European Centre
for Medium Range Weather Forecasts

ECMWF NEWSLETTER

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IN THIS ISSUE:

GENERAL

METEOROLOGICAL

COMPUTING

*Note: These articles directly concern the computer service, we recommend computer users read them all.

COVER: A pictorial representation of the horizontal grid and the vertical levels used in the ECMWF forecast model. The 15 vertical levels are shown on an elongated radial scale in pressure co-ordinates. The level closest to the earth's surface cannot be distinguished in the figure.

This Newsletter is edited and produced by User Support.

The next issue will appear in December.

1 August 1980

1 August 1980 will go down in the history of ECMWF as a very important date, representing the initiation of full (7 days per week) operational forecasting. Some minor adjustments to the daily schedule were made at the same time, giving a later cut-off (20.45 GMT in lieu of 17.45 GMT). During normal conditions, the analyses are now available for dissemination before 23.00 GMT, the 3 day forecasts by 00.30 GMT, the 5 day forecasts by 01.15 GMT and the 7 day forecasts by 02.00 GMT. In view of the fact that the Centre's computer facilities are not duplicated, some delays may occur. Such delays are, however, not very frequent. It can be forecast, based on recent experience, that a delay of more than one, but less than two, hours will occur - on the average - some 4 days per month and a delay of more than two hours, some 2 days per month. Serious delays could perhaps occur 1 day per month.

The fact that forecasts from the Centre are available every day of the year will naturally mean that the forecasters in the 17 Member States can now really make use of them in support of their forecasting activities. This evidently also means that our forecasts become increasingly important to the ECMWF community and that we must do our utmost to produce and disseminate the forecasts as reliably as possible.

From 1 August 1980, ECMWF is attempting to have complete archives of the analyses and forecasts, i.e. if a forecast is partially or wholly lost, it will be repeated - unless otherwise decided - at a later time, for archiving purposes. This practice will, if successful, greatly simplify the use of the archives for various studies in the future, and will also make the results of such studies more reliable and complete. Contrary to what was said in Michel Miqueu's recent article on the archives, there are no plans to destroy the archives after ten years for the analyses and two years for the forecasts. The archives, which, in fact, contain only a very small subset of all the information that is potentially available in the operational suite, will be kept for the foreseeable future as it is impossible to anticipate the real value of such archives in advance. In any case, the rapidly decreasing cost (per bit) of storing data on magnetic media will make the cost of such an archiving policy marginal as compared to the cost of the operational production runs.

The Numerical Weather Prediction data study/intercomparison project sponsored by the WMO Working Group on Weather Prediction Research of the Commission for Basic Systems has now produced the first results on the errors of the forecasting models from different centres. These early results were presented at the WMO/American Meteorological Society seminar in Nice on 8-12 September 1980. The results seem to indicate that all centres have significant systematic errors in their forecasts and these errors have more or less the same large scale structure, in spite of the large variety of models used by the centres in question. The magnitudes of the errors, however, differ significantly. As regards the quality of the forecasts, conventional verification statistics are being produced and will be presented in one of the following issues of the ECMWF Newsletter. The first results seem to confirm the TAC statement that our forecasts are "on the average the best available".

Daniel Söderman

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THE ECMWF OPERATIONAL FORECASTING MODEL

- PART I -

THE ADIABATIC CALCULATION

This article, the first of two on the operational model, describes briefly the adiabatic part of the model and the organisation of the calculation on the CRAY-1. Part II on the "Physics", of the model will be published in a future Newsletter.

The operational model provides global forecasts, up to 10 days ahead, of pressure, temperature, wind components and humidity on a three-dimensional grid. This grid is made up from 15 horizontal levels (15 grid points between the surface of the earth and the "top" of the model atmosphere) with 28,800 points on each level. In addition to these three-dimensional fields, the model predicts surface conditions and precipitation (snow and rain). The horizontal grid, which is illustrated on the front cover of this Newsletter, is a regular staggered grid, the Arakawa C-grid with a 1.875^{o} spacing between grid points. The physical laws on which our model is based are the perfect gas law for a mixture of dry air and water vapour, the laws of conservation of mass and water vapour, the momentum equation and the first law of thermodynamics. As some of these physical laws contain sources and sinks, it is necessary to provide a second set of expressions which specify the sources and sinks in terms of known quantities. It is therefore required to describe the heating and cooling of the atmosphere by specifying the radiative transfer, the turbulent transfer of heat, the thermodynamic effects of evaporation (sublimation) and condensation, and the formation of precipitation. Similarly, the turbulent transfer of momentum and viscous dissipation must be specified to complete the momentum equation. Finally, the turbulent transfer of moisture must be described. For the purpose of this article I shall use the equation, only one,

