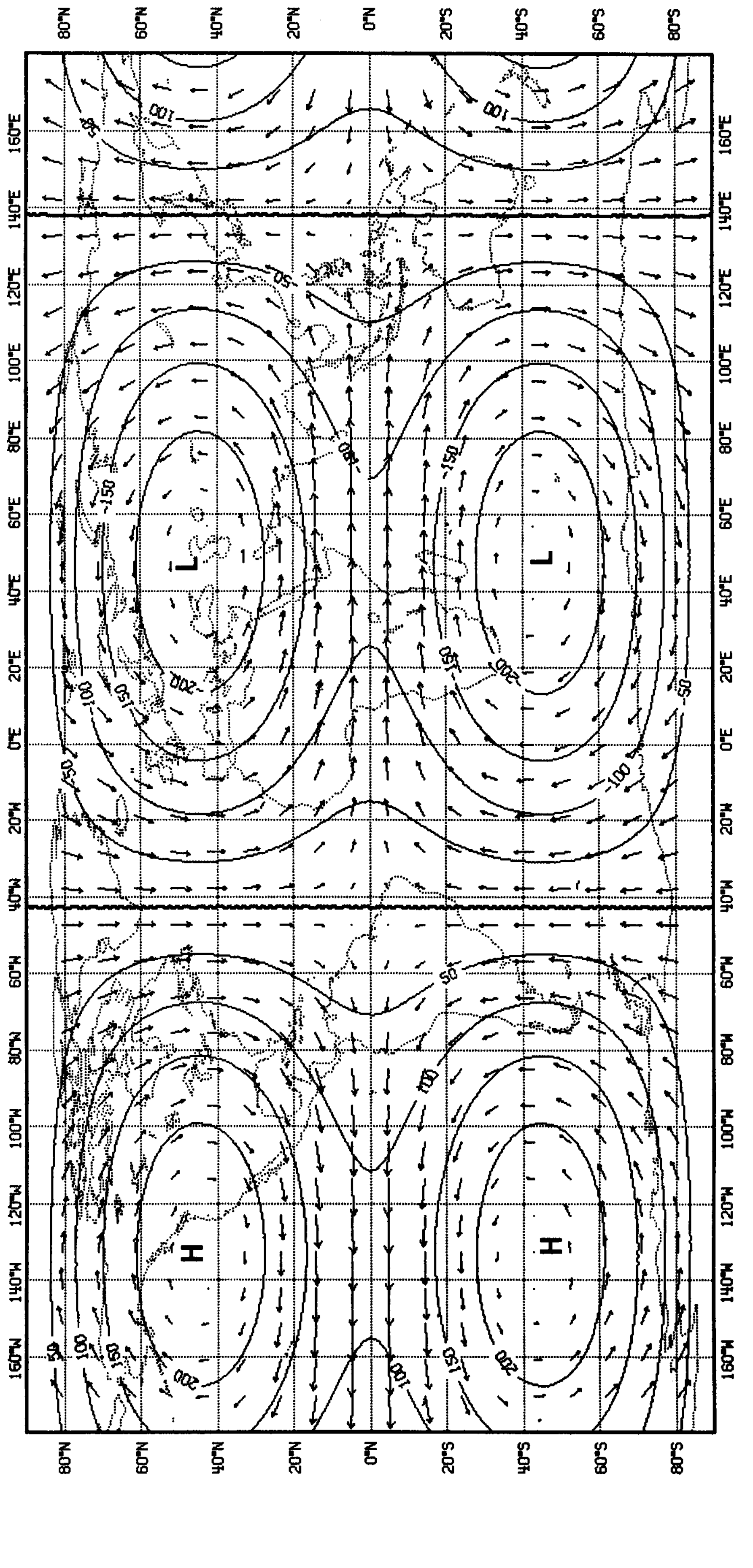


Fig. 4 Gravest symmetric, zonal wavenumber 1, external Rossby mode.

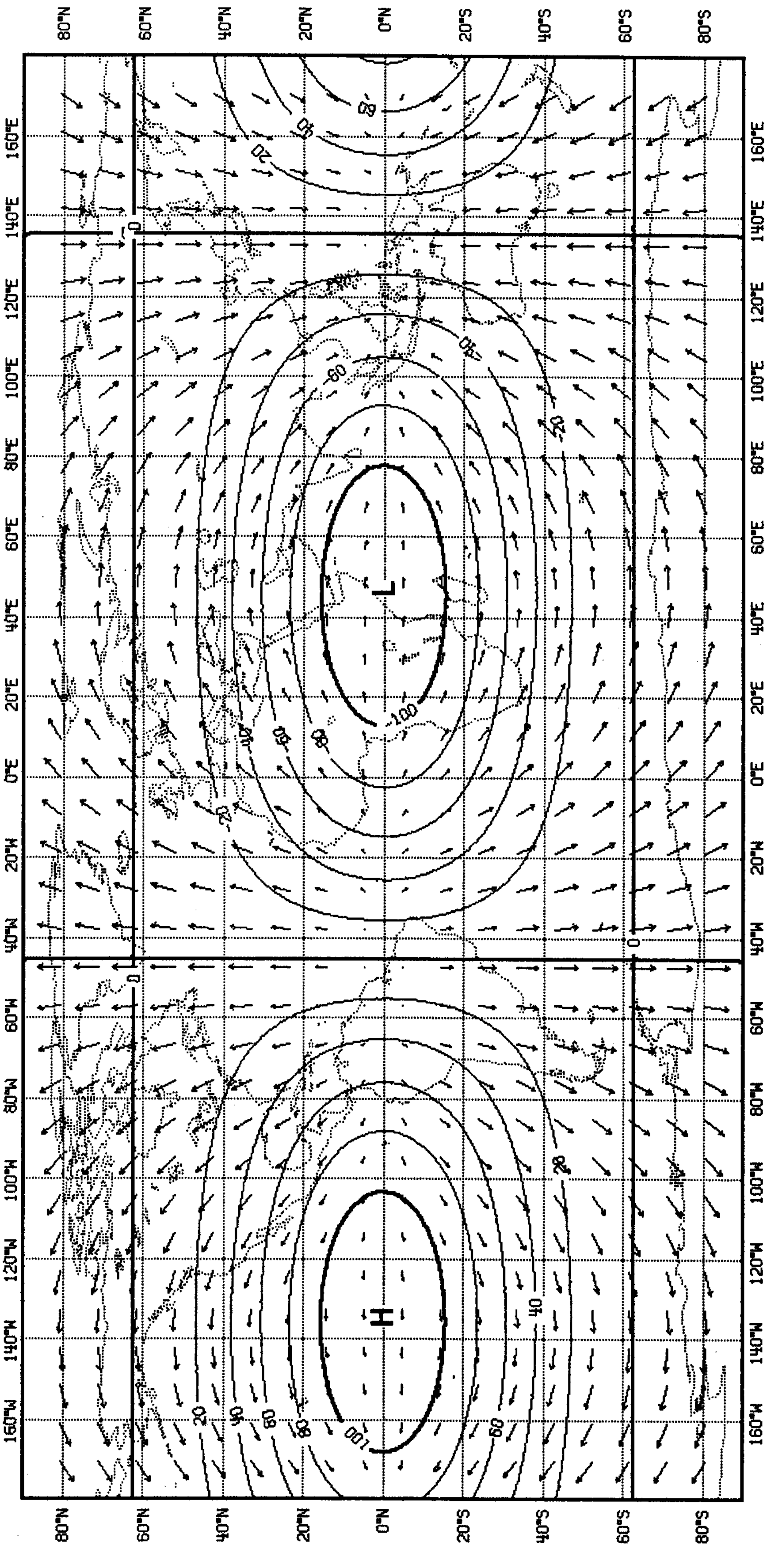


Fig. 5 Gravest symmetric, zonal wavenumber 1, westwards travelling, external gravity mode.

