European Centre
for Medium Range Weather Forecasts

TECHNICAL NEWSLETTER

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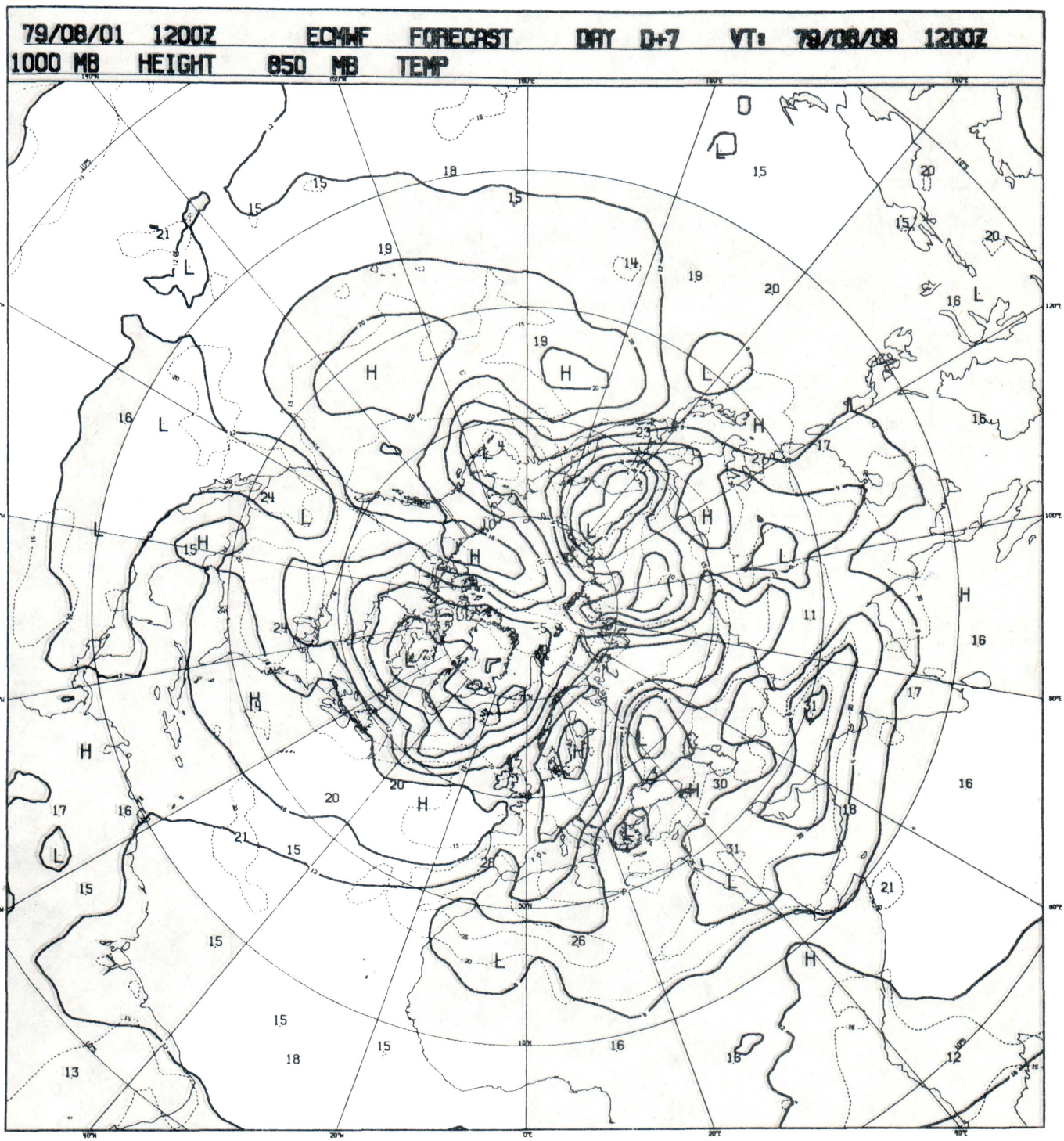
ECMWF LIBRARY



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

COVER: ECMWF's first operational forecast: A seven day forecast of 1000mb geopotential height (solid lines) and 850mb temperature (pecked lines), verifying on 8 August 1979 from 1 August 1979.