$$\dot{x} = A(x)+P(x) \qquad (1)$$

to describe the evolution in time of the model atmosphere. x is a vector, or array, which contains all the model's dependent variables and $\dot{x}$ is the rate of change of x in unit time. The A term represents adiabatic effects such as advection, pressure and coriolis forces and reversible compression and expansion and so on, whereas P represents the source/sink terms. If we can calculate A and P for a given x, then we may be able to design an integration procedure for our governing equation (1) which will then give x as a function of time. It is usually regarded that we know the A term exactly and so we may use our grid point values, our discrete representation, explicitly to calculate a good approximation to A, whereas the physical effects embodied in the P term take place on spatial scales which are considerably shorter than our grid length, approximately 200km in the north/south direction, and are as such sub-grid scale. Nevertheless, the effect of P cannot be disregarded for forecasts longer than 1 day and so we must seek statistical or parametric representations for P, which will enable us to calculate its effects on the representable scales of our model. The phrase "physical parameterisation" has been used by meteorologists when referring to this part of models. More will be said about parameterisation in part II.

The adiabatic term A contains many derivatives with respect to the spatial co-ordinates and these are approximated basically by central difference formulae. Our present numerical procedures allow use to integrate (1) forward in time in steps of 15 minutes, that is 960 steps are required to produce a 10 day forecast. This restriction on the time-step is known generally as a linear stability criterion since if it is adhered to, spurious numerical instability will not arise from linear effects. Other types of instability can arise because of the non-linearity of A. When two fields are multiplied together, the interactions involving the shortest waves cannot be represented correctly, as these interactions produce scales which are too fine to be resolved on the basic grid and are instead misinterpreted as contributions towards longer scales. These spurious interactions are usually called aliasing errors and can lead to instability. In order to avoid the worst effects of this process, many models use strong artificial smoothing to damp out the short scales. Our approach has been to design schemes which conserve non-linear invariants in some terms of the equations. These conservative schemes are not only important from the physical point of view but also from a numerical one, by inhibiting the development of non-linear instability.

In order to perform the time-stepping procedure we require x at two time levels and each time level consists of seven three-dimensional fields (basic variables, diagnostics and "work" space). This amounts to 2x7x15 (number of levels)x28800 (grid points on each level)=6 million numbers.

These six million numbers are divided up into a large number of records which are stored on four CRAY-1 discs. Data for a single line of latitude, a vertical slice, are stored in two separate records. These records are continually being moved between the discs and the CRAY-1 memory using buffered input/output and sufficient data is retained in the CRAY-1 to perform the calculations for a single vertical slice. The program is designed in such a way that reading, writing and computation take place asynchronously. The most efficient version of the operational model keeps about 600,000 numbers in the CRAY-1 memory and requires a little less than 4 hours (2 hours 48 minutes CPU time) to compute, postprocess and diagnose a 10 day forecast, which is considerably better than the 22 hours which was required for our first experimental forecast on the CRAY-1 in 1978, with admittedly less efficient algorithms,and less hardware.

D.M. Burridge

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RETRIEVAL OF DATA FROM THE CENTRE'S DATA BASES

This article, a further in the series giving an overview of the various subsystems involved in the operational activity at ECMWF, describes the facility for retrieving data from the Centre's data bases both archived and on-line. It is called GETDATA.

Data have been stored since 1 August 1979, and can be divided into three categories:

(a) Raw observational data.
i.e. the meteorological observations received continuously at the Centre and used as input to the objective analysis. The data are available in decoded form and include quality control information. Observations of specific code types (e.g. SYNOP, TEMP) can be requested for a specified time or time period, for a specific area of the globe and in a specified format (e.g. packed or expanded). In addition, reports having particular characteristics (e.g. those having quality control flags set) can be requested.