In the second step, the identified gravity mode projections are modified. The simplest method would be to set them to zero (linear normal mode initialisation). However, this would not solve the problem, because the non-linear advection processes and the parameterised physical processes would immediately start to excite new gravity waves. Machenhauer (1976) proposed eliminating only those parts of the gravity wave components which are not in balance with the non-linear processes. As a result, the linear tendencies for the gravity waves will be exactly compensated by the nonlinear dynamical and physical tendencies, yielding vanishing total tendencies for the initialised gravity waves. The corresponding mathematical equations can easily be formulated in normal mode space. It is a system of nonlinear algebraic equations which can be solved iteratively. This is the technique used at the Centre.

Further information about the general problem of initialisation and how the normal mode initialisation technique is applied at the Centre will be found in a new Lecture Note on initialisation that should be published soon. It will be available in the Library of your National Meteorological Service.

- Werner Wergen

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## REPORT ON USE OF ECMWF PRODUCTS IN THE MEMBER STATES

In June 1983, Member States were invited to submit information on the applications and uses of ECMWF products in order systematically to collect organised reports in a single publication which could be used as a reference by both the Centre and the Member States.

Reports were received from all Member States, and Iceland, which is associated to the Centre by a Co-operation Agreement. These reports are contained in the publication "REPORT ON USE OF ECMWF PRODUCTS 1983". It is intended that a similar publication will be published by the Centre in future years. Copies are available in the libraries of the Member States; extra copies are available on request to the Centre.

Amongst the wealth of information contained in this report, we find that, of the 17 Member States, twelve report that they either already use or plan to use ECMWF products in statistical forecasting schemes (four using the MOS technique, three the perfect prognosis method (PPM), one using both methods in different forecasting schemes, the others do not specify). Nine Member States report that they use or plan to use ECMWF products as first guess fields or boundary values in their own limited area modelling. Nine Member States report on the use of experimental products.

Lists of the users of medium-range forecast products were provided by several Member States. The areas of use include agriculture, the energy sector, engineering and construction, air pollution, tourism, ship routing, offshore platform forecasts, and the general public.

Much useful information is contained in the verification results contained in the report. The extensive range of future plans, including forecasting to D+10, use of 5-day mean fields, limited area modelling, more statistical interpretation and greater use of the Centre's archives, indicate the high level of satisfaction and confidence felt by the Member States in the Centre.

Future requirements foreseen for products not now listed in the ECMWF Current Product Catalogue (Meteorological Bulletin M3.4/1(4), which lists the Centre products available to the Member States) were specified by several Member States for consideration by the Centre's Technical Advisory Committee.

It is hoped that this publication will become a useful reference for the Member States, in which they can keep each other informed of their activities in the application and use of ECMWF products.

\- Austin Woods

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## AN EXPERIENCE WITH ECMWF FORECASTS IN SOUTH AFRICA

Mr. J. van Heerden of the South African Weather Service in Pretoria visited the Centre in August. He reported that South Africa now makes regular use of the Centre's Southern Hemisphere GTS products. They are considered to be useful by the Pretoria forecasters and give valuable guidance for medium range weather forecasting over South Africa out to day 4.

Mr. van Heerden brought with him an example of a recent successful ECMWF forecast issued on 20 July 1983. Figs. 1 and 2 show the Day 1 and Day 4 ECMWF 1000mb forecasts hand plotted together with the verifying weather charts for 21 July and 24 July analysed by the South African service. The intense low south of Cape Hope moves eastward during these three days and high pressure builds up from the west. A pronounced trough-ridge situation develops over South Africa and severe weather conditions with heavy flooding occur over the Natal region. The Centre's 1000mb forecast captured the development very well four days in advance and, according to Mr. van Heerden, gave good guidance to the forecasters in Pretoria. This was even more important as the floods followed a prolonged drought in that region.

Mr. van Heerden pointed out that successful forecasts, as shown in the example, help to raise the forecaster's confidence in the Centre's products, which are still relatively new to them.

\- Horst Böttger

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## AN ECMWF/WMO GLOBAL ARCHIVE

### History

Following discussions between WMO and the Centre, it was agreed that in response to a request from WMO and subject to co-sponsorship from WMO, ECMWF would create analysis and observational global data sets for the period 1 January 1980 to 31 December 1982 and provide a service in extracting any reasonable subset of the data to be used in any development work in the area of statistical interpretation of numerical forecasts. Accordingly, a consultant (E. Hellsten) was appointed to establish the data sets, and he joined the Centre on 1 July 1983, attached to the Meteorological Applications Section for 12 months. Design and development is now under way to create the data sets from existing ECMWF archives and to provide retrieval facilities for extracting subsets for WMO Member States.

