European Centre
for Medium Range Weather Forecasts

ECMWF NEWSLETTER

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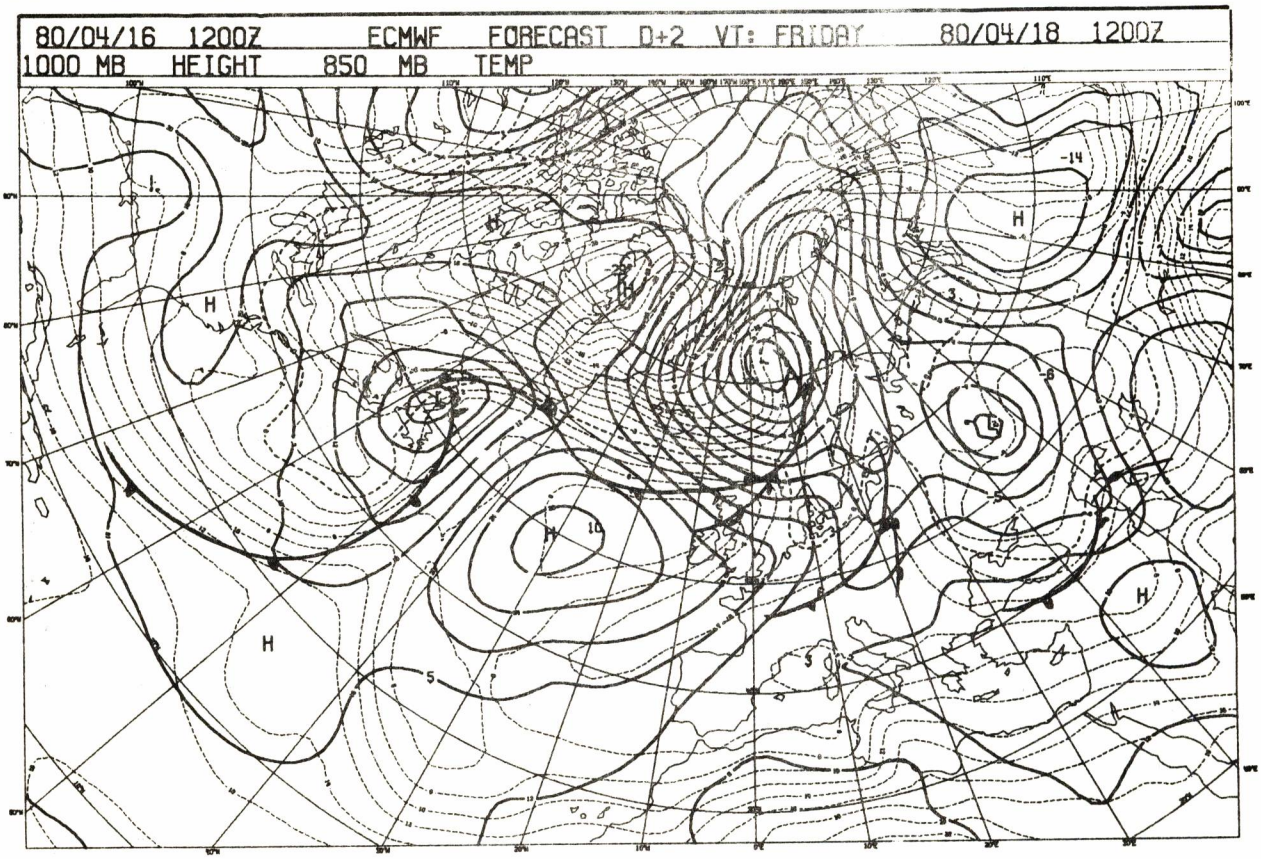
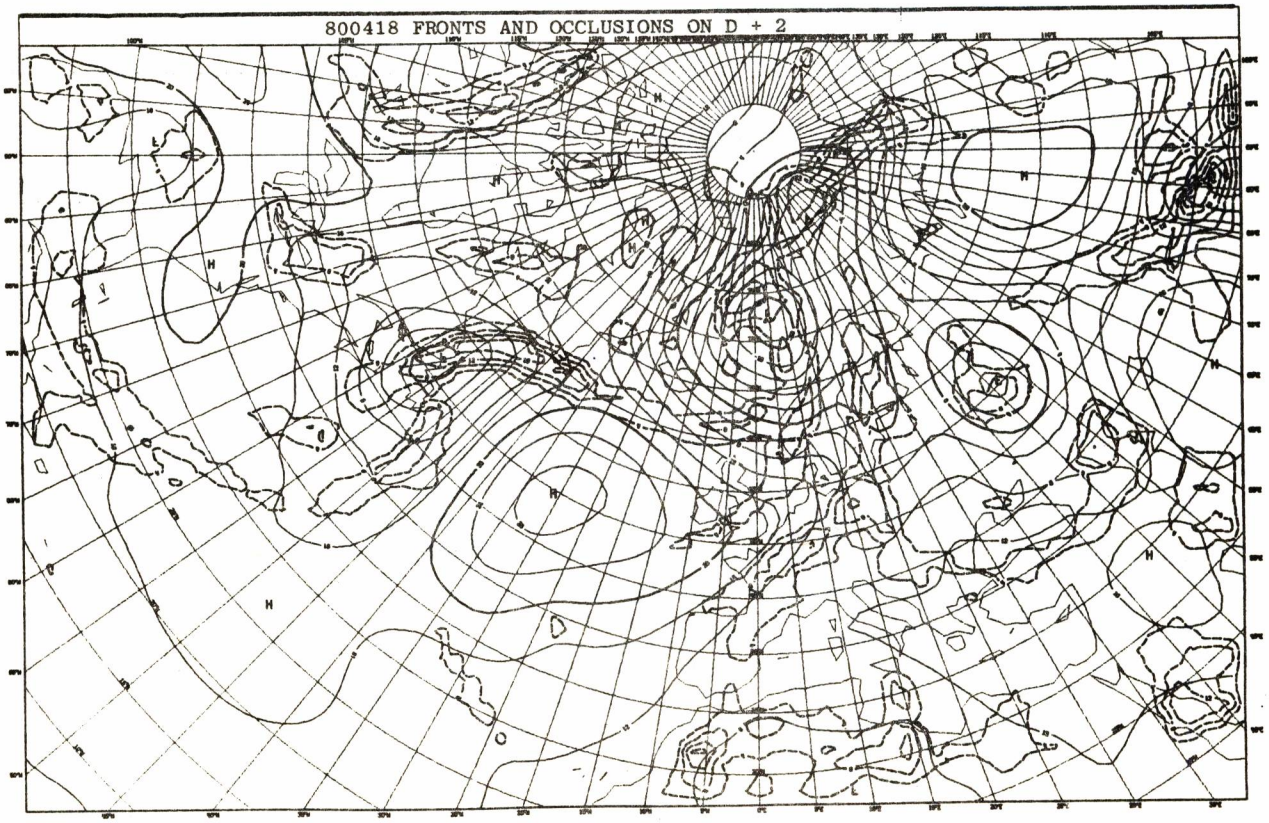
Number 3 - June 1980





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

COVER: See article on facing page

This Newsletter is edited and produced by User Support.

The next issue will appear in August.

COVER PICTURE : OBJECTIVE FRONTAL ANALYSIS

It has always been a major task of synoptic analysis to locate and describe not only dynamical systems (e.g. highs and lows), but also to define characteristic air masses originating from different climatic zones. These air masses have typical values of temperatures and humidity and therefore they are best identified by a parameter which includes these physical quantities, such as ϑ_e the equivalent potential temperature.

The areas where most "weather" happens are usually found along the boundaries between such air masses, the synoptic "fronts", and it is a primary task of every forecaster to analyse the location and intensity of these fronts. Frontal analysis is usually carried out on a purely subjective basis, taking into account temperatures, humidity and cyclonic curvature of the surface isobars associated with a more or less distinct change in wind direction. These indicators are not always very pronounced, and there is scope for subjective interpretation.

Since the ECMWF forecast model produces all the parameters necessary for the analysis of fronts with a reasonable internal consistency , one can perhaps attempt to define an objective "frontal parameter". One might think of a parameter comprising the gradient of the ϑ_e -field, the presence of a maximum of relative geostrophic vorticity and the condition that the value of ϑ_e is higher than the average value at the surrounding grid points, combined in a suitable fashion. The two first factors are obvious, the last is due to the fact that the front can always be found on the warm edge of the strongest gradient. In the example shown, contours of such a frontal parameter are plotted as dashed lines on the background of the 1000mb height field. In this example, they compare rather well with a careful hand-analysis of the fronts.