Observations are archived after being kept on-line for approximately three days from observation time.

(b) Post-processed analysis fields
i.e. output from the Centre's objective analysis scheme.

Fields are available for 00Z, 06Z, 12Z, 18Z for each day, for parameters geopotential, temperature, u & v wind components, humidity mixing ratio and vertical velocity, for levels 30mb, 50mb, 70mb, 100mb, 150mb, 200mb, 250mb, 300mb, 400mb, 500mb, 700mb,850mb and 1000mb. There is also a number of surface fields such as mean sea level pressure, surface temperature, snowfall, rainfall, net radiation etc.

Fields for specified parameters and levels may be requested for specified hours over a specified date period, in a lat/long grid for surface fields and spectral coefficients for upper air fields.

Analysis fields are archived after being on-line for approximately one day. On-line data offers more options, such as polar-stereographic projections and a choice of output formats (e.g. packed or unpacked).

(c) Post-processed forecast fields
i.e. output from the Centre's 10-day forecast.

The same considerations apply as those for analysis fields, except that data are stored for each 12 hour step of the forecast, making 20 steps in all.

The Centre's data are therefore on a number of devices such as discs and tapes, but the user need not be aware of where the data resides, GETDATA will access it automatically. The user needs only to attach the library containing the GETDATA procedure and code, and then supply a set of directives specifying the particular data required. The directives may be in the GETDATA control card or in a card-image file or a combination of both.

The directives take the form

keyword = $value_1/value_2/..../value_n$

e.g. LVEL=850/700/500

or keyword = $value_1$/TO/$value_2$,

e.g. DATE = 800701/TO/800707.

Most keywords have default values, but a few do not, for example, the user needs to specify the local file name of the target file to receive the data. Apart from being written to by GETDATA, this file is otherwise the responsibility of the user, for such operations as rewinding and cataloguing etc. If a specific field or report is not available, GETDATA writes a short dummy record to the target file in its place.

The user's directives are listed on a file, usually the job's OUTPUT file, together with any error messages which may be generated by an illegal request.

An example follows. Retrieve TEMP reports from stations 01001 and 03005 for the period 14/5/80 00Z to 17/5/80 18Z in expanded format and to write the data to file TARGET:

```
GETDATA,TYPE=RREPT,TRGT=TARGET,
   PARM=TEMP, STNO=Ø1ØØ1/Ø3ØØ5, DATE=8ØØ514/TO/8ØØ517,
   HOUR=ØØ/18, FORM=FEF.
```

For details on how to use GETDATA, see the "User Guide to ECMWF's Integrated Data Base Access System", Operations Dept. File 23.2/26.1/27.0. It should be noted that any user who wishes to access data thus should first contact User Support at the Centre.

Brian Norris

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ECMWF METEOROLOGICAL PUBLICATIONS AUGUST-SEPTEMBER 1980

Technical Report No.19: A low order barotropic model on the sphere with orographic and Newtonian forcing.

Technical Report No.20: A review of the normal mode initialization method.

Technical Memorandum No. 19: On the effect of easterly shear on the atmospheric waves in the equatorial zone.

Technical Memorandum No. 20: Programming Systems, documentation, Olympus,Doctor.

PROGRESS IN TELECOMMUNICATIONS AND GRAPHICS

The second Regnecentralen 8000 computer was delivered and installed in the first week of June, according to schedule. Since then,Provisional and Final Acceptance have both been passed. The updated operating system, which permits the sharing of local peripherals by both 8000's (see Newsletter No. 3/1980, p.12), has also been brought into operation,and the NFEP software has been adapted to take account of this. Most our software development and testing of new connections can now be done on the second 8000, and so the Centre will shortly announce new NFEP schedules with greatly increased availability for Member States access.

The NFEP project, as well as the Joint Terminal software (RC3600), has now passed Final Acceptance as far as all technical aspects are concerned. Only documentation and training await completion. Although we will get some technical assistance from SIA Ganymede until the end of this year, the responsibility for maintaining and improving the NFEP software now rests with us.