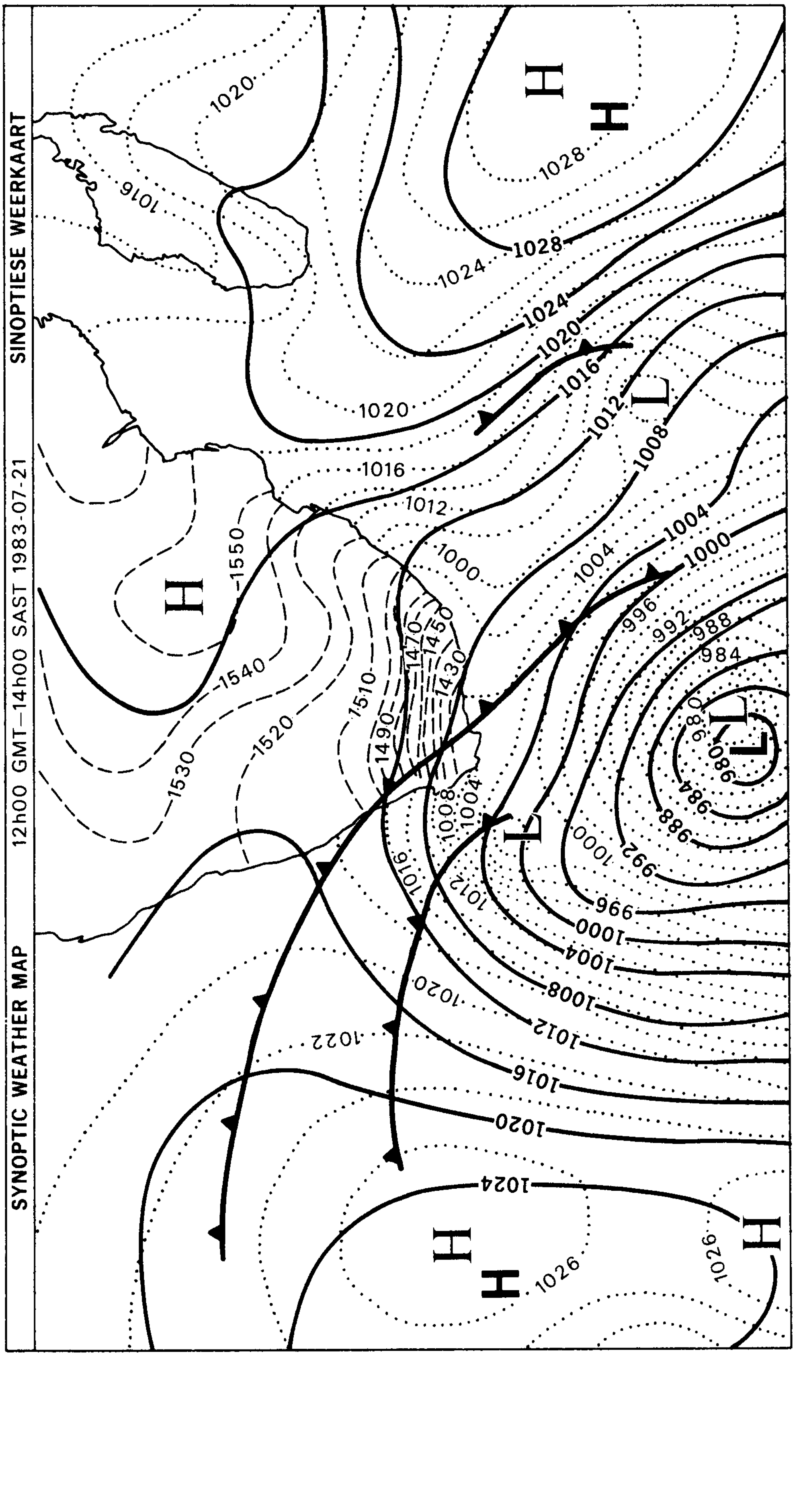


**Fig. 1** Surface pressure field of 21 July 1983 12 GMT (contour interval 2 mb, dotted lines) analysed by the weather service of South Africa and ECMWF 24 hour forecast of 1000 mb height (labelled in mb, contour interval 4 mb, full lines) valid at the same time. Note that the surface pressure field of the analysis is discontinued over high ground over South Africa and the 850 mb height field is shown instead (contour interval 10 m, dashed lines)

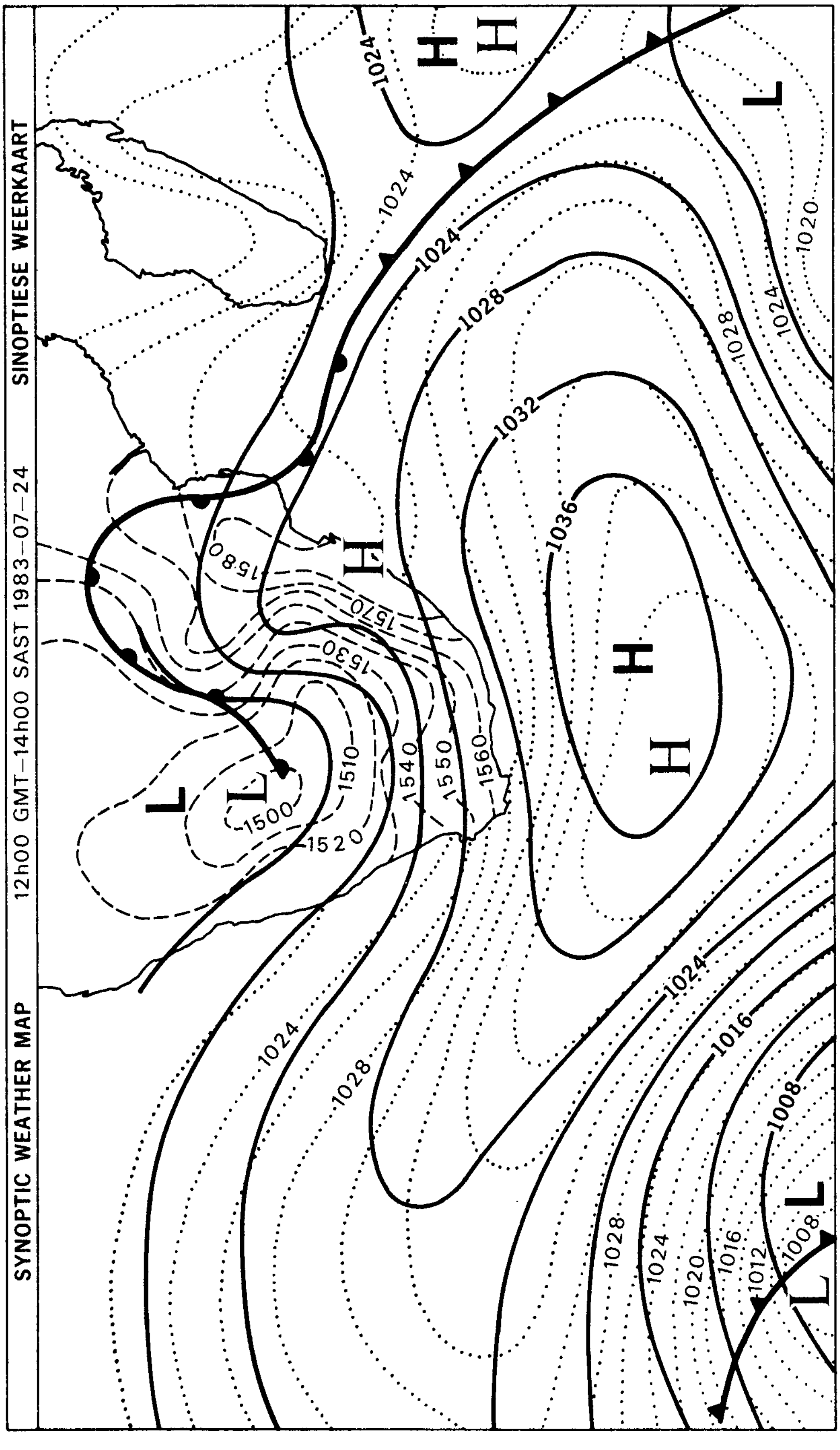


**Fig. 2** As Fig. 1; the ECMWF 96 hour forecast is plotted together with the verifying analysis of 24 July 1983 12 GMT.

The ECMWF/WMO global analysis data set

This will comprise global analyses of upper air grid point fields for 12 GMT for the period 1 January 1980 to 31 December 1982; the period may be extended later. The data set will include values of:

- geopotential height
- temperature
- u and v horizontal wind components
- vertical velocity
- relative humidity

at the standard pressure levels 1000, 850, 700, 500, 300, 200 and 100mb. The data will be available on a 2.5 x 2.5 degree latitude/longitude grid co-located with the 5 x 5 degree grid used for ECMWF data distributed daily on the GTS.

The global data set will be extracted from the full ECMWF archive and will be held on magnetic tape at the Centre. It is envisaged that 6 months of data will fit on one 6250 bpi tape using efficient packing techniques. Copies of the global data or of reasonable subsets requested by WMO Members will be available in one of a number of formats:

- the packed internal storage format, with appropriate retrieval and conversion programs
- the FGGE IIIB format
- the WMO GRID code format

The ECMWF/WMO global observational data set

If the analysis data sets are used in any development work in the area of statistical interpretation of numerical forecasts, it is recommended to use observational data from national data banks. ECMWF will, however, provide copies of raw observational data as received at the Centre via the GTS and inserted into the ECMWF Reports Data Base archive.

The Centre will create two sub-sets of surface observations (SYNOP), one for the European area and one for the rest of the globe. The observations will be extracted from the ECMWF Reports Data Base archive for the main synoptic hours 00, 06, 12, 18z. The stations outside Europe will be selected on the basis of frequency of receipt over the data period. It is not planned to include ship observations other than ocean weather ships.