Map produced by the ECMWF contouring package.

This Newsletter is edited and produced by User Support for the Operations Department of ECMWF.

The next issue will appear in December.

ECMWF'S FIRST OPERATIONAL FORECAST

1 August 1979 was a very tense day for Centre staff. After many months of work, preparation and testing, the day had arrived for the first operational medium-range forecast to be made at the Centre and despatched in real-time to national meteorological services in Member States. The forecast was to be based on an initial state at 12 Z on the 1 August, and results as far as 7 days were to be made available to Member States.

Things started smoothly. Until the telecommunications system is fully operational the Centre is receiving its input observation data in raw GTS form, copied to magnetic tape by the United Kingdom Meteorological Office and brought across by car to the Centre. The tapes containing data from about 1800Z to 2400Z for 31 July and from 0000Z up to 1030Z on 1 August arrived on time and the data on them was decoded and quality controlled. Data assimilation cycles, analyses and initialisations were carried out during the course of the afternoon producing analysed states for 1200Z and 1800Z on the 31 July, and for 0000Z on the 1 August, all according to schedule.

During the evening, the tape from the Meteorological Office containing data for 1 August up to 1800Z arrived, and the data was decoded and quality controlled. The analyses for 0600Z and 1200Z on 1 August started ..... but then, inevitably perhaps, for these "first nights", computer system problems arose interfering with the progress of the forecast. By 0200Z, only the first day of the forecast had been completed, when by this time the seventh day should have been produced. The staff on duty were becoming worried that this the Centre's first operational forecast would be lost. The decision was then taken to dead-start the CRAY-1 with a different version of the CRAY operating system, and .... the problems disappeared. The forecast was restarted and, much to everyone's relief and sense of gratification, ran straight through without further problems. In this way were the Centre's first operational results produced, about four hours behind schedule, but nonetheless the forecast was accomplished as planned!

As witness to this and to mark this milestone in the Centre's work, on the front-cover of this month's Newsletter is shown the seven day forecast of the 1000mb geopotential height and 850mb temperature made from 1 August (i.e. verifying on 8 August 1979). In this brief account, I do not want to comment on how this forecast verified but just to show what the Centre is now capable of regularly producing.

Since the first troublesome night and delay in the forecast production, all has gone relatively smoothly and according to schedule. As planned, the Centre has carried out operational forecasts five nights a week (Mondays to Fridays). All the expected forecasts have so far been produced successfully with only very minor delays or hitches, but obviously I do not want to tempt fate by speaking too loudly .....

For the Centre, the start of medium-range operational forecasting in real-time on a regular basis has been a very important step. We recognise that there remain major objectives. Firstly there is the substantial task of learning more about the meteorological quality and characteristics of our forecasts, isolating shortcomings and systematic errors, in turn, hopefully, leading to improvements in the forecasts. There must also be continued development of the operational suite of programmes to full operational status and reliability.

R.L. Newson

THE PRESENTATION OF THE CENTRE'S PRODUCTS TO MEMBER STATES

Elsewhere in this Newsletter, the production of ECMWF's first operational forecast is described. This marked the start of the initial phase of operational activity at the Centre, with medium-range forecasts being carried out five days per week, the results being available to national forecasting services in Member States. With this in mind, it would seem appropriate to describe basically how and in what form results are distributed for use in Member States.

1. Means of distribution

It has been decided that the Centre's products will be distributed over a private network of dedicated communication links between the Centre and each Member State. Ultimately, all the links will be medium speed (i.e. operate at 2400 or 4800 bits per second), but for technical and economic reasons, the full medium speed network will be implemented gradually over the course of a few years, and a number of Member States will only have low speed connections to the Centre (operating at 50 or 100 bauds) to begin with. At the time of writing only a few Member States have low-speed connections. Thus, as an interim measure until the telecommunication network is more fully established, and to make the Centre's results, now being produced operationally, available to Member States (even though perhaps not in a useful real-time way), forecasts for an Atlantic-European area in chart form are despatched by mail as soon as possible the morning after the forecast is produced.