A lot of good news can be reported on the development of our network to the Member States. The 50 baud link to Portugal was finally set up by the PTTs and went into successful operation. The Technical Advisory Committee's proposal to permit 100 baud Alphabet No.2, as a third option for low speed lines has been endorsed by the Council. Consequently the Centre has ordered from the PTT speed upgrades from 50 to 100 bauds for the lines to Spain and Italy, and has also ordered the necessary enhancements for the asynchronous multiplexer of the NFEP. It is planned to install these enhancements by the end of the year, and then run the circuit to Greece at 100 baud instead of the present 50.

Improvements in the software at the British Meteorological Office have led to a further increase in the sustained throughput to more or less the maximum possible on a 2400 bps line and to a truly parallel data receiving and sending operation.

The medium-speed line to Ireland has been set up by the PTT and considering the advanced status of the Irish software development we hope to start bilateral testing soon. A similar statement can be made regarding the telecommunication software development in the French Meteorological Service. Establishment of the medium-speed line to them is scheduled for late October and software testing of the link will start soon thereafter.

It is also evident that the project at SIA Ganymede to provide file "multi-streaming" in the joint terminal software is making progress, and the same can be said for the Cyber 18/20 software development by CDC La Jolla.

In the graphics area the thorough study of international standardisation efforts has led to conclusions about our approach in implementing the GKS (Graphical Kernel System) proposal at ECMWF. In pursuit of this, we have developed some co-operation with the French Institut National de Recherche en Informatique et Automatisme (INRIA) which is now continuing with Mr. A. Ducrot coming to the Centre from the Institute as a consultant for two months, helping in the implementation of an INRIA package (FORTRAN-3D) and its adaption to GKS requirements.

The Evaluation Board for the Colour Raster Display finalised its report which was approved by our Director. The tender by AYDIN UK Ltd had been ranked first. The subsequent negotiations with this company took a successful course and contracts for acquisition and maintenance were signed on 12 September. The main features of this device will be a resolution of 1024 by 1024, initially 128K bytes of memory, 16 colours and a dual cartridge disc subsystem of 5 Mbytes. Delivery is expected by the end of November and our preparations towards getting acquainted with the device are underway.

Fritz Königshofer

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*IMPLEMENTATION OF THE INTERIM CYBER PERMANENT FILE SPACE CONTROL SCHEME

The scheme outlined below will be introduced shortly.

An allocation of PF space has been given to Member States by Council; this will be split into various projects. Within the Centre there are allocations to Departments, and then to projects.

The AC parameter on CATALOG is automatically generated from the project identifier on the ACCOUNT card. Thus, every file will belong to a project and so to a Member State or Centre Department.

Space occupied per Member State or Centre Department will be compared with their allocation every working day.

When an allocation has been exceeded, the Computer Division will, on behalf of the Council, control at Member State or Centre Department level by:

i) requesting the Member State or Centre Department to reduce its space occupied to below the allocation;

ii) giving them approximately 2 working days to do so, this period may be altered depending on circumstances.

iii) If no action has been taken within that period, the Computer Division will select those projects exceeding their allocation by the largest amount and dump all their files to tape until the balance has been restored.

iv) The Member State or Centre Department will be informed which files have been dumped to which tape. The tape will be held for a fixed period of 6 weeks, allowing users to copy files to elsewhere. The tape will then be recycled.

The above procedure means that the tape dump taken is not an archive. Users with files which they wish to keep must move them to their own tapes. The above procedure has been adopted because it forces the user to really consider whether a file is to be kept or not. Any automatic archive scheme results in a large number of tapes holding a lot of unwanted material, usually causing the eventual breakdown of that scheme just through sheer volume of files held.

The allocations to be used for Member States were given in ECMWF Technical Newsletter No.6 (Dec. 1979), allocations for the Centre Departments are 35 Mwords per department. This represents an overallocation to allow for the fact that not everyone will use his full allocation at all times. If this assumption turns out to be wrong, then the allocations will have to be decreased to fit the available space. Only time will tell if this will be necessary.

A bulletin will be issued shortly detailing this scheme.