The following parameters will be extracted from the complete synoptic report: temperature, dewpoint, mean sea level pressure, precipitation amount, wind direction, wind speed, past weather, present weather, total cloud amount, low level cloud amount, cloud information (Cl, Cm, Cn), maximum temperature, minimum temperature, state of ground, pressure tendency.

One 6250 bpi tape is expected to suffice for one year of data from the European ara, with a second tape for the data from the remainder of the globe. Copies of data retrieved from this dataset will be provided

- in the packed internal format, with appropriate retrieval software
- in the FGGE IIB format.

Request for data

In addition to providing the computer resources needed to set up the global data sets described above, the Centre will provide a service in extracting any reasonable subset of the data (including sub-areas) from the global data set both for fields and observations. The data and any necessary software will be supplied on magnetic tape and a standard fee will be charged per tape.

- John Chambers

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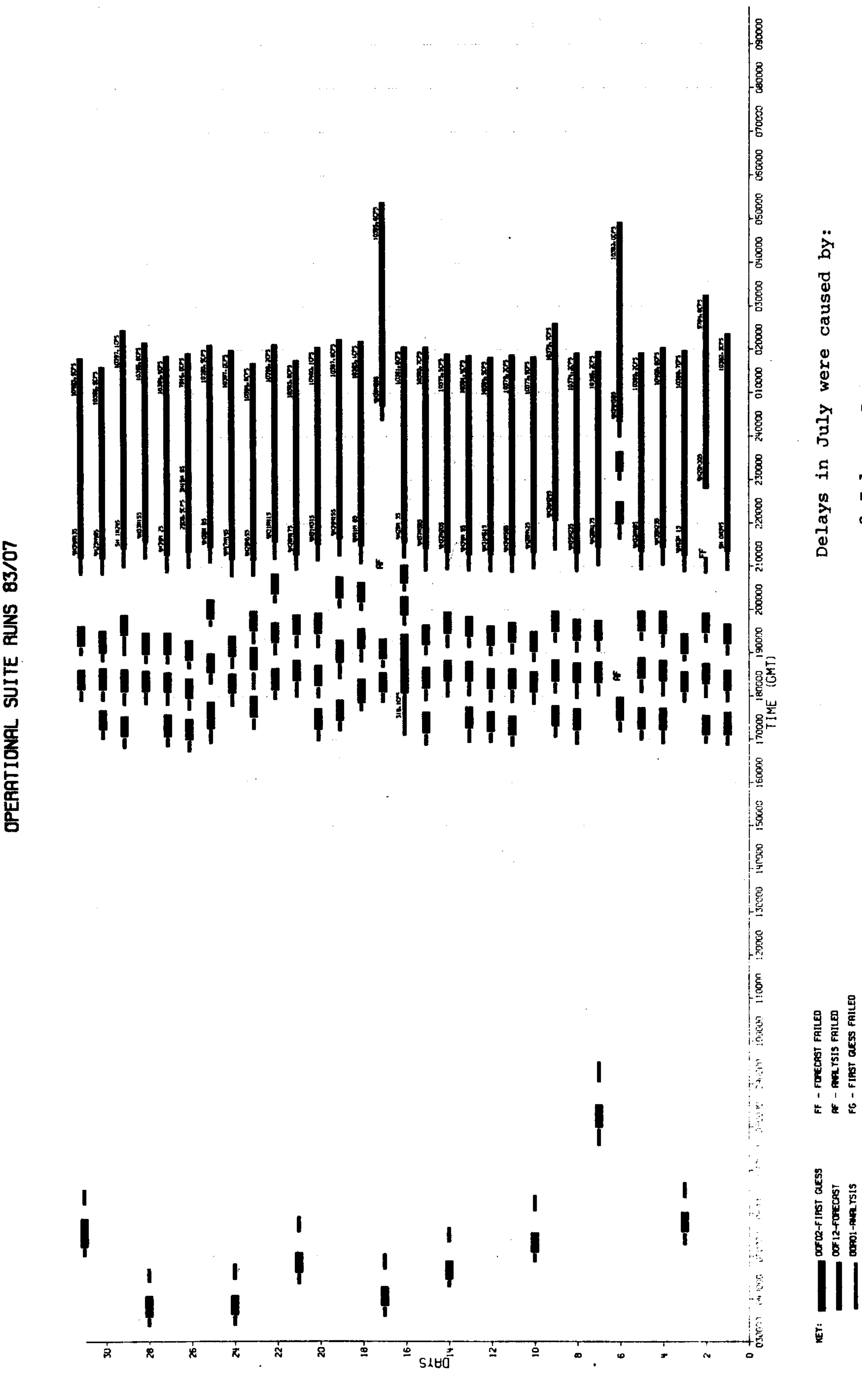
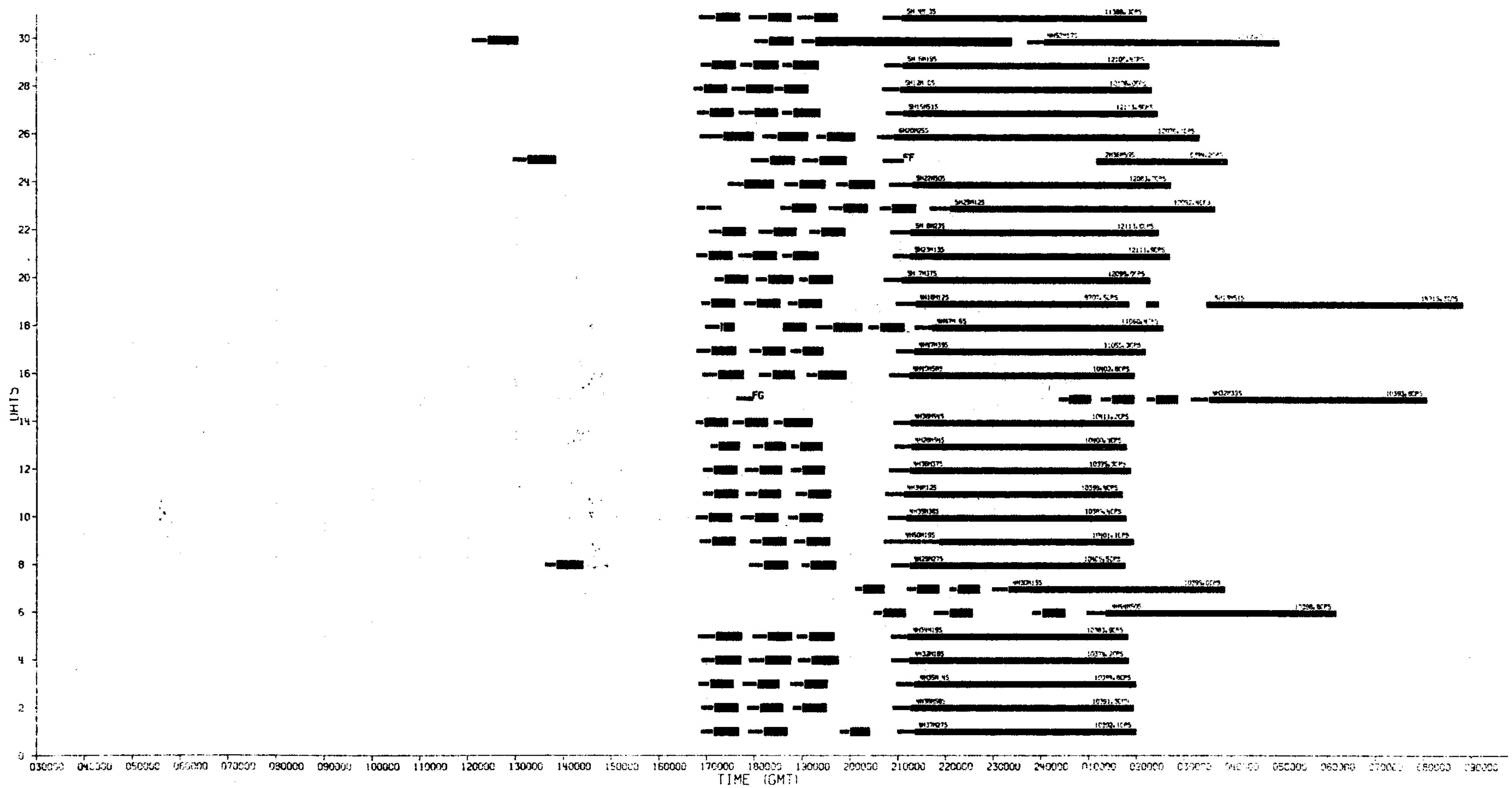