Despite these rather encouraging first results, further development will be necessary, since the threshold values to define fronts depend to some extent on the overall synoptic situation and the season.

- Herbert Pümpel

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FORECASTS OF AN ATLANTIC BLOCKING SITUATION

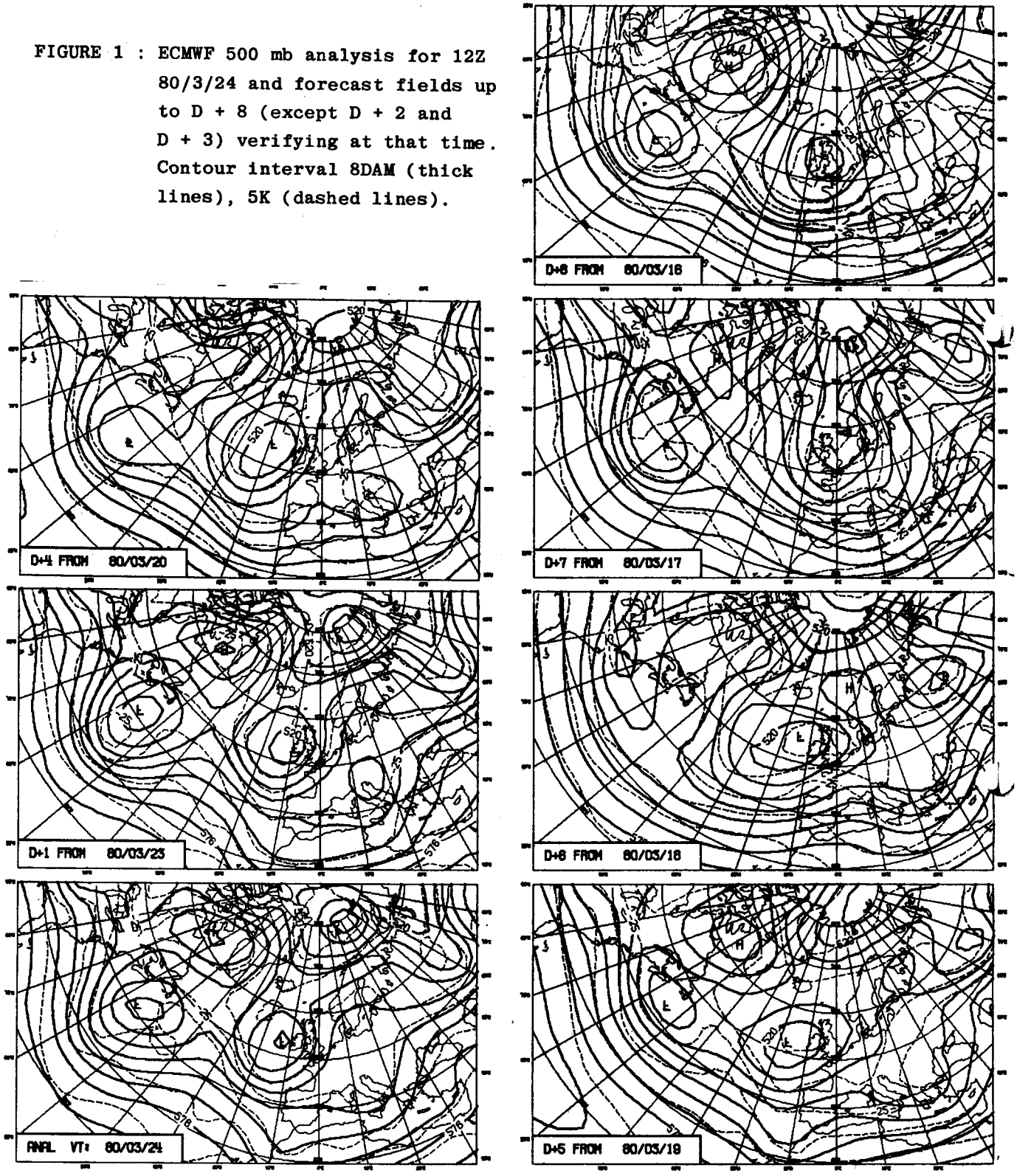
A blocking situation, that is, the obstruction on a large scale of the normal eastward progression of migratory weather systems, formed over the Western Atlantic in the third week of March 1980. Blocking situations are of major interest because of their pronounced influence on other weather features even at considerable distances both upstream and downstream of the block. Fig.1 overleaf shows the verifying 500mb analysis for 24 March (lower left). As in this case, a block often comprises a closed anticyclonic circulation (a cut-off high) at high latitudes and a closed cyclonic circulation (a cut-off low) at low latitudes. The cut-off high here is north of 60°N, the cut-off low is near 40°N in the Western Atlantic.

Figure 1 also shows forecasts from preceding days verifying on 24 March, up to the D + 8 forecast from 16 March. Forecast charts are not available from weekends as ECMWF is currently operational only 5 days per week. Although forecasting of blocking is generally thought to be difficult, it can be seen that the large-scale flow in the Atlantic is well predicted in these ECMWF forecasts. The pronounced meridional nature of the flow, the positions of the cut-off low and high giving the anamolous circulation pattern, and the position of the low over North-Western Europe downstream of the block are all clearly evident in the forecasts.

Prolonged blocking in the Northern Hemisphere occurs most frequently in the eastern North Atlantic and the eastern North Pacific in the Spring. The block typically persists for a week or more, and remains nearly stationary or drifts slowly westwards. Figure 2 shows the situation 3 days later in the analysis for 27 March (lower left). The block is now starting to break down (as was indicated clearly even in the D + 8 forecast from 19 March) and by the end of the month the circulation pattern had again become generally zonal over the area, with the major features progressing eastwards.

- Austin Woods

FIGURE 1 : ECMWF 500 mb analysis for 12Z 80/3/24 and forecast fields up to D + 8 (except D + 2 and D + 3) verifying at that time. Contour interval 8DAM (thick lines), 5K (dashed lines).