Andrew Lea

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FORTAN 77, FTN5 AND CFT 1.10

As you may already know, (Technical Newsletter No.1, February 1979, page 20), a new Fortran standard ANS X3.9 1978, was published two years ago. This standard, commonly known as FORTRAN 77, has now been implemented by CDC for the Cyber range in a new compiler called FTN5. This compiler is not yet available at ECMWF. Cray have also implemented some features in the current version of CFT and hope to have a full implementation by CFT 1.10, which is due in April next year.

Some of the main changes between the old and new standard are:-

1. Character data type
2. Block IF structure
3. Various changes in DO loops
   e.g. Real Control variable
   Negative step
   Initially satisfied loops are not executed
4. Improved control over I/O
   e.g. END= and ERR= in READ statements
   The ability to open and close files dynamically, thus releasing buffer memory.
5. Arrays may have up to 7 dimensions and may start at an element other than 1 (e.g. -2).

There are some incompatibilities between the FTN4 and FTN5 compilers, so a conversion program, F45 will be released at the same time as FTN5 to assist users in converting their programs.

Further details of specific changes and problems in conversion will be published in future Newsletter issues.

Gary Harding

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*COS 1.08

It is planned to test COS 1.08 within the next 7 or 8 weeks with a view to implementing this release by early November. The 1.08 versions of the products have been under test for several weeks and so far no major problems have come to light. Once COS 1.08 has been evaluated by the Systems Section, a series of user trials will be arranged, when users may ensure that existing programs can run satisfactorily under this release of the operating system.

There are several new features available with release 1.08. These include:

Partial implementation of JCL. This allows control statements to be read from a dataset other than $CS.

A parameter on PDM control statements (ACCESS, ADJUST etc) to prevent the job from aborting on a fatal error.

Multi-typed datasets. This enables permanent datasets also to be disposed without the necessity of copying the dataset first.

Unblocked I/O.

A selective load feature for LDR. This enables the user to specify which modules are to be included/excluded from the load.

Several new macros are available to enable the CAL user to perform coded and binary I/O more simply.

The multi-typed dataset feature will require extensive testing, as it has caused problems in the past and is a major piece of re-coding.

Neil Storer

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MASS STORAGE SYSTEMS (MSS)

During April of this year I attended the 3rd IEEE (Institute of Electrical and Electronic Engineers) Symposium on Mass Storage Systems in Denver, Colorado, USA. There were several hundred delegates, mostly from the USA and Europe. Several good presentations were given, and it was felt that they would be of general interest to readers of the Newsletter.

In the context of this article, Mass Storage Systems are considered to be capable of holding at least 10^{11} bits of data. One of the earliest devices capable of this was the IBM 1360 Photostore, first delivered in 1968 and still in use at one site, though being rapidly phased out. Other devices to appear on the market were the AMPEX terabit memory, the Unicon 690, and the IBM and CDC cartridge stores. Early MSS devices relied upon optical techniques; the photostore consisted of slides which were recorded by means of an electron beam, and the Unicon 690 used a laser to burn holes in a metallic film. Later devices used video techniques; the AMPEX TBM was based on video recording of magnetic tape and the IBM and CDC cartridge systems use cartridges of 2.7 inches wide magnetic tape using NRZI recording at 6250 bits per inch.

Several manufacturers explained what projects they had underway at the present. Most of these projects were based upon optical techniques.

Les Burns from OMEX talked about the SLIDESTORE which is based on magazines of slides. Each slide is capable of holding 3×10^9 bits. There will be 100 slides per magazine and 5 magazines per system, the number of slides may later be upgraded to 2000 or even 6000. The main problems with the SLIDESTORE are mechanical, such as ensuring that the laser is correctly focussed etc. This was also the case with the photostore, due to the cumbersome nature of the equipment.

Another manufacturer to use slides, or rather fiche, is the Harris Corporation. Gerry Duggan spoke about a system being developed for NASA-MARSHALL. Each fiche holds 2×10^9 bits and 1024 fiches are held in a carousel (a cylinder 2 feet long by 1 foot in diameter). Transfer rates of 50 Mbits/second were quoted.