Delays in July were caused by:

2 July - Cray memory error.
6 July - Power failure, all machines affected.
17 July - Power failure, all machines affected.

## OPERATIONAL SUITE RUNS 83/08

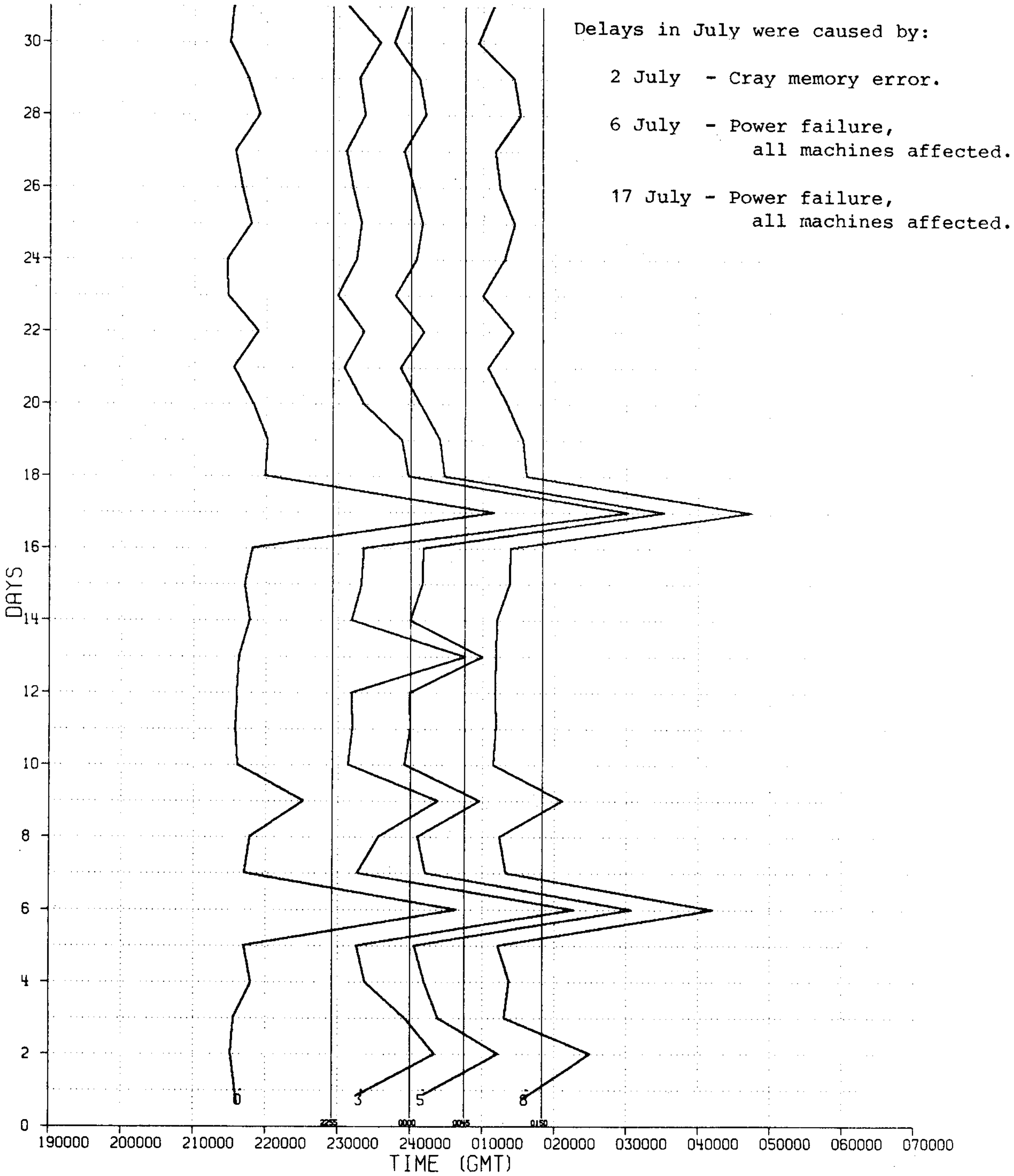



Delays in August were caused by:

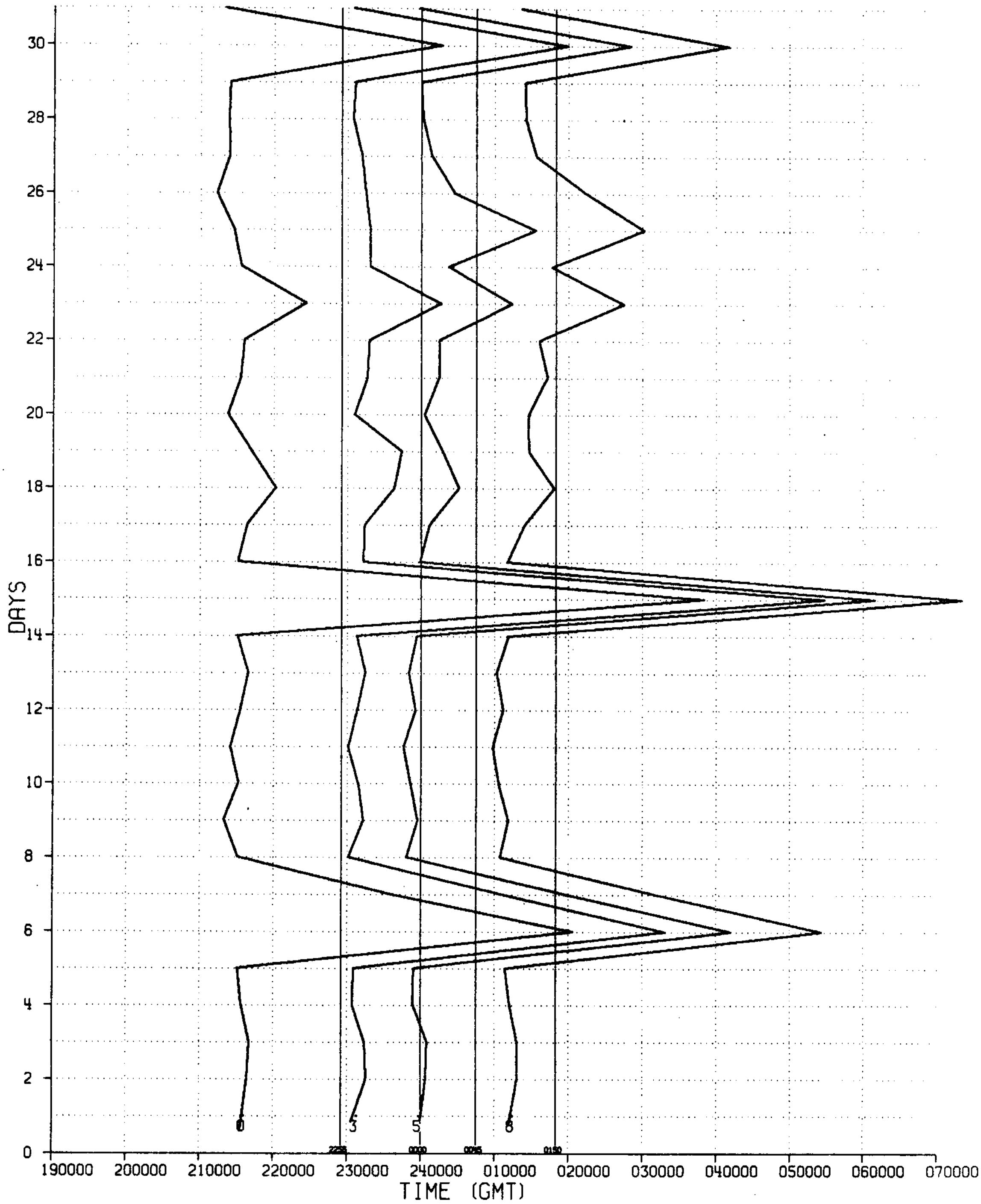
6 August - Diesel generator testing.
15 August - Cray Install following disk errors.
23 August - Software changes which caused analysis to fail.
7 August - Cray disk controller fault and memory error.
19 August - Numerical instability in the forecast at 8½ days.
25 August - Cray channel error.
30 August - Cray channel error.