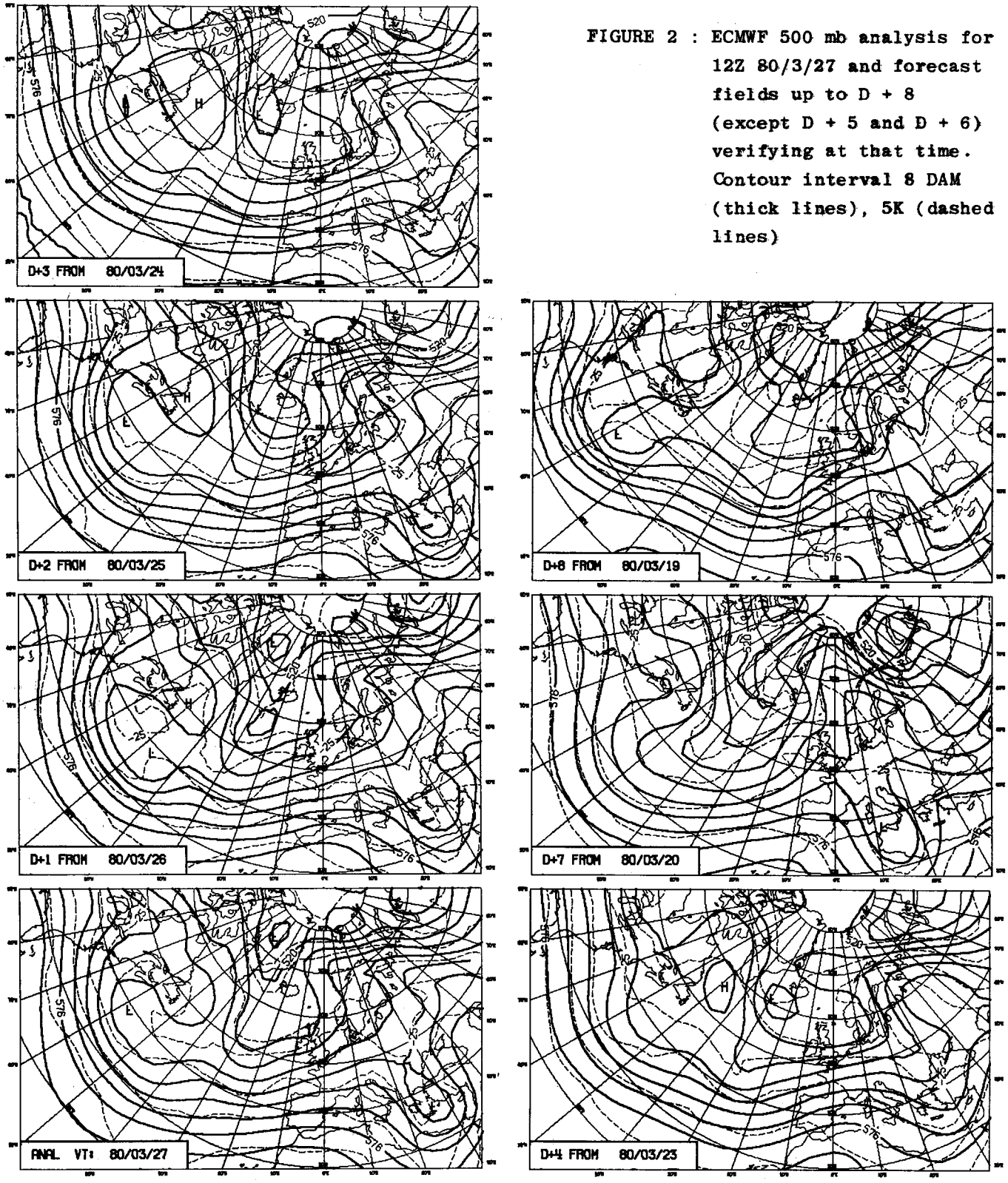


FIGURE 2 : ECMWF 500 mb analysis for 12Z 80/3/27 and forecast fields up to D + 8 (except D + 5 and D + 6) verifying at that time. Contour interval 8 DAM (thick lines), 5K (dashed lines)

ARCHIVING IN THE OPERATIONAL SUITE AT ECMWF

This is an article in the series describing the subsystems that make up the complete operational suite. Previous articles include that on decoding (see December 1979 issue of the Technical Newsletter), and quality control of the observational data and the bulletin correction program in use at ECMWF (see the February 1980 and April 1980 issues respectively of the ECMWF Newsletter).

1. Archiving in the operational suite

There are several data streams involved in the ECMWF operational suite; some data are received externally in Global Telecommunications Systems form (via RTH Bracknell), the main part, analysed and forecast data, are created during the operational suite run, a subset of which is disseminated to the Member States.

Archiving is that part of the suite which saves a selection of those data for different purposes and various lengths of time. One of the goals of archiving is to rebuild the data base environment as it exists in the operational suite and therefore to permit rerunning the operational suite in the same conditions as in the operational run. Another goal is to facilitate study of the data (or part of it) over a period of time and/or over a geographical area.

2. Archive streams

The data to be archived have been divided into independent streams depending on their nature and their most likely future usage. The streams comprise:

- 1 : Raw data
- 2 : Analysis data
- 3 : Forecast data
- 4 : Operational data

2.1 Raw data

The Raw Data which are archived consist of the reports in the format and with the contents they have in the Reports Data Base (Ref.1) (RDB), i.e. in a format packed at bit level and containing original values coming from the GTS, substituted values from either quality control process (see Newsletter February 1980) or manual intervention, and all the flags attached to a report.

The logical structure of the RDB is maintained in the archives so that the reports are grouped every day (from 00Z to 2359Z) into 7 different observation types, namely:

- surface reports (SYNOP, SHIP)
- upper air reports (AIREP)
- SATEM reports
- sea reports (BATHY, DRIBU...)
- TEMP reports (TEMP, TEMPSHIP..)
- PILOT reports
- SATOB reports

These data will be kept for at least 10 years.

2.2 Analysis Data

These consist of the analysed fields produced by the ECMWF analysis process every six hours (00Z, 06Z, 12Z, 18Z) and are divided into two groups:

- 13 surface fields (Ref.2) (also referred to as physics parameters) including: surface pressure; surface temperature; snow depth; large scale rain; convective rain; snowfall; soil wetness; boundary layer dissipation; surface sensible heat flux; surface latent heat flux; surface stress; surface net radiation; net radiation at top.
- in grid point form (1.5° x 1.5°)
- stored at the rate of 15 bits per value.

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- 6 upper air fields (Ref.2) (interpolated from σ levels) including: geopotential; temperature; wind components (U and V); vertical velocity; humidity mixing ratio.
  - in spectral form (truncation T80)
  - stored at the rate of 15 bits per value
  - at 13 pressure levels (1000, 850, 700, 500, 400, 300, 250, 200, 150, 100, 70, 50 and 30 MB)

It is intended to keep these fields for 10 years also. All the fields which are archived are derived from those produced during the Centre's operational analyses.

2.3 Forecast Data

Twenty time steps of forecast data produced by the Centre's model are archived every run, at 12 hour intervals, starting at 12H and ending at 240H. As in the case of the analysis fields they have been divided into 2 groups:

- 13 surface fields (Ref.2) the same as for analysis
- 6 upper air fields (Ref.2) (interpolated from σ levels) as for analysis except:
  - truncation is T40
  - level 30 MB is not archived.

The retention period for forecast archived data is planned to be 2 years.

2.4 Operational Data (Ref.3)

Unlike the previous streams described above for which the archived data are no longer in a format directly acceptable by either the analysis or the forecast processes, the operational data comprise all the data - in exactly the same format - which have been used to start either the operational analysis or the operational forecast, along with the program libraries which were used during the same operational run, so that any rerun or any test can be made under identical conditions.

These operational data are kept for 6 months.

3. Archiving Process

The physical support to store the archive data is a pool of 6250 characters per inch magnetic tapes; each tape has a back up copy (for the first three streams). Each stream has its own set of tapes, the contents of which are recorded in a disc file known as the directory of the stream. The directories are used by both the archiving and the retrieval to select and position the relevant tapes which have to be processed.

The process itself is split up into 3 sub-processes:

- pre-archiving : to extract and format from the on-line data bases all the data which need to be archived for a given stream, using the standard tools available for accessing those data bases;
- storing : to copy to the relevant tapes all the pre-archived data;
- back-up : also used to ensure the integrity of the data on the original tape.

4. Retrieval

The three first streams of Archives (Raw Data, analysis and Forecasts) are accessible by users in batch mode in the same way as are the on line data from which they are extracted, and by using the same standard package which will be described later in this section.

4.1 Target file (Ref.2)

A user who wishes to retrieve archived data invokes the retrieval package which provides him with a "target file" the format of which follows the conventions of the ECMWF History Level 1 data format.

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4.2 Archive Tape Usage

The retrieval package, by making use of the directories attached to each stream of archived data, will carry out all the tape or disc mounts necessary to achieve any user's retrieval in such a way that it will be completely transparent to the user.

4.3 Semi on line data base

Data retrieved from the stream 1 (Reports) is kept on line using a cache memory system so that any further request to the same data does not necessarily mean staging data from tape. The length of time such data will remain on line will depend on the overall access from that stream and is controlled within a volume limit through an ageing algorithm. Nevertheless, this feature will also be transparent to the user, since data which have no "on-line" existence will be staged automatically, with the advantage that generally the data will be staged only once for different accesses so that other users may benefit from this earlier staging.

4.4 Reports Retrieval

It is possible to ask for reports:

- over a time period;
- of a given nature (i.e. code type);
- over a given geographical area (defined by latitude or longitude or WMO block list, or WMO station list or analysis boxes) (Ref.2)
- with a specific format (Ref.1,2)
- with specific quality flags (Ref.1,2).

4.5 Field Retrieval (analysis and forecast)

A user may access:

- a selection of fields
- at various pressure levels
- over a time period
- at different time steps

The extraction of a geographical area and the selection of different output formats is possible outside the retrieval package.

4.6 Operational data retrieval (Ref.3)

As these data are meant to be used along with the actual operational analysis and forecast packages, they will not be examined here in detail. At present a user may access:

- the input data sets to the analysis process
- the 4 "observation files" (each over 6 hour period) fed into the analysis
- the input data sets to the forecast process
- the libraries of programs used during the operational run.