It was noticeable that only one of the projects discussed by the manufacturers was based on magnetic recording techniques. TBM is no longer supported by AMPEX, but Dave Dodd from STC hinted that a 1000 Mbyte disc was soon to be announced by them, and Lee Johnson from CDC discussed their system, the Control Data 38500. This consists of cartridges of tape 2.7" wide and 100" long, recorded in 8 streams of 9 tracks at 6250 bits/inch. This gives a capacity of 6.4×10^7 bits per cartridge. There are 2000 of these cartridges held in a Cartridge Storage Unit (CSU), and 2 CSUs may be employed. Data is normally spooled from the cartridge to disc. IBM also have a similar system, the IBM 3850, although their cartridge tape is longer, 667.7 inches.

Quite a few of the users were enthusiastic about the Calcomp ATL (Automated Tape Library). This is a modular system of which the basic components are a control unit, two storage units, a reel selection mechanism and two automatic reel mounting units, each serving its own tape drive. There is storage space for about 1000 reels. It can be upgraded to about 6000 reels and 32 tape drives. Physical tape retrieval and mounting takes 15 seconds.

Some applications consisted of a separate small computer system with one or more ATLs spooling data from tapes to disc. This data is then available for distribution to the main computers, each of which is connected to the smaller system, in several instances via NSC Hyperchannels.

The NSC Hyperchannel cropped up several times during these presentations and was the subject of a separate paper presented by Jim Thornton of Network Systems Corporation. The Hyperchannel is a means of coupling various mainframes and devices.

The most significant presentations at the Symposium were devoted to the revolutionary optical disc. Two manufacturers described their devices.

Donald Hertzog from RCA described their system. It seems to be in an advanced stage of development with an engineering model, which has a capacity of about 10^{11} bits per disc, under test. The drive has a transfer rate of 100 Mbits/sec via 2 channels. A system, costing between $20K and $50K, should be on the market by 1983. It should be possible

to upgrade the number of channels to 8 and it is envisaged that a "juke box" type of system, capable of holding up to 100 discs would also be produced. The discs themselves would cost between $10 and $200 depending upon demand.

Leonard Laub from EXXON described their system,which uses equipment originally designed by Thomson-CSF of France. This system is planned for delivery to a customer by early 1982. The discs have a capacity of $6x10^{10}$ bits and a transfer rate of 15 Mbits/sec. The system would cost somewhere in the region of $50K . At present EXXON do not have any plans for the "juke box" system. Discs would cost about $350, more than the RCA discs because they are pre-formatted.

The discs would have a lifetime of at least 20 years, and it will be possible to record on them at any time during their lifetime. It should be possible to duplicate discs offline without having to transfer the data via the CPU. The optical disc system consists of a thin vinyl plastic disc in which holes are punched by a low power laser. Readback is performed by noting the variation in reflectivity of laser light from the surface of the disc. In fact, it is not the surface of the disc itself that contains the data, but a "sandwich" layer which is protected from surface scratches and enables the disc to be handled manually.

My conclusions from the meeting were that optical disc technology seems to offer the most promising solution to mass storage, at least in the immediate future. Several of these systems are due for release within 2 to 4 years, However, the lack of standards in this area, and the lack of any integrated system for data transmission and file transportation, would seem to indicate that widespread use of these devices will lag behind these releases by several years. File management systems for mass storage devices are in their infancy. As an interim solution the Calcomp ATL is very cost-effective and could tide over several potential MSS users until practical MSS becomes available. To use optical discs to their best advantage it will be necessary to develop new methods of organising data to overcome the problem of the non-rewritability of the medium. In fact, the words 'overcome' and 'problem' should not be used, as non-erasability will probably be found to be an asset.

Neil Storer

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*FAST FOURIER TRANSFORMS IN ECLIB

At present there are a number of different versions of FFT in use by a variety of projects within ECMWF. The packages differ from each other in terms of input and output data organisation, normalisation, and speed.

Currently, the fastest available (FFT99) is supported in ECLIB. This utilises the 'real/half-complex' formulation and generates results which are organised in a slightly different manner from FFT33. It executes approximately 10% faster on the Cray. New users of FFT are urged to use FFT99 as future (faster) versions will almost certainly use the same formulation.

However, it is planned to support alternative versions in ECLIB. We are, therefore, interested in knowing what alternative versions are in regular use and should be supported in the library. We know of FFT33, FFT44, FFT55. Please advise User Support Section if you regularly use any of these versions.