## DISSEMINATION RUNS

### July 1983



DISSEMINATION RUNS
August 1983

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# *CRAY SOFTWARE PLANS

## COS 1.12

By the time this Newsletter is published, we hope to have COS 1.12 in service on the CRAY. At the time of writing, COS 1.12 is in the final stages of testing - a couple of problems have to be fixed before it can be brought into production.

The introduction of COS 1.12 is the first step in a series of CRAY software changes required to support the CRAY X-MP.

Extensive changes have been made to COS in the 1.12 release. Substantial parts of it have been re-written, both to fix problems and improve maintainability, and to introduce new features, most of which will be transparent to users.

The major new features are:

- X-MP and SSD support
- Re-written Job Scheduler (will not crash the system if disk errors occur whilst jobs are rolling)
- Dynamic allocation of buffers for file transfers to/from the front-end
- FETCH - non-permanent acquire
- Automatic field length management
- Facility to accept or skip bad data (caused by a disk error)
- Asynchronous SETPOS/GETPOS with blocked datasets (currently only available with unblocked datasets)
- COS security features and permanent dataset privacy (both initially disabled)

One difference between COS 1.12 and COS 1.11 that users will notice is the logfile message:

    SY016 - USE NEW MEMORY REQUEST BEFORE 1.13

this may be ignored initially. Once COS 1.12 has been in service for a few weeks, further information on converting to the new memory request will be issued.

There is another difference between COS 1.12 and COS 1.11 which should not concern most users. This is the use of an alternative timestamp based on nanoseconds since 1 January 1973, rather than the real time clock (which records 12.5 nanosecond cycles since 0 AD). Any users who process binary audit tables or the Job Accounting tables (using RTDT or DTRT) should contact User Support.

## CFT and COS products

Initially, the products will not be changed, i.e. the 1.11 products (LDR, $SYSLIB etc.) and CFT 1.10 will be used. The 1.12 products and CFT 1.11 will be made available for testing once COS 1.12 is in service. They cannot be used under COS 1.11 due to incompatibilities in binaries caused by the introduction of the automatic memory management and security features within COS.

CFT 1.11 will still use the current "old" calling sequence. However, once CFT 1.11 has been tested and made the default CFT compiler, a version of CFT 1.11 which generates the "new" calling sequence will be made available (see ECMWF Newsletter 19, p.13, for a description of this calling sequence change). Note that this implies that ALL the libraries used by a program which has been compiled using the new calling sequence must also be recompiled. The next release of CFT (CFT 1.12) will <u>only</u> support the new calling sequence.

CRAY X-MP Software

Although COS 1.12 provides support for use of both CPU's of the X-MP, it does not allow multitasking, i.e. one program using both CPU's simultaneously. This will be supported in COS 1.13 (and CFT 1.12).

We therefore plan to install a pre-release version of COS 1.13, designated COS X.13, on the X-MP when it arrives. It is not possible, at present, to give further details of the features in COS X.13.

- Richard Fisker

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## INSTALLING COMPUTERS

The Centre is about to embark upon its third installation of a Cray computer.

The first was the prototype serial 1, which was installed temporarily at the Rutherford Laboratory in 1977. There, space was at a premium, so some improvisations had to be made, the most notable of which was the raised platform upon which the Cray-1 mainframe was installed (having been pushed up a specially made ramp by hand!). This platform was necessitated by the depth of the floor being too low for the refrigeration pipework containing the Freon coolant for the logic of the mainframe and disk controllers.

The second installation was that of the existing Cray-1 serial 9 at the present Headquarters, in September 1978. The Computer Hall had been specifically planned to accommodate a wide variety of possible computers. As the vendors had not been selected, the Computer Hall and its site facilities (electricity, water and air conditioning) had to be flexible enough to accommodate any combination of possible machines.

Serial 9 was installed with relative ease in comparison to Serial 1. However, it was only a short time after installation, when the system had been switched on and off a few times, that strange things began to happen in the Plant Room below the Computer Hall. It was found that a compressor cylinder head gasket in the refrigerator condensing unit had 'blown'. The gasket was replaced (after a successful search of Southern England for a spare gasket for an American machine), only to find that the new gasket had 'blown' when the system was next switched off. Now everyone knew that something was not quite right!

The theory about this problem was that, when the system was switched off, the Freon gas changed state to a liquid, which flowed downstairs through the pipework and into the cylinder head of the compressors. So, when restarted, the head gasket 'blew' under liquid pressure. It was decided to cut the gas pipe and insert an accumulator vessel of larger diameter than the pipe. This work was completed and the fault never occurred again, hence the theory must have been correct!! You see, getting Cray-1's to work is not just a matter of achieving the megaflops with crafty code or wading through the jungle of COS bugs - you also have to get your refrigeration and electricity right!

Now we are in 1983, a whole six years since the Centre's first venture into installing Cray-1's and we are doing it again. This time, it is a faster machine, the 'X-MP', giving more megaflops/dollar but needing also more refrigeration and electrical supplies.

For 12 months, we have been planning how to install the Cray X-MP and still maintain a 24 hour operation. Of course, this is impossible,as to connect the new electrical and refrigeration equipment must require a shut-down of the site services. Some of these are quite major operations. For example, because the site has to run two Crays for a few months and the X-MP generates more heat than Serial 9, the main cooling water pumps had to be replaced and the water pipes had to be changed to a larger diameter.

To give some idea of the site facility changes for the CRAY X-MP, the following additional equipment was needed:

3 Electrical frequency converters each with a 250 HP motor, weight 6500 Kg

2 Refrigeration condensing units, weight 2000 Kg, each with a cooling capacity of 170 Kilowatts and containing 2 x 25 HP motors.