4.7 Retrieval Package Utilisation

The retrieval package, as mentioned earlier, is the same whether a user wants to access on-line data or archived data. It consists of a procedure with keywords and associated value(s) allowing the user to combine all the possible retrievals already mentioned. A user guide (Ref.2) has been published as a Technical Note by the Operations Department. The procedure names are:

GETDATA for streams 1, 2 and 3
GETOPER for stream 4

Some of the possible keywords are listed below with their meaning:

DATE	date or period
HOUR	hour or time step
PARM	code type or field mnemonic
LVEL	pressure level
AREA	limit of the geographical area
VERS	which version of the data is requested
FORM	format of the user's target file

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References:

ECMWF Operations Department Technical Notes:

(1) "Report Data Base Format"
File 23.2 (14.9.78)

(2) "User's Guide to ECMWF's Data Base Access System"
File 23.2/26.1/27.0 (29.2.80)

(3) "Operational Archiving and Retrieval
File 27.3 (8.4.80)

"Archiving/Retrieval"
File 27.0 (4.5.78)
File 27.1/2 (19.3.79)

- Michel Miqueu

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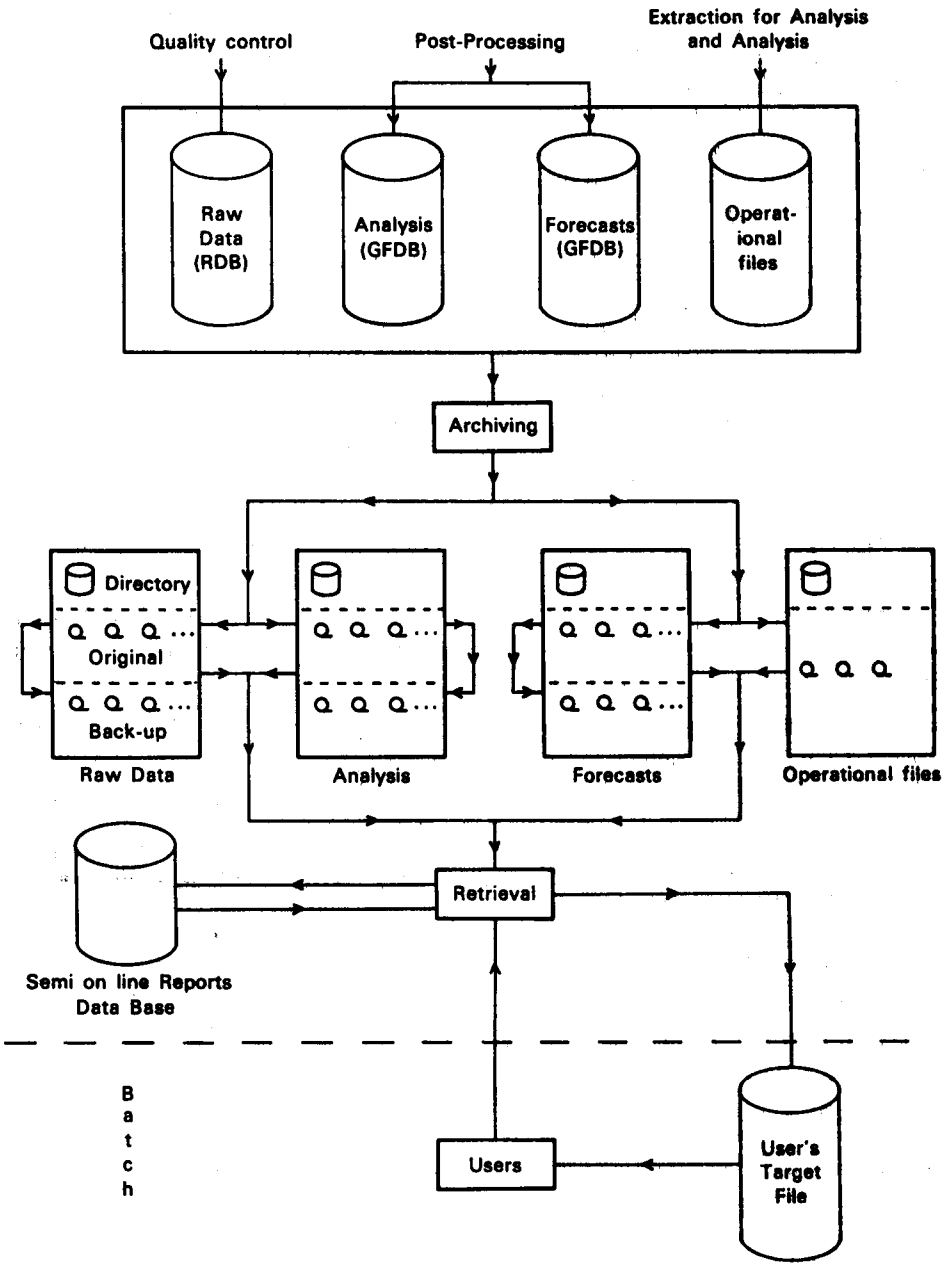

Diagrammatic representation of archiving and retrieval

RESEARCH DEPARTMENT ACTIVITIES

In this issue of the Newsletter we start a series of articles on what different groups in the Research Department are doing. The first one to appear is on the FGGE group and describes what FGGE is, and what the Centre is doing in connection with the FGGE data set. Future articles will cover the physical parameterisation group, the spectral model and the diagnostics group.

ECMWF and the FGGE

As part of the Centre's commitments to support GARP (the Global Atmospheric Research Programme) the FGGE section is engaged in producing the Level IIIb data sets* for FGGE (the First GARP Global Experiment). The Geophysical Fluid Dynamics Laboratory, Princeton, will also prepare IIIb data sets.

The analyses will form a description of the state of the global atmosphere and its underlying surface over a one year period far more complete than previously available. They will be archived at the two World Data Centres for Meteorology for general use by the scientific community in

(a) diagnostic studies leading to a better understanding of atmospheric dynamics in particular for extended range forecasting, and climate and general circulation studies;
(b) the provision of initial and verifying conditions for prediction model experiments;
(c) the development of more efficient data assimilation systems for conventional and satellite based observing systems;
(d) the design of future optimal observing systems for routine weather prediction and research.

The FGGE observing year ran from 1 December 1978 to 30 November 1979, during which special observing sub-systems were used to fill in critical gaps, most notably the tropics and southern hemisphere, in the WMO World Weather Watch (WWW) operational global observing system. Because of the enormous expense of maintaining these special systems, the effort was concentrated into two Special Observing Periods each of about 60 days in January-February (SOP-I) and May-June (SOP-II), each in turn with a core of about 30 days of intensive observations.

Fig. 1 shows the data distribution for one 6-hour period during SOP-I, and illustrates the typical data coverage and types from the composite observing system in operation during this period.

The Basic Observing System (operating throughout the observing year and expected to continue as part of WWW):

The WWW surface based network of 2-3000 surface synoptic stations (SYNOP); about 1000 fixed and mobile ships (FSHIP, MSHIP); nearly 1000 upper air stations (TEMP, PILOT); and 6-1200 aircraft reports (AIREP/CODAR).

Geostationary satellites operated by ESA, Japan and the US, giving about 2-3000 wind observations

US polar orbitting satellites (only one, Tiros-N, until towards the end of the observing year) each providing temperature profiles based on CLEAR, partly CLOUDy, and cloudy (MICRO) vertical soundings, and carrying the ARGOS data collection and platform location system, vital to some of the other systems below.

The Special Observing Systems, most operating only during the SOPs:

Supplementary WWW stations to improve the sparse upper air network in certain regions.

Tropical wind observing ships (TWOSR,TWOSN) over tropical oceans.

An aircraft Dropwindsonde System of aircraft deployed sondes (DROPS) over the tropical oceans.

A Tropical Constant Level Balloon System to fill in gaps in the TWOS/island station network over the tropical oceans above the altitude of the dropwindsonde aircraft (COLBA).

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* The FGGE data set classification is: Level I : primary data; Level II : meteorological parameters; Level III : initial state parameters,"a" and "b" refer respectively to operational and delayed cut-off collection of data.