David Dent

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MAGNETIC TAPES

Since 1976 the Stranger tapes library has steadily increased in size and now stands at about 1100 tapes. Over the next six months it is intended to cut this library down to approximately 250 tapes, providing TEMPORARY tape storage only, i.e. 1-4 weeks. Users who require permanent, or more than 4 weeks', storage for a tape, must copy it to a Pool tape. Users who own Stranger tapes at the moment should check whether they are still required, and if not, release them. If any Stranger tapes have been stored at ECMWF for more than four weeks, or are intended to be stored here permanently, they must be copied to Pool tapes.

To assist the computer operators in locating Stranger tapes, a slot number will be allocated to each tape. You will be requested to punch this slot number (as well as your VSN) onto your REQUEST/LABEL card as a comment after the parameter string terminator.

e.g.: REQUEST,T,GE,E,NORING,VSN=COL1. SLOT NO.=173
LABEL,TAPE2,VSN=COL2,D=GE,W,RING,L=COLA. SLOT NO.=69

Users who already own Stranger tapes will shortly be sent a list of their Stranger tape VSN's and their corresponding SLOT NUMBERS. Pool tapes cannot be removed from ECMWF. Any data on Pool tapes which a user wishes to send/take away, must be copied to a Stranger tape (supplied by ECMWF if required).

Mary Marsh

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MEMBER STATES' USAGE OF CRAY RESOURCES UP TO AUGUST 18, 1980 (IN UNITS)

Denmark	5,965
Finland	163
France	48,830
Germany	28
United Kingdom	103,572
Netherlands	1,997
Spain	3,341
Sweden	14,882
Yugoslavia	1,916

Andrew Lea

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HOW FAULTY HARDWARE CAN SPEED UP YOUR PROGRAM

A general circulation model being run by the UK Meteorological Office on the Cray suffered a curious experience as a result of a computer hardware problem. An intermittent T register fault caused the program to fail. The model was restarted from a restart point and the repeat calculation executed with 20% less CP time than normal!

It seems that the hardware malfunction upset some calculations concerning convection and resulted in considerably increased convective activity in the model atmosphere. The restart point chosen was not far enough back in time to remove the effect of the failure, hence the model atmosphere was stable and dry as a result of the erroneous convective activity and there was little or no convection in the repeat run. The considerable computer effort needed to calculate the effect of convection was therefore saved, resulting in faster execution!

David Dent

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VACANCIES AT ECMWF

There are the following vacancies at ECMWF Headquarters at Shinfield, near Reading. Remuneration is commensurate with those of International Organisations. For both posts, fluency in one of the working languages of the Centre and a good knowledge of at least one of the others is required. (The working languages of the Centre are French, English and German). For further information contact Personnel Section.

POST: CONSOLE OPERATOR (C110)

FUNCTION: The Console Operator reports to a Shift Leader and is responsible for controlling the computer systems via central consoles. The successful candidate will assist the Shift Leader in providing a computer service for local batch work and supporting remote batch stations and terminals. Additionally, the Console Operator will perform the operation of off-line equipment, the control of input and output batch workloads, performing maintenance procedures on peripherals, reporting faults and monitoring performance of all equipment and carrying out any other tasks which are essential to the smooth running of Computer Operations. The computer system includes a CDC CYBER 175 linked to a CRAY-1 large scale scientific computer. Applicants must be prepared to work a shift system including weekends and public holidays and, in times of emergency, to stand in for other operators in other shifts.

QUALIFICATIONS: Candidates must have at least 2 years' operating experience in a large scale scientific computing environment and be able to demonstrate their knowledge. CDC experience is an advantage but not essential. The post calls for a good standard of achievement in secondary education. The possession of Higher National Certificate or equivalent in computer related subjects would be considered an advantage.

STARTING DATE: As soon as possible.

Possible vacancy:

POST: COMPUTER OPERATOR (TAPE LIBRARY ASSISTANT) (C11X)

FUNCTION: The Assistant will report to the Operations Support Supervisor. Duties are related to the allocation, control and maintenance of a Magnetic Tape Library, which contains more than 6000 reels of tape.

The post is in the Computer Operations Section, which is responsible for the operation of large scale Control Data and Cray computers. The Assistant will work in close liaison with the computer operators.