The air flow through the frequency converters had to be ducted to the outside of the building to avoid overheating the Plant Room.

In order to get the new refrigeration pipes up to the Computer Hall, it was necessary to drill two 14 cm diameter holes through about 36 cm of the reinforced concrete floor without creating dust in the Computer Hall. This operation took about 6 hours and was carried out with a diamond tipped core-drill, cooling and dust control was achieved by flowing water around the drill and sucking it away with a vacuum cleaner.

Because Serial 9 will eventually leave the Centre and the electrical distribution capacity in the Plant Room is inadequate for running both Cray machines, it was decided to switch Serial 9 onto a temporary supply and allow the X-MP to use the permanent facilities. This exercise reduced the cost of installation and the unnecessary installation of extra switchgear.

Preparation of the Computer Hall false floor for the X-MP involved 41 holes of varying shapes to be cut for access of cables and cooling pipes. In order to spread the weight of the mainframe, plus the IOS and the SSD (totalling 8129 Kg, with a point loading of 3515 Kg/m2) an additional 46 floor jacks have been installed.

Incidentally, while the above preparation has been proceeding, a few other events were happening:

- a VAX 11/750 was installed;
- the Cyber 835 was taken out of service, its electrical facilities being used for the new Cyber 855;
- the Cyber 855 also needed new water pipes and pumps to be installed under the floor;
- two new disc controllers and two new 885 disc drives were installed;
- the disc controllers and tape controllers were upgraded;
- electrical and physical preparation for the IBM 4341 has been done.

In the next few months, there follows the installation of the LCN hardware. When the Cyber 855 is accepted, the 175 has to be disconnected and shipped out, then the 835 has to be electrically reconnected, involving new cabling. It also has to be connected to the water supply and the water flow has to be regulated. Once the Cray X-MP is accepted, Serial 9 has to be disconnected and shipped out. After this, there is only the future upgrading of the IBM system to face.

There have been many moments when I and others had the feeling it will never work again, but it always does, doesn't it?

By the way, if the CRAY X-MP speed is 400 megaflops, then considering the weight of the hardware, you get 0.025 Mflops/Kg, or 0.02 Mflops/Kw if you consider the electrical consumption.

Happy computing!

- Eric Walton

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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 151). All other News Sheets are redundant and can be thrown away. The following News Sheets can be thrown away since this list was last issued: 53, 143, 149, 150, 151.

| No. | Still Valid Article |
|---|---|
| 16 | Checkpointing and program termination |
| 19 | CRAY UPDATE (temporary datasets used) |
| 47 | Libraries on the Cray-1 |
| 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 |
| 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 |
| 142 | INTERCOM login default procedures |
| 144 | DISSPLA FTN5 version |
| 146 | Replacement of Cyber 175 by Cyber 855 |
| | Cyber dayfile message switches |
| 147 | (20.7.83) NOS/BE level 577 |

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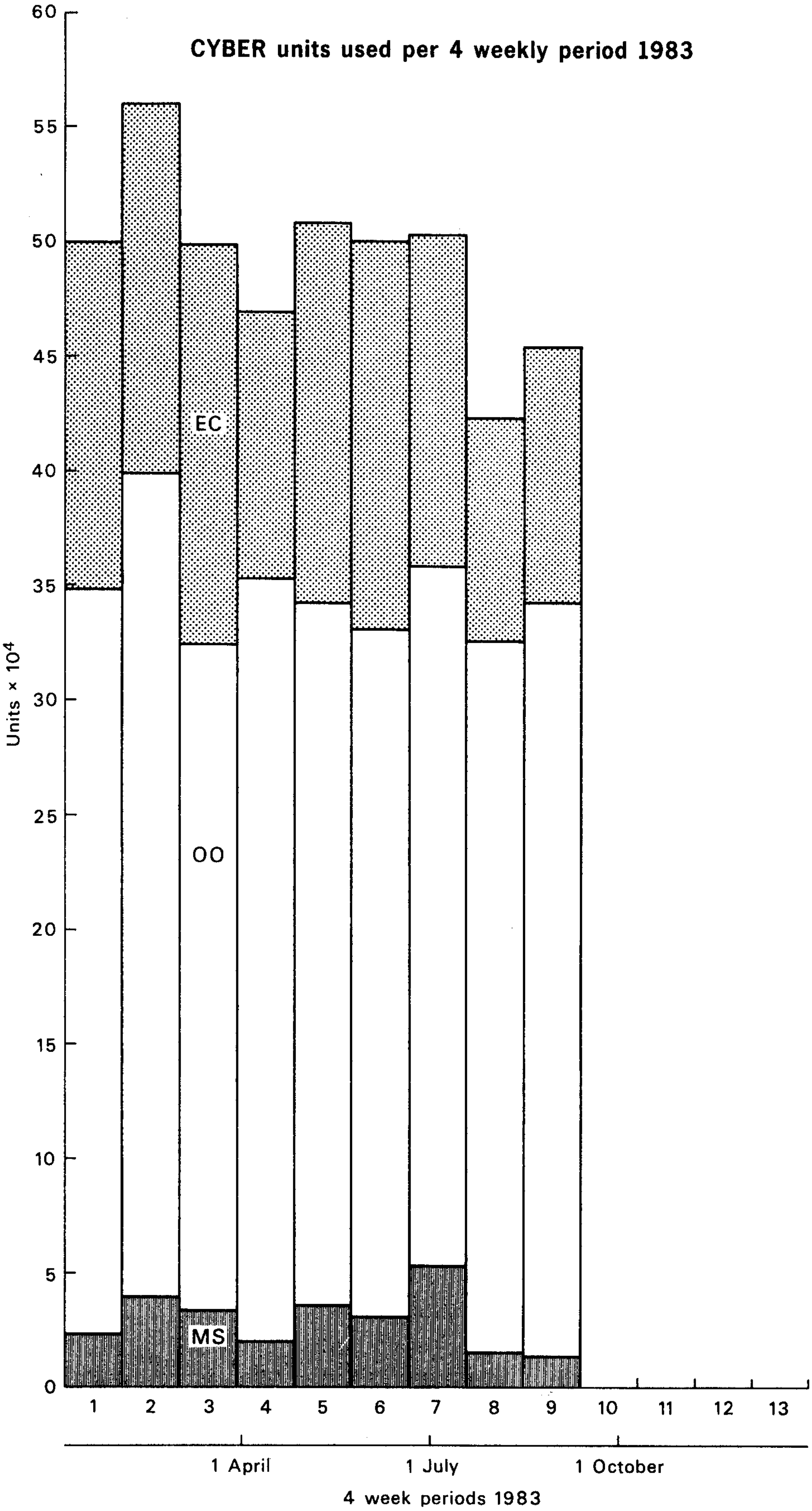
## COMPUTER USAGE STATISTICS 1983