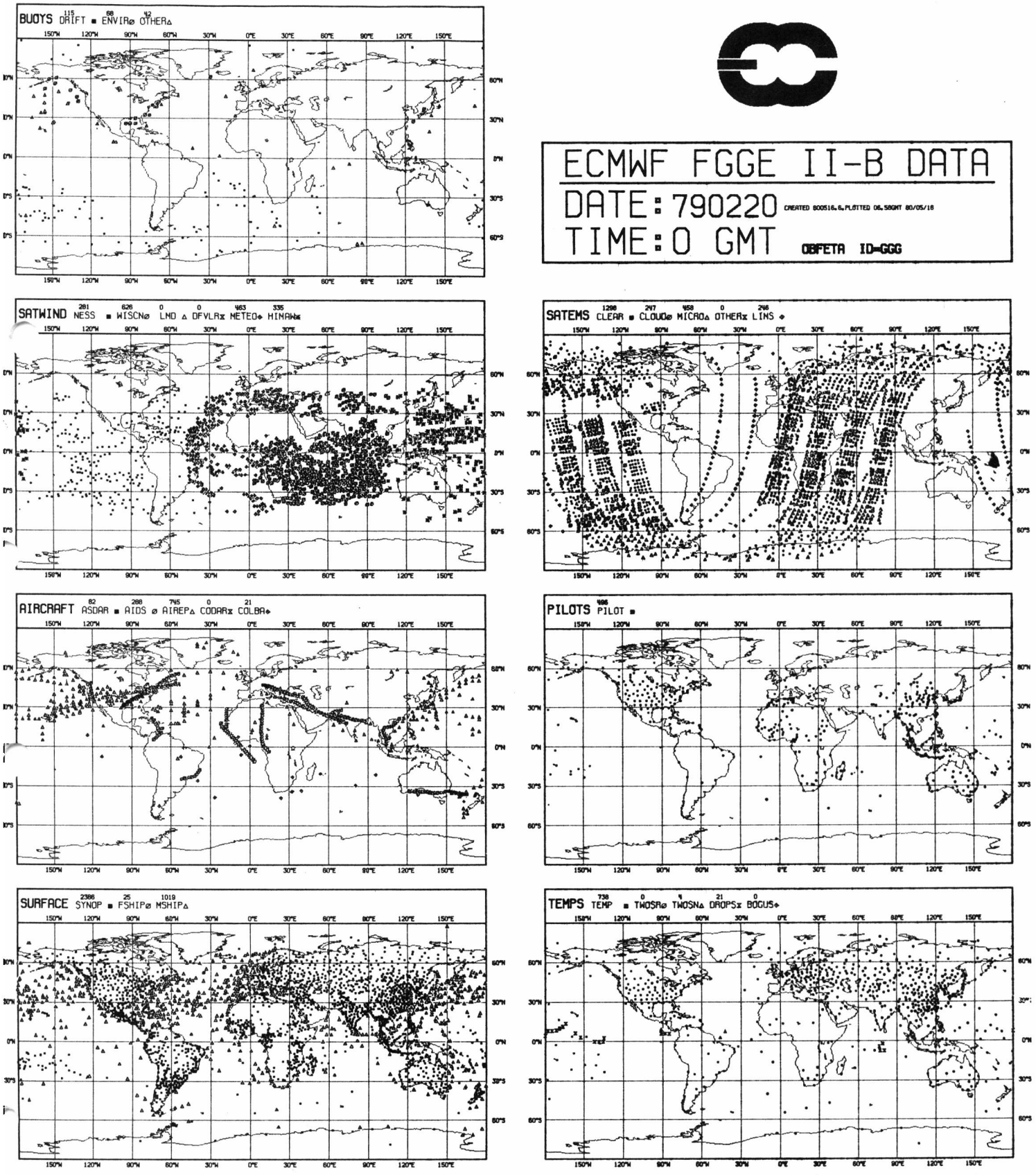

Fig. 1

Typical data coverage and types from the FGGE composite observing system for a 6-hour period during SOP-I (see text).

A Southern Hemisphere Drifting Buoy System measuring the temperature and mean sea level pressure between about 20°S and 65°S (DRIFT).

Research satellite data (including stratospheric temperature soundings - LIMS).

A Special Aircraft Data Collection program to retrieve data from specially equipped wide bodied jets (AIDS/ASDAR).

A number of special oceanographic programs coinciding with the FGGE have also contributed to the observing network.

All relevant data were collected and processed at a number of specialised data centres operated by a number of countries and organisations before delivery to either the Level II-b Surface Based Data Centre (USSR) or the Space Based and Special Observing System Data Centre (Sweden). Our Level III-b data set production is based on the final II-b data sets merged in Sweden.

Production started late last year, and was initially slow with many teething problems in both the II-b data, and the Centre's operational analysis scheme which forms the basis of the FGGE operational production. However, things are settling down; 3 months of analyses were completed by mid-May and delivery of the last of the III-b sets to the WDC's is expected within about a year.

Per Kallberg and Sakari Uppala form the basis of the Centre's FGGE section together with seconded scientists from Norway (Knut Bjorheim); the US (Paul Julian and Steve Tracton), Japan (Masao Kanamitsu) and Australia (Peter Price). Invaluable assistance is received from many other sections of the Centre, especially the Data Assimilation Section.

- Peter Price

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ECMWF METEOROLOGICAL PUBLICATIONS APRIL - MAY 1980

Technical Report No. 17: The response of a global barotropic model to forcing by large scale orography.

Technical Memorandum No. 13: Program description of a barotropic model on the sphere.

Technical Memorandum No. 14: ECMWF Forecast Report, December 1979

Technical Memorandum No. 15: Modifications to the operational analysis suite.

Technical Memorandum No. 16: Two case comparisons between vertical motions obtained from the quasi-geostrophic omega-equation and those in the ECMWF analysis system.

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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 at least one of the working languages of the Centre is required; a working knowledge of the other working languages would be an advantage. (The working languages are French, English and German). For further information contact Personnel Section.

POST: SENIOR SCIENTIST (R202)

FUNCTION: To carry out research into methods for the assimilation of meteorological observations into high resolution numerical models and into methods for the initialisation of numerical models.

QUALIFICATIONS: A university education (Ph.D) or equivalent and several years post graduate experience in dynamical meteorology and related areas of meteorology. Practical experience in numerical weather prediction in the fields of data assimilation, initialisation and objective analysis would be an advantage.

STARTING DATE: 1 November 1980 or as soon as possible thereafter.

POST: JUNIOR SCIENTIST/PROGRAMMER (R604)

FUNCTION: To carry out scientific programming and system analysis for the Centre's numerical models. This will mean, in particular, to design and maintain the diagnostic packages for the ECMWF global forecasting models, the maintenance of the research forecasting system and program libraries.

Additional functions will include liaison with the Operations Department to implement changes to the operational forecasting system.

QUALIFICATIONS: A university education or equivalent in a scientific or mathematical discipline and several years programming experience, preferably as a member of a team.

Background in meteorology or another allied science is desirable as well as practical experience in large-scale scientific computing.

STARTING DATE: 1 September 1980 or as soon as possible thereafter.

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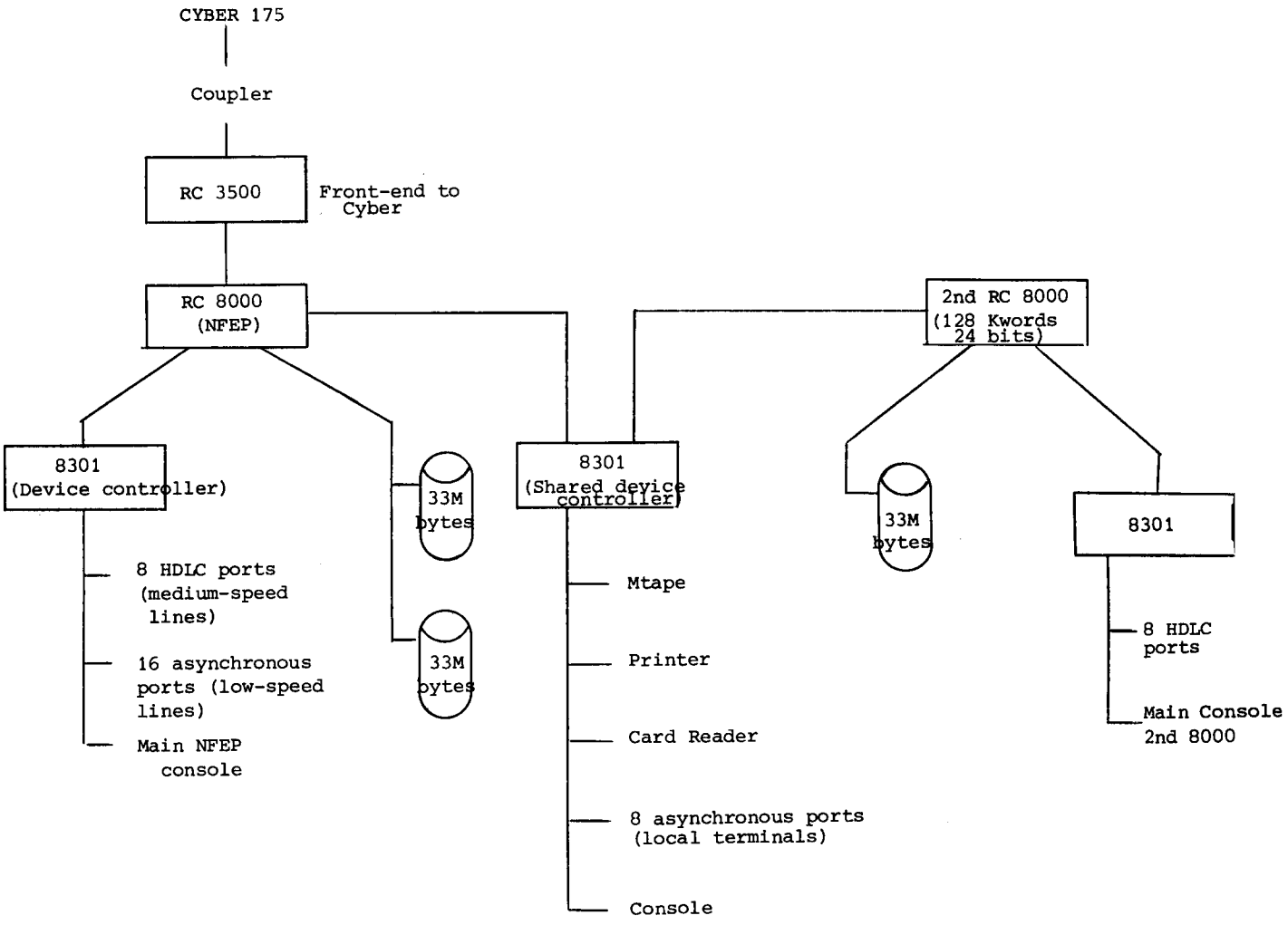
SECOND REGNECENTRALEN 8000