The basic duties are:

- Operation of magnetic tape cleaners and certifier.
- Updating records for use and performance of tapes.
- Receives and dispatches tapes for other establishments.
- Assists the Operations Support Supervisor with general duties.
- Acts as relief for the Computer Receptionist in her absence.
- Assists the Operations Shift Staff with operating peripheral equipment if necessary.

These duties do not require regular shift work. However, circumstances may call for occasional shift duties as peripheral operator.

QUALIFICATIONS: Secondary education and at least three years' experience or higher technical education. Specific training, however, will be given on the job.

The post demands practical work of a repetitive nature. Candidates should be methodical and have a good degree of common sense.

STARTING DATE: As soon as possible.

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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 92). All other News Sheets are redundant and can be thrown away.

No.	Still valid article
11	FTN Rounding Option
15	Private Packs on the Cyber (MOUNT/DISMOUNT)
16	Checkpointing and program termination
17	Private packs and interactive jobs
19	CRAY UPDATE (temporary datasets used)
31	Fortran Callable Tape REQUEST
37	IN trays for Cray and Cyber jobs
42	Cyber Scheduler (see News Sheet 59 also)
43	Cray AUDIT
	Transfer of Coded Files
47	Libraries on the Cray-1
50	8 disc Cray System
	Terminal Procedure
51	Cyber Disc Reconfiguration
53	Cyber Job Card Priority Usage
	Writing 6250 bpi Tapes (EEC Parameter)
	Punching Conventions (Coding Forms)
54	Things not to do to the Station
55	New Cyber Peripherals
56	DISP
59	New Cyber System (Scheduler Changes)
65	Data Security on Cyber and Cray
66	New Cray Audit
	Cyber Accounting
67	Attention Cyber BUFFER IN Users
70	Cyber/Cray Station
71	Packs Command
72	The Change to BST (Machine Schedules)
73	Minimum Cyber Field Length
75	Disposing with SDN=PLOT
77	ACCOUNT of an Executing Job
86	NOS/BE 1.4 Introduction
89	Cray Account validation (& minimum field length for Cray jobs)
91	INTERCOM user auto logout
	COS 1.08 products
92	COS 1.08 products
	FTN 518

The News Sheets which can be thrown away since this list was last published are numbers 64, 76, 80, 87, 88, 90.

Andrew Lea

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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.

GENERAL

METEOROLOGY

* 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 Other methods of quick contact: - telex (No. 847908) - COMFILE (see Bulletin B1.5/1)		CB 037	308/309
Computer Division Head	- Geerd Hoffmann	OB 009A	340/342
COMPUTER OPERATIONS			
Console	- Shift Leaders	CB Hall	334
Reception Counter) Terminal Queries)	- Judy Herring	CB Hall	332
Tape Requests	- George Stone	CB Hall	332
Operations Section Head	- Eric Walton	OB 002	349/351
Deputy Operations Section Head	- Graham Holt	CB 033	330
DOCUMENTATION	- Pam Prior	OB 016	355
Libraries (ECMWF, NAG, CERN, etc.)	- John Greenaway	OB 017	354
METEOROLOGICAL DIVISION			
Division Head	- Roger Newson	OB 008	343
Applications Section Head	- Joel Martellet	OB 011	360
Operations Section Head	- Austin Woods	OB 107	406
Meteorological Analysts	- Ove Åkesson	OB 106	380
	- Veli Akyildiz	OB 104A	379
	- Horst Böttger	OB 104A	378
	- Rauno Nieminen	OB 104A	378
	- Herbert Pümpel	OB 106	380
Meteorological Operations Room		CB Hall	328/443
REGISTRATION (User and Project Identifiers, INTERCOM)	- Pam Prior	OB 016	355
Research Department Computer Co-ordinator	- Rex Gibson	OB 126	384
Systems Software Section Head	- Peter Gray	CB 133	323
TELECOMMUNICATIONS			
Fault Reporting	- Pierre-Pascal Regnault	CB 028	397/375
Section Head	- Fritz Königshofer	CB 130	310
User Support Section Head	- Andrew Lea	OB 003	348

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* CB - Computer Block
OB - Office Block

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