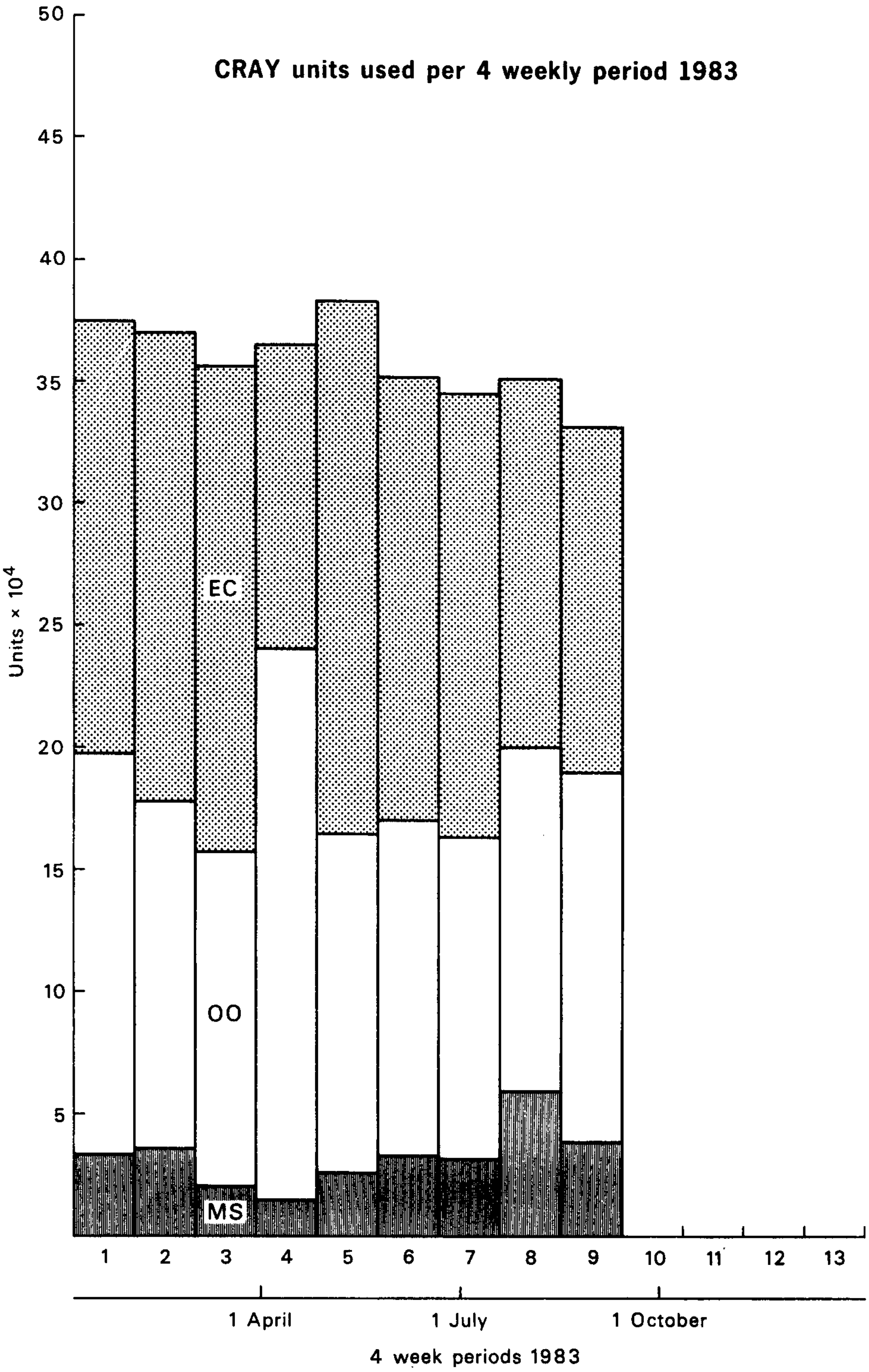


EC = Centre users

OO = operational suite running

MS = Member State users, including Special Projects

EC + OO + MS = total usage, less those jobs classed as systems overheads



## COMPUTER USER TRAINING COURSES

The Centre is offering another series of training courses for Member States personnel and ECMWF staff. Information has been sent to the Member States and nominations to attend are now invited. Nominations from ECMWF staff are invited via Section Heads.

Course: Introduction to the facilities 6-9/10 February 1984

This is intended for anyone who will be programming the Cray, to give them sufficient experience to run simple work. It will also introduce them to some of the Cyber facilities they may need to complement their Cray activity. Prior knowledge of another computing system, plus a knowledge of Fortran is required. An optional fifth day (10 February) is devoted to explaining how to use ECMWF's meteorological database and archive system.

Course Cray in depth 13-17 February 1984

An in-depth course for those who will make heavy use of the Cray and its many unique facilities. Intending participants will be expected to know how to run simple jobs on the Cray.

- Andrew Lea

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## ECMWF PUBLICATIONS

| | |
|---|---|
| Technical Report No. 37 | High resolution experiments with the ECMWF model: a case study |
| Technical Memorandum No. 75 | Numerical experiments on the seasonal transition of general circulation over Asia in summer 1979 |
| Technical Memorandum No. 76 | On the use of observation error data in FGGE main level III-b analysis |
| Technical Memorandum No. 77 | Report on the third meeting of Member State Computing Representatives, 18-20 May 1983 |
| Technical Memorandum No. 78 | Sea surface temperature, May 1982 - June 1983 |
| ECMWF Forecast and Verification Charts | to 31 July 1983<br>to 31 August 1983 |
| ECMWF Daily Global Analysis | October - December 1982 |
| Forecast Report No. 22 | April - June 1983 |

ECMWF Annual Report (English) for 1982

Report on use of ECMWF products

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## CALENDAR OF EVENTS AT ECMWF

| | |
|---|---|
| 23 - 24 November 1983 | 18th session of Council |
| 28 November - 1 December 1983 | Workshop on Convection in large scale numerical models |
| 6 - 10 February 1984 | ECMWF Computer user training course: Introduction to the facilities |
| 13 - 17 February 1983 | ECMWF computer user training course: CRAY in depth |

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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

## USEFUL NAMES AND 'PHONE NUMBERS WITHIN ECMWF

| | | | Room* | Ext.** |
|---|---|---|---|---|
| Head of Operations Department - Daniel Söderman | | | OB 010A | 373 |
| ADVISORY OFFICE - Open 9-12, 14-17 daily<br>Other methods of quick contact:<br>- telex (No. 847908)<br>- COMFILE (See Bulletin B1.5/1) | | | CB 037 | 308/309 |
| Computer Division Head | - | Geerd Hoffmann | OB 009A | 340/342 |
| Communications & Graphics Section Head | - | Peter Gray | OB 101 | 369 |
| COMPUTER OPERATIONS | | | | |
| Console | - | Shift Leaders | CB Hall | 334 |
| Reception Counter )<br>Tape Requests ) | - | Jane Robinson | CB Hall | 332 |
| Terminal Queries | - | Norman Wiggins | CB 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 (acting) | - | John Chambers | OB 226 | 450 |
| Operations Section Head | - | Austin Woods | OB 007 | 344 |
| Meteorological Analysts | - | Veli Akyildiz | OB 005 | 346 |
| | - | Herbert Pümpel | OB 006 | 345 |
| Meteorological Operations Room | | | CB Hall | 328/443 |
| REGISTRATION (User and Project Identifiers, INTERCOM) | - | Pam Prior | OB 016 | 355 |
| Operating Systems Section Head | - | Claus Hilberg | CB 133 | 323 |
| Telecommunications Fault Reporting | - | Stuart Andell | CB 035 | 209 |
| User Support Section Head | - | Andrew Lea | OB 018 | 353 |
| RESEARCH DEPARTMENT | | | | |
| Computer Coordinator | - | Rex Gibson | OB 126 | 384 |
| Meteorological Education and Training | - | Bob Riddaway | OB 111 | 366 |

* CB - Computer Block
OB - Office Block

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