The second RC 8000 computer is being delivered on 2nd June and the timetable envisages an installation and checkout period of two weeks. This machine will provide the basis for a later duplication of the Network Front-End Processor (NFEP). Its main usage will be in the checking-out of new medium-speed links to Member States and in the maintenance and development of NFEP software. It is also being investigated whether it could be used in our graphics experiments. In practice, the arrival of the second 8000 will mean that the NFEP will be much more available to the on-line Member States than at present, RJE access on the medium-speed links to the Centre's mainframes will then also be possible in the afternoons, except on the two afternoons per month reserved for preventive hardware maintenance.

With the second RC 8000, new releases of the basic operating system and of the system utilities will be installed on both 8000's. The device controllers and peripherals are being re-organised to allow shared usage when appropriate. The new configuration is outlined in the following figure.



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Regarding the Joint Project (DWD, SMHI, DMI and ECMWF) of RC3600 terminal software the bug-free period of one month's operation has been achieved successfully. SIA Ganymede have now prepared a final release of this software which completes software developments on this project. It is expected that Final Acceptance can be announced shortly. (Work connected with this project has been the reason why one of the Centre's 3600 Batch Terminals had temporarily to be taken out of normal user service, it was used for development). SIA is also working on the implementation of multi-streaming of files on both the NFEP and the RC 3600. This significant new feature will enable RJE,Data Acquisition and Data Dissemination to operate in parallel on one line thereby enhancing the operational repertoire of the Centre as well as of Member States implementing it. Also, at present, software in the NFEP is being changed to conform to the upgrades planned for our Cyber NOS/BE and Intercom systems.

I am looking forward to being able to report some news about the projects above in our next Newsletter. Then I might also be able to report other ensuing progress on existing or future medium speed connections.

- Fritz Königshofer

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* KNOW YOUR ACCOUNT

Within the next few weeks the first stage of account validation will be introduced into the accounts processing. This change means that, providing you use a valid project identifier on your ACCOUNT card, in the dayfile of each job that you run you will receive information on the current usage of your project in terms of Cyber units, Cray units and Cyber PF kilowords. If, however, you use an incorrect project identifier you will be informed of your error, though your job will be allowed to execute.

At a later date, jobs using invalid project identifiers or priority groups which are already exhausted will be dropped before execution with an appropriate message. This delay in the introduction of the second phase will give you time to correct any invalid identifiers which you may be using currently. Please remember that once validation occurs you will need to distinguish precisely between O and Ø (zero), and 1, I and L, and that miskeying will also cause your job to be dropped.

An overview of this control scheme was given in the ECMWF Technical Newsletter No. 6 (Dec. 1979), page 9.

- Tony Stormer

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ECMWF SUBROUTINE LIBRARY

For some time now, we in User Support have been collecting together useful routines and utilities, organising them into a software library. A pre-release version (called ECLIB) has been in use for some time, the first fully documented version will be available in July.

Where possible, routines are being made available on both the Cyber and the Cray. Documentation will be provided in the form of a fourth volume to the Computer Bulletin set. The initial contents of the library is listed below. For further information, please contact me at User Support Section.

Initial Contents for ECLIB

CONVERT (Cray - Fortran and Assembler) converts data between Cyber and Cray format. Handles all Fortran data types and takes care of difference in machine and length.

PERMANENT FILE MANAGEMENT (Cray - Fortran and Assembler, Cyber - Fortran and Assembler) Provides file managing routines such as ATTACH, CATALOG, etc. Includes file transfer requests (ACQUIRE and DISPOSE).

SUBMIT (Cray - Fortran, Cyber - Fortran and Assembler) Submits a file into Cyber or Cray input queue.

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RANDOM I/O (Cray - Fortran and Assembler, Cyber - Fortran and Assembler). Provides a random access capability overlapped with computation. The index is maintained by the package. The Cray implementation supports a name index.

FAST FOURIER TRANSFORM (Cray - Fortran and Assembler, Cyber - Fortran) Calculates a number of FFTs simultaneously. This is the fastest known method.

SYMINV (Cray - Assembler, Cyber - Fortran) Inversion of a symmetric positive definite matrix with checking for ill-conditioning.

SIGMA (Cray - Assembler, Cyber - Fortran) Vector summation and scalar product of 2 vectors.

INDEX (Cray - Assembler) Fast table lookup for the purpose of sigma to pressure level interpolation.

GATHR (Cray - Assembler, Cyber - Fortran) Gather operation from random memory locations.

EXP, ALOG, SQRT (Cray - Assembler, Cyber - Fortran) Half precision functions which execute more quickly than the usual full precision CRAY version.

COPYCI, LISTCI (Cyber - Fortran) Control card callable functions, which read and write card image tapes.

HUMIDITY routines (Cray - Fortran, Cyber - Fortran) A set of routines for calculating humidity variables.

DATE routines (Cray - Fortran, Cyber - Fotran) A set of routines for manipulating dates.

JOB and ACCOUNT (Cray - Fortran, Cyber - Assembler) Routines to obtain the job name and account.

FICHE (Cyber - SYMPL/Assembler) Send output to fiche.

NUMARG (Cyber - Assembler) Returns the subroutine argument count, for compatibility with Cray.

AUDPF (Cyber Assembler) Selective audit output, based on account.

- David Dent

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PORT LIBRARY MANUAL

We have now obtained a copy of the PORT Library Manual from Bell Laboratories for evaluation purposes.

To quote from the manual,"PORT stands for Portable, Outstanding, Reliable and Tested"! It mainly covers the traditional areas of mathematical software, however, established statistical routines have been excluded as these are provided by other excellent libraries. In addition, there are centralised routines for error handling and memory allocation, which support the structure of the library. In the interests of portability Input-Output is generally relegated to separate subprograms in the utility section.

On the mathematical side it contains many standard subprograms,and in addition

(i) routines for solving differential equations and evaluating integrals, including the cases of noisy or singular integrands;
(ii) cubic spline routines for interpolation, integration and differentiation, also, a B-spline package offering subprograms for interpolation, least squares fitting, derivative evaluation and integration and errors in a B-spline approximation; the package includes mesh generating subprograms;
(iii) Finding the zeroes of systems of non-linear equations, requiring the evaluation of the Jacobian, either user-provided or estimated;

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(iv) best uniform rational approximation to a given function on a specified mesh;
(v) a set of subprograms for evaluating expansions in terms of orthogonal polynomials.

These, and many other areas are covered. If you are interested in consulting the manual, it is available in the Advisory Office; if you think there is a need for this library here please contact me. Both Cyber and Cray versions are available from Bell Laboratories.

- John Greenaway

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* THE CRAY JOB CLASS SCHEDULER (JCS)

The Job Class Scheduler has been installed into COS 1.07 on our site and should be introduced into service early this month. This will help us in the scheduling of jobs on the Cray-1. JCS is a "high-level" scheduler in that it decides which jobs are to be taken from the input queue for execution. In this respect, it is similar to ECMWF's high-level Cyber scheduler, however JCS is much more versatile.

The Cyber high-level scheduler provides a class structure. When jobs enter the input queue, their time limits and central memory requirements are compared with values held in a table to determine to which classes the jobs belong. The scheduler allows a job to go into execution only if the limit on the number of jobs in that job's class has not been reached. If the limit has been reached, then the job will be held in the input queue until some jobs belonging to that class which are already in execution, terminate. JCS also has a class structure but one which is much more sophisticated. It allows us to separate jobs into classes depending upon time limit, memory, jobname, username, priority, source and destination ID, in fact anything which describes a job in the input queue. The types of comparison are also more varied - the Cyber scheduler only deals with values being greater than a limiting value; JCS allows any logical operation >, <, =, ≠, ≤, ≥, .AND., .OR., .NOT.. It also allows us dynamically to modify the class structure to take into consideration the changing nature of the workload during various periods when the machine is running. Initially, we shall be using two class structures, one to be used during the operational forecast period and one to be used outside this period. These structures will differentiate between "normal" jobs and those special jobs such as system, FGGE and operational forecast jobs. Normal jobs will in turn be assigned to classes mainly on a time limit and memory basis.