2. Format of product distribution

Despite the short term measure of despatching products in chart form mentioned above, once the telecommunication network is more fully established, products will be distributed only in a coded digital form over the network, essentially containing arrays of values at defined grid-points. Within this context, products are available in two basic format and code forms:

(i) a compact bit-oriented ECMWF message and code format specifically designed by the Centre for dissemination of its products

(ii) WMO message format containing an ECMWF version of the WMO GRID code.

(A hybrid form, WMO message format containing the ECMWF bit-oriented code, is also available). For the low-speed connections, products can only be distributed in the WMO form (in either CCITT Alphabet No.2 or 5); on medium-speed lines either the ECMWF form, the WMO form in Alphabet No. 5 or the hybrid form are available. The messages in the ECMWF format are identified by a unique six-digit catalogue number 'nnnnnn'; the messages in the WMO format, although having a fixed (WMO) catalogue number, each have a unique bulletin identifier, this identifier being a considerably generalised use of the WMO 'TTAAii' in the abbreviated heading. Full details of the formats and headings are given in Meteorological Bulletin, M3.1/1.

3. The versions of the codes used

The ECMWF code contains ECMWF products (and relevant identifying information) in purely binary form, the data being transmitted as a bit stream without separators between groups of data, lines or sections. The products are basically represented as the values of a parameter at an array of defined grid points, their values being scaled and coded as the difference between the value at that point and a reference value. The number of bits to represent this value is fixed for each grid-point contained in this message. There is also the possibility of representing a sparse data field (such as rainfall) by use of a mapping option, thus avoiding having to specify, for example, a large number of zero values. The ECMWF code also contains the option of representing data in a spectral form for either a global or hemispheric domain, the data stream in this case being a series of coefficients of spectral functions (for triangular truncation T40 or T80).

The version of the WMO GRID code used is a defined subset of the full version of the WMO GRID code (FM47-V), and in principle use of this code follows WMO regulations and guide-lines as far as possible. In the body of the code, each data group specifies the value at a grid-point (scaled and as a difference between

the parameter value at the grid-point and a standard value). There is a fixed number of digits for each grid-point in the message. The options of representing data-sparse fields in an economic way or providing data in spectral format are not available in the ECMWF subset of the WMO GRID code.

Full details of both the code forms are contained in Meteorological Bulletin, M3.2/1 - "Codes used in the dissemination of ECMWF numerical products".

4. The range and presentation of results to Member States

The forecasting model in use at ECMWF predicts the change of the fundamental variables on σ-surfaces (i.e. pressure surfaces normalised with respect to surface pressure) on a horizontal latitude/longitude grid with resolution currently $1.875^{\circ} \times 1.875^{\circ}$. The model σ-surfaces and horizontal resolution are likely to be changed relatively frequently. Therefore to insulate users of the products from these changes, and to get the results in a more usable form, at each 6 hour time interval the forecast data on σ-surfaces and the model's horizontal grid are transformed to a set number of standard pressure levels, and a standard horizontal latitude/longitude grid of $1\frac{1}{2}^{\circ} \times 1\frac{1}{2}^{\circ}$ (N.B. $1\frac{1}{2}^{\circ} \times 1\frac{1}{2}^{\circ}$ is used to allow for increase in the horizontal resolution of the model, and so that when this occurs as much of the model information as possible is retained). This standard vertical and horizontal resolution will be kept constant and, as far as possible, independent of the internal model changes. On this set of standard pressure levels (ranging from 1000 to 50mb), potentially all the basic meteorological parameters can be made available from the ECMWF forecasting system viz. wind or wind components, geopotential heights, relative humidity, temperature, vertical velocity. Additionally, a number of "two-dimensional" parameters such as surface pressure, surface temperature, accumulated precipitation, snow-cover, can also be selected. However only the parameters basically predicted by the model are available, and users must themselves compute such parameters as vorticity, dewpoint, instability indices etc. At the present time only a limited range of parametersis being distributed (geopotential heights and temperatures on standard pressure levels) until more experience is gained as to the meteorological quality of the other parameters. The range of parameters generally available will be extended early in 1980.

The range of products described above is generated theoretically for verifying times at 6 hour intervals for the whole of the forecast period. Again in this initial period of operational activity, the range of verifying times generally available has been limited to the seventh day of the forecast.

To assist users in the selection of products over geographical areas of interest to them, and to break large fields of grid points into manageable units for transmission to Member States over the telecommunications network (there are limits to the length of messages which can be transmitted, especially for products in WMO message format), a considerable number of standard geographical areas has been defined. For the basic latitude/longitude grid, there are sets of grid-points covering quadrants of the globe at resolution of $1\frac{1}{2}^{\circ} \times 1\frac{1}{2}^{\circ}$ and multiples thereof. There is also a need for products on a polar stereographic grid over the Northern hemisphere, and data at grid-points on the basic latitude/longitude grid is further transformed to values at points on such a polar stereographic grid of resolution 150 km at 60°N. The polar stereographic grid, overall covering the Northern hemisphere, has been divided into a number of standard sub-units (both at the base resolution of 150 km and multiples thereof). Bearing in mind that the model being used in the initial operational phase has a resolution 1.875°, the standard geographical areas are only being constructed at present for resolutions of 3° or more for latitude/longitude grids, or 300 km or more for polar stereographic grids.

Overall from the range of parameters and verifying times available, and the defined standard geographical areas, the user of the products just then has to select what exactly he wants - i.e. he has to specify the parameter and verifying time and to choose the geographical area or areas which most nearly cover their forecasting domain. At the same time the coded form in which he wishes to receive the data has to be specified.

For full details regarding the range of products and verifying times available from the ECMWF forecasting system and the full list of standard geographical areas (or sets of grid-points), please see Meteorological Bulletin M3.3/1 -"The presentation of ECMWF products to Member States." This document defines the full range of products verifying times and grid systems potentially available; the range of products actually available at a given phase of ECMWF's operation is described in Meteorological Bulletin M3.4/1 -"ECMWF current product catalogue".

R.L. Newson

MANTRAP WITH SEGMENTATION

As existing users of segmented programs (Cyber only) may be aware, MANTRAP is not supported with such programs. Even though it may be of limited assistance in certain cases it will certainly not be valid in general. It appears, from preliminary information received, that the CDC counterpart, Post-Mortem Dump (PMD) which is to be introduced at level 499, likewise will not be supported for segmented programs.

Hence, always ensure the separate parts of your program are first checked out individually, without segmentation wherever possible.

J. Greenaway

VECTOR SUMMATION

The summation of a short one-dimensional array on CRAY-1 is not very suitable for vectorisation.

```
      SUM = 0
      DO 10 I=1,192
   10 SUM = SUM + A(I)          (2.9 MFLOPS)
```

The standard vectorisation technique for this problem, as recommended in the CRAY-1 FORTRAN reference manual p.4-5, is:

```
      DO 10 L=1,64
   10 HELPER(I) = A(I)
      JS = 64
      DO 20 J=1,2
      DO 15 I=1,64
   15 HELPER(I) = HELPER(I)+A(I+JS)
   20 JS = JS + 64
      SUM = HELPER(1)
      DO 40 I=2,64
   40 SUM = SUM + HELPER(I)     (6.0 MFLOPS)
```

If the array length is known to be a multiple of smaller numbers, such as $192=3*4^3$, then a strategy becomes possible. The more elegant vectorization of the code is thus:

```
      I = 1
      J = 2
      K = 3
      DO 10 L=1,3
      14 = 4*1
CDIR$ IVDEP
      DO 20 M=1,189,14
   20 A(M) = A(M)+A(I+M)+A(J+M)+A(K+M)
      I = 14
      J = 4*J
   10 K = 4*K
      SUM = A(1)+A(65)+A(129)        (9.4 MFLOPS)
```

This sum is even more accurate. The proof is left to the reader....

Johannes H. Andersen

FOOTNOTE

There is an assembler coded function available to perform this operation. The above example would be coded as:

```
SUM = SIGMA(192,A,1)
```

and achieves an execution speed of 28.6 MFLOPS. The technique used is essentially similar in that 8 partial signs are accumulated in a vector register by means of the vector functional units recursive characteristic. However, SIGMA is able to obtain the argument array with only one vector load from memory for each 64 word segment and this load overlaps with computation. The Fortran example required 4 (shorter) vector loads.

David Dent

CYBER SCHEDULER *

Some further changes were made to the parameters in the Cyber scheduler based on observation of current workload patterns. As of the 1st August, the following is the situation for the class boundaries:

CP time : T20,T100,T400,T1000,T3000, over
(default T40)

CM size : CM60000, CM140000, CM320000, over
(default CM60000)

where all values are in octal.

As always we recommend you code realistic values of both T and CM for your jobs to ensure optimum turnround. Remember that 80% of all jobs use less than 20 (octal) seconds, therefore code T20 as much as possible.

J.L. Pepin

A CRAY ALIAS PROBLEM

Currently if an Alias exists for a file and then a RELEASE statement is used on the Alias name, that RELEASE will fail with a non-fatal error message:

"RLS COULD NOT FIND A DNT FOR dn" where dn is the dataset name.

This is regarded as a deficiency which has been notified to CRAY. Until this problem is fixed, care is necessary in the use of Aliases in multiple step jobs.

This was seen recently in an example brought to the Advisory Office. An ASSIGN statement was used to define an Alias for a file which was then used by several steps in a job, as follows:

```
ACCESS (DN=x,PDN=.....)
ASSIGN (DN=x,A=FT33)
LDR(--)  ----     READ(33)
  :
  :
RELEASE(DN=FT33)
  :
  :
LDR(--)  ----     WRITE(33)
```

J. Greenaway

HALF PRECISION FUNCTIONS FOR THE CRAY

Half precision vector versions of SQRT,EXP and ALOG have recently been obtained from Paul Dubois (Lawrence Livermore Laboratory). These will be made available later as alternatives to the standard library versions. They could be of interest where computational expense must be minimised and the full accuracy of the functions is not necessary.

Initial trials indicate the following characteristics:

	execution time	relative error
SQRTH :	64% of SQRT	0.1E-06 to 0.1E-04
ALOGHF:	48% of ALOG	0.2E-07 to 0.1E-05
EXPHF :	63% of EXP	0.1E-08 to 0.1E-04

David Dent

LIBRARY STATUS *

The following software libraries are currently available at ECMWF. Please note that those names marked * are being phased out and will be withdrawn from use by the end of 1979. Please change to the alternatives which will have similar contents (libraries have public ID's unless otherwise indicated).

1. CYBER

Library name	Old name	Contents
NAGLIB (system library - need not be attached)		NAG library (Mark 6)
ECLIB	*ECMWF,ID=EWP3	ECMWF routines
VARLIB	*VARIANLIB,ID=EWPLOT	Graphics
TEKLIB		
CONTLIB	*NEWCONTLIB,ID=EWPLOT	
CERNLIB		CERN program library
PROCIN		Procedure library

2. CRAY

Library name	Old name	Contents
NAGLIB		NAG library (Mark 6)
NCARLIB		NCAR library-only on Cray
ECLIB	*ECMWFLIB,ID=DUMPOO *CONVLIB	ECMWF routines data conversion routines
$SCILIB	*CRAYLIB	see below

*SCILIB is supplied by Cray Research and contains the following mathematical and utility functions:

MXMA	Matrix multiply
MINV	Matrix inversion
CFFT2, RCFFT2, CRFFT2	Fast Fourier transform
SNRM2, SCNRM2	$\sqrt{(X_1^2 + X_2^2 + - - + X_n^2)}$
SROT, SROTG, SROTMG, SROTM	Modified Givens rotation
ISAMAX, ICAMAX	Finds element of vector having largest abs. value.
SASUM, SCASUM	Sums the absolute values of the elements of a vector
SDOT, CDOT	Scalar product
SGCAL, CSSCAL, CSCAL	Scales a vector by a scalar
SSWAP, CSWAP	interchanges 2 vectors
SCOPY, CCOPY	copies a vector
SAXPY, CAXPY	y = A*X+Y
PACK, UNPACK	bit manipulation

Users of MXM in $SCILIB (CRAYLIB) — Please note that it has changed its name to MXMA. There will be a similar routine called MXM in the next release of $SCILIB (1.06) (with a simplified calling sequence).

David Dent

NAG LIBRARY DEVELOPMENTS

Documentation for the next release of NAG (Mark 7) has been received and we expect to be sent the Cyber implementation shortly. There will be a much longer delay before the Mark 7 version becomes available on the Cray. The following is an extract from the NAG newsletter and outlines the new facilities. We would be interested to hear if any of the new routines are particularly useful to ECMWF users.

THE MARK 7 FORTRAN LIBRARY

"The Mark 7 FORTRAN update was distributed to implementors for machine-range testing earlier this year. It is another large extension to the Library, comprising 82 new routines.

Of these, 23 routines are additions to the D02 chapter to provide a wide variety of facilities for the solution to the initial value problem. They fall into 3 groups: those based upon a Runge-Kutta-Merson method, those based upon Gear-3 operating in an Adams mode, and those based upon Gear-3 operating in a 'stiff'mode. Within each group facilities are provided to simply integrate over a range, to integrate over a range with intermediate output, to integrate until a specified component attains a given value and to integrate until a function of the solution is zero. In addition to this, routines are provided which perform a stiffness check and routines which allow interpolation between solution values. Two useful routines, outside this set, solve a regular and a general second-order Sturm-Liouville eigenvalue problem using a scaled Prüfer method.

The E04 chapter continues to develop. At this mark, 10 new routines have been added to address the unconstrained non-linear least-squares problem.

In response to user-requests, routines have been provided in the E02, Curve and Surface Fitting chapter, to evaluate a cubic spline, its first 3 derivations and its definite integral from its B-spline representation. Six other routines are provided in this chapter; 2 on surface fitting, 2 on fitting in the ℓ_1 -norm and 2 on Padé approximation.

There are 21 new linear algebra routines, the most significant being new sparse matrix routines, routines to work efficiently in a paged environment and routines employing Crawfords method to solve the generalised eigenvalue problem $A\underline{x} = \lambda B\underline{x}$ where A and B are symmetric band matrices and B is positive definite.

The G01 chapter, Simple Calculations on Statistical Data, has been increased by 6 new routines which calculate statistical distribution functions. A new routine has also been added to the G02, Correlation and Regression Analysis, chapter.

Significantly a new chapter, D03, devoted to Partial Differential Equations, starts at Mark 7. It contains 4 routines; 1 solving Laplaces equation using an integral equation method, 2 applying Stone's strongly implicit method for the solution of simultaneous algebraic equations and 1 routine which places a triangular mesh over a 2-dimensional region.

The update is completed by 3 new quadrature routines (one a Monte-Carlo routine for multi-dimensional quadrature), a root finding routine, a routine to calculate Dawson's integral and 4 new X routines.

Two of the X routines are significant in that they are used to control error and diagnostic information which for the first time will be printed directly from NAG routines. This change in policy is reflected in an enhanced version of the error routine, P01AAF. The majority of routines will remain unaltered and users can continue to use the IFAIL mechanism as before. In fact, at Mark 7, only the new sparse matrix routines are affected by this development."

LOOKING AHEAD TO MARK 8

"One of our constant problems in developing the Library is to keep a balance within the Library; strong chapters tend to get stronger whilst weaker chapters tend to languish. Mark 8 should see us addressing this problem more seriously.

New material should be available for the D01 quadrature chapter and new fastFourier Transform routines are expected for the C06 chapter. Our efforts to improve the statistical coverage of the Library will see the first of several routines to address 'Time Series' placed in the Library. Parabolic routines are expected in the partial differential equations chapter and new boundary value code is intended for the D02, ordinary differential equations chapter. Hopefully the H and C05 chapters will see new material based upon developments in the E04 chapter. Similarly the E01 chapter may benefit from the improvements to the E02 chapter and simple driver-routines may be placed in the former to call E02 routines.

The major development at Mark 8 will undoubtedly be the creation of a Graphics Supplement to the Library. All sites should have received a questionnaire and a description of our plans in this area. The idea is to provide high-level routines which will interface with the user's own graphics package and which will complement the existing routines within the NAG Library. Response to our questionnaire has been heartening and it looks as though the considerable effort of this enterprise will be well worthwhile."

David Dent

GRAPHICS SOFTWARE - NEW LIBRARIES *

New versions of the Graphics Software are available and should be used as follows:

```
ATTACH,CONTLIB.
ATTACH,VARLIB.
ATTACH,ECLIB.
ATTACH,CERNLIB.
LDSET,LIB=CONTLIB/VARLIB/ECLIB/CERNLIB.
LGO.
```

All libraries are stored under PUBLIC ID's and are multi-read access; consequently no ID or "MR=1" is required on the ATTACH card. The order of the libraries is important and should be as shown. ECLIB is needed for disposing raster files to the plotter and CERNLIB is used for some utility routines.

For the Tektronix the load sequence is:

```
ATTACH,CONTLIB.
ATTACH,TEKLIB.
ATTACH,CERNLIB.
LDSET,LIB=CONTLIB/TEKLIB/CERNLIB.
LGO.
```

Users are requested to use these libraries in place of the old libraries (NEWCONTLIB and VARIANLIB) as soon as possible. All future maintenance will be on the new libraries only, and it is planned to purge the old libraries by the end of the year.

A new coastline data base is also available as mentioned in the June Newsletter (newsletter No.3 pages 23-25). Note that this data base is independent of the release of the new libraries and can be used with either the new or old libraries.

```
ATTACH,TAPE90,COASTLINES.
```

A new edition of the Contouring Package Users Guide will soon be printed, but meanwhile the changes have been documented in internal memo 5.2 of 10.5.79 and memo 5.2 of 9.7.79.

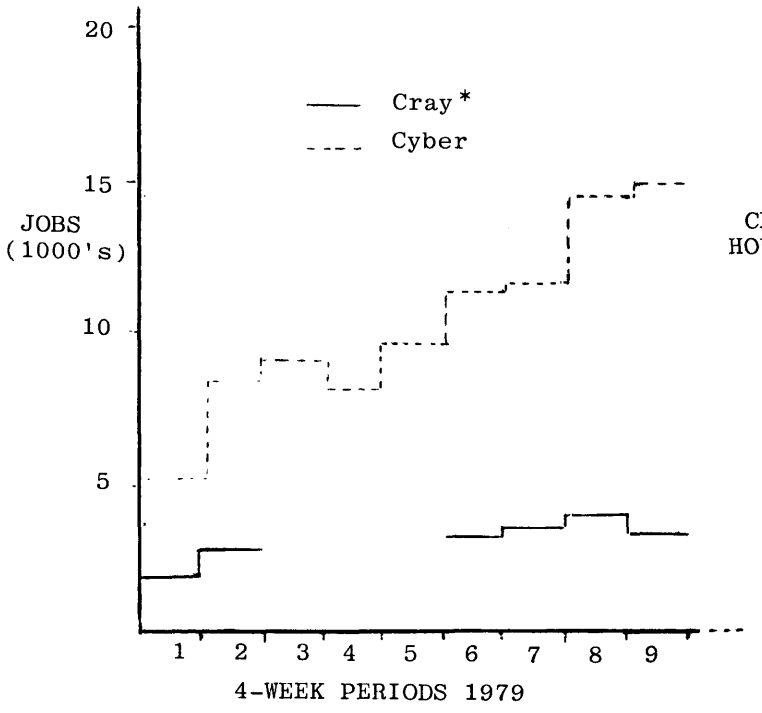
Any user experiencing problems in the changeover from the old to the new software should contact us as soon as possible.

A. Lemaire
H. Watkins