This structure will not be fully effective until the memory parameter (CM) describes a maximum value, not an initial value as at present. This should occur with COS 1.09 later this year.

The Cray-1 workload will be evaluated with a view to optimising the class structures. This will be greatly helped by a feature of COS 1.07 called the System Performance Monitor, which places messages into the systemlog at regular intervals. These messages will be extracted and processed to provide the relevant statistics, which in turn will enable us to tune the JCS to our needs.

- Neil Storer

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* CFT SUBROUTINE CALLING SEQUENCE AND MEMORY MANAGEMENT CHANGE

Cray currently have plans for a major change in the CFT subroutine calling sequence. This is now planned for release at level 1.09 (October 1980). At the same time, they are considering a change in memory management for local variables and arrays.

The calling sequence change has been mentioned previously (see ECMWF Newsletter No.2). This will require re-compilation of programs, with minor code changes for routines written in CAL.

The memory management changes are, however, more extensive and might require some program changes. These changes will have three main effects:

1) Local storage will be released on exit from subroutines.
2) Argument association will not exist from one call of a subroutine to the next.
3) It will no longer be possible to increase user memory after the start of execution.

To help overcome the problems caused by 1), the Fortran 77 SAVE statement will be implemented. This will allow a list of local variables or all the variables of a subroutine to be saved. There will also be a new CFT control card parameter which will do this for all the subroutines compiled at the same time.

The advantages of these changes are:

1) Reduction in the amount of local storage space required for a program as it can be shared between several subroutines.
2) This will allow dynamic allocation of arrays.
3) It will be possible to call subroutines recursively.
4) A reduction in the amount of space required for compiler temporaries.

If you believe these changes will cause you significant problems please contact me as soon as possible.

- Gary Harding

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* CYBER UPGRADES DURING 1980

During the remainder of the year, we will be making the following hardware upgrades to the Cyber 175 front end processor in order to improve its capacity.

1. At the end of May, the Cyber memory will be increased from 192K (600K octal) words to the maximum memory size of 256K (1 million octal) words. This additional memory should result in a significant improvement in CPU utilisation and throughput of large jobs.

2. Between September and December, 8 of the 16 844-41 disc drives will be replaced by 4 885 fixed module disc drives ("fixed module" means the disc packs are not removable). At the same time the 4 7154 disc controllers will be replaced by 6 7155 controllers which are capable of driving both the 844-41 and 885 disc drives simultaneously. This disc upgrade will almost double the online disc storage from the current 376 Mwords to 743 Mwords.

Meanwhile, in order to be able to support the new fixed module discs, it is necessary to upgrade our operating system from the current NOS/BE 1.3 at release level 473 to NOS/BE 1.4 at release level 518. This operating system upgrade, which is planned for mid-July, will have very little impact on the users, apart from the need to recompile some libraries and applications.

In order to allow users to verify that they can run production work with the upgraded operating system, and to help us to identify and correct any problems that may arise, a series of user trials will be run at the end of June.

Before these user trials commence, a news sheet will be issued detailing any operating system changes that will affect the users.

- Tony Stanford

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ACCIDENTAL PURGING

Accidental purging of a Permanent File (PF) can be made less tragic since normally the dear soul is immortalised in a DUMPF tape by the daily operational backing-up routine : User Support or the operators can perform a resuscitation of the deceased by running a LOADPF.

We have now experienced a situation where the above procedure would fail. Consider the following:

JCL : "PURGE,OLDDEAR."

User (hitting his forehead):

"Oh my God..... that was cycle so and so, I really should have kept it! Lucky though, that I still have another cycle. I ought to protect it from accidental purging."

JCL (referring to the surviving cycle of OLDDEAR) :
"RENAME,OLDDEAR,CN=KEEPOFF."

This is the right thing to do. The CN password prevents any attempt to purge a file, unless the permission has been granted by declaring the password with a PW keyword. However, LOADPF will now fail to resuscitate the original lost cycle. The permissions part of the PFC (Permanent File Catalog) entry captured by DUMPF no longer matches those still in the permanent file base, because, of course, there was no password originally.

CONCLUSION:

If you have accidentally lost a cycle and want it reloaded from a dump, don't change anything on other cycles still remaining. Wait until after the last cycle has been reloaded before adding passwords, etc.

- Luigi Bertuzzi

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DYNAMIC CYBER FILE BUFFERS FOR STANDARD FORMATTED/UNFORMATTED DATA

Cyber I/O-oriented jobs may take advantage of the following Record Manager feature:

```
:
:
FILE,TAPEi,BFS=j.
:
:
ATTACH,ECLIB.
LIBRARY,ECLIB.
:
:
 LOADER SEQUENCE TO EXECUTE"PROGRAM y"
:
:
```

where

1) i = 0 to 99 or "TAPEi" = any valid Logical File Name appearing in the PROGRAM statement (NOTE: a FILE card for each LFN other than INPUT and/or OUTPUT should be used);

2) j = buffer size in (decimal) words, namely:

   65 to 26200 (formatted I/O)

   or

   513 to 26200 (unformatted I/O)

3) PROGRAM y = a program statement of the form PROGRAM ANY(...,TAPEi=0,...).

./.

Thanks to this feature:

i) the program execution starts with minimum field length requirements;

ii) I/O initiation on stream "i" triggers the allocation of "BFS" central memory words for the "TAPEi" buffer;

iii) I/O termination on stream "i" can be followed by a "CALL RETURN(i,NFAIL)", thus decreasing the field length requirement by "BFS" words (NOTE : RETURN is loaded from ECLIB);

iv) program execution performance differences can be experienced by varying the BFS parameter within the limits indicated (NOTE : no general rule can be given. The program structure and the machine load dictate the performance in most cases).

- Luigi Bertuzzi

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NEW VERSION OF GRAPHICS SOFTWARE

A new version of the graphics software was introduced on Thursday 8 May. The new version number is 107. This version number is printed in the dayfile and is the same as the cycle number of the libraries and other related files. News Sheet 64 of 24.10.79 detailing the changes for version 106 is still valid; full documentation on all these changes will be issued with the next update of the Contour Package User's Guide.

Apart from correcting minor bugs, the major reason for introducing this new version is that it will allow the collection of detailed statistics on the usage of the two libraries.

Cray Version

The Contour Package and the Varian Basic Software version 107 are now available on the Cray-1. They are used as on the Cyber, and the plot files are automatically transferred to the Cyber and plotted.

All information related to the version 107 is given in News Sheet 76 of 7.5.80.

Background Files

Please note, background files created with the old version of the graphics software (i.e. version 106) are not compatible with the new software. Users are therefore advised to re-create their background files with the new libraries.

- Howard Watkins

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DOCUMENTATION

At the end of March, Cray manuals as listed below were sent to Member States' Computing Representatives:

CRAY-1 Hardware Reference Manual, Revision E.
CRAY-OS Version 1 Reference Manual, Revision G.
CRAY-OS Version 1 Reference Manual, Change packet G-01.
CRAY-1 Fortran (CFT) Reference Manual, Change packet E-01.
CRAY-1 Fortran (CFT) Reference Manual, Change packet E-02.
CRAY-1 Fortran (CFT) Reference Manual, Change packet E-03.
CAL Assembler Version 1 Reference Manual, Change packet G-02.
CAL Assembler Version 1 Reference Manual, Change packet G-03.
CRAY-1 Library Reference Manual, Revision C.
CRAY-1 Library Reference Manual, Change packet C-01.
UPDATE Reference Manual, Revision A.
UPDATE Reference Manual, Change packet A-01.

- Pam Prior

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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 77). 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)
63	Daily Schedule for Operational Suite
64	New Version of Graphics Software
65	Data Security on Cyber and Cray
66	New Cray Audit
	Cyber Accounting
67	Attention Cyber BUFFER IN Users
68	Protected Files on the Cray
70	Cyber/Cray Station
71	Packs Command
72	The Change to BST
73	Minimum Cyber Field Length
75	Disposing with SDN=PLOT
76	New Version of Graphics Software
77	Software Changes
	ACCOUNT of an Executing Job

The only News Sheet which can be thrown away since this list was last published is number 74.

- Andrew Lea

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MEMBER STATES' USAGE OF CRAY RESOURCES UP TO MAY 19 1980 (IN UNITS)

France	22558 units
Germany	1 unit
United Kingdom	65196 units
Spain	3341 units
Sweden	7859 units

- Andrew Lea

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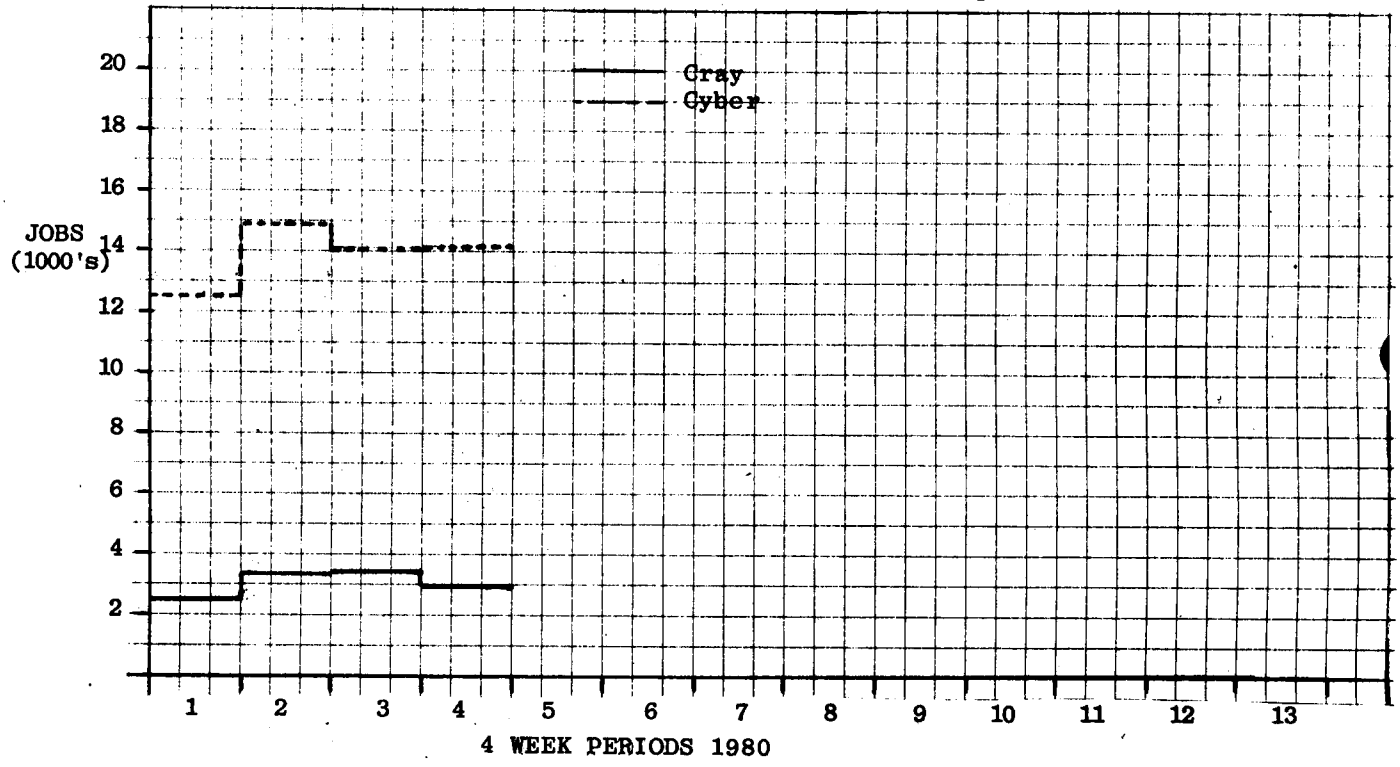
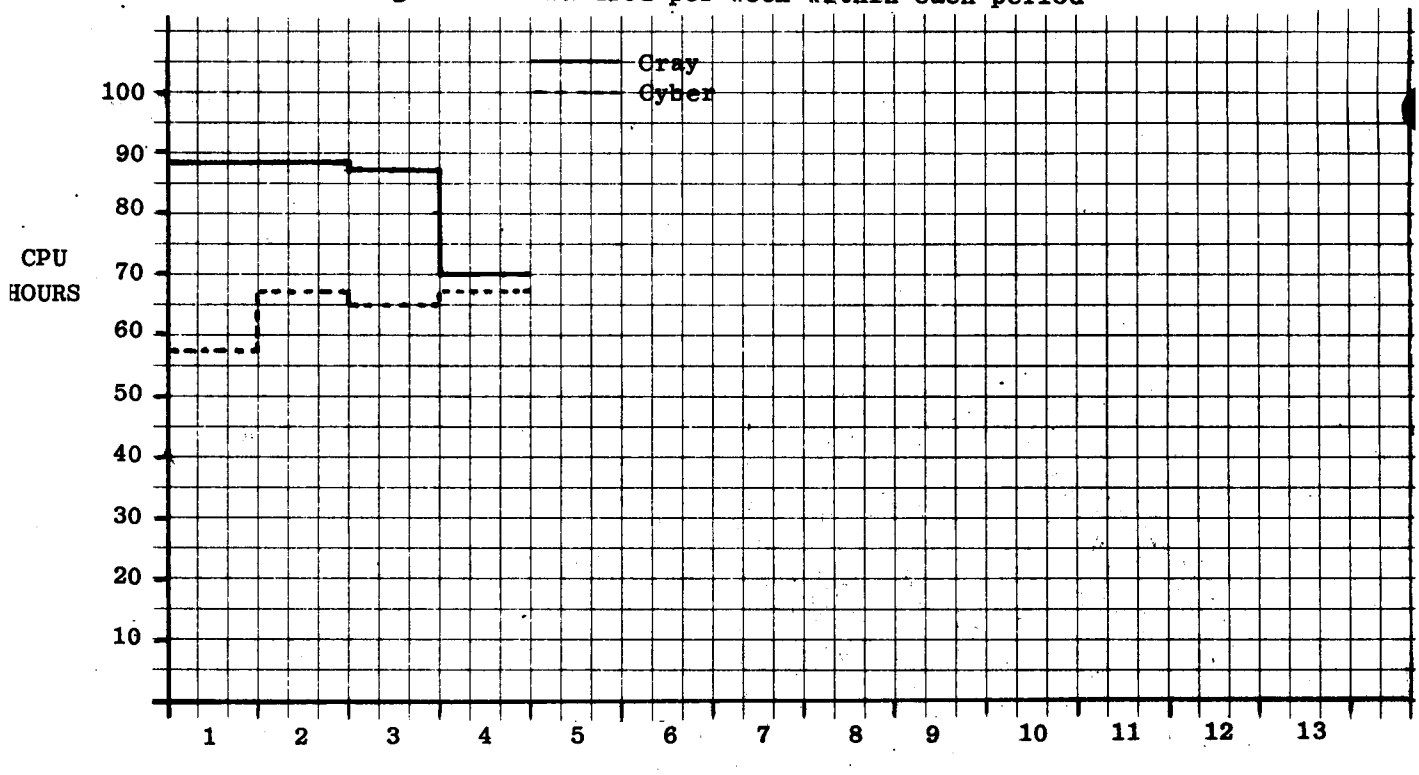
STATISTICS FOR 1980

The tables below show the weekly average for the number of jobs and CP time used for both systems. They are presented as averages over 4-week periods, to smooth out random week by week variations. Neither set of statistics includes the figures for background diagnostic jobs.

Average number of jobs per week within each period



Average CPU hours used per week within each period



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.

	Newsletter No.*	Date	Page
CRAY-1			
Computer Architecture	T2	Apr. 79	10
	T3	June 79	10
	T4	Aug. 79	8
File transfer - to a named device	T2	Apr. 79	14
Public Libraries	T5	Oct. 79	6
Memory available to users	T6	Dec. 79	12
Software - level 1.07 of COS	2	Apr. 80	11
CYBER 175			
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Discs - (844-41, double density)	T3	June 79	17
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- FGGE	3	June 80	8

* 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 (from 1 July 1980)	OB 009A	340/342
COMPUTER OPERATIONS			
Console	- Shift Leaders	CB Hall	334
Reception Counter) Terminal Queries)	- Judy Herring	CB Hall	332
Operations Section Head	- Eric Walton	OB 002	349/351
Deputy Ops. Section Head	- Graham Holt	CB 023	307
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
	- Launo 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
Tape Requests	- Pauline Litchfield - George Stone	CB Hall	335/334
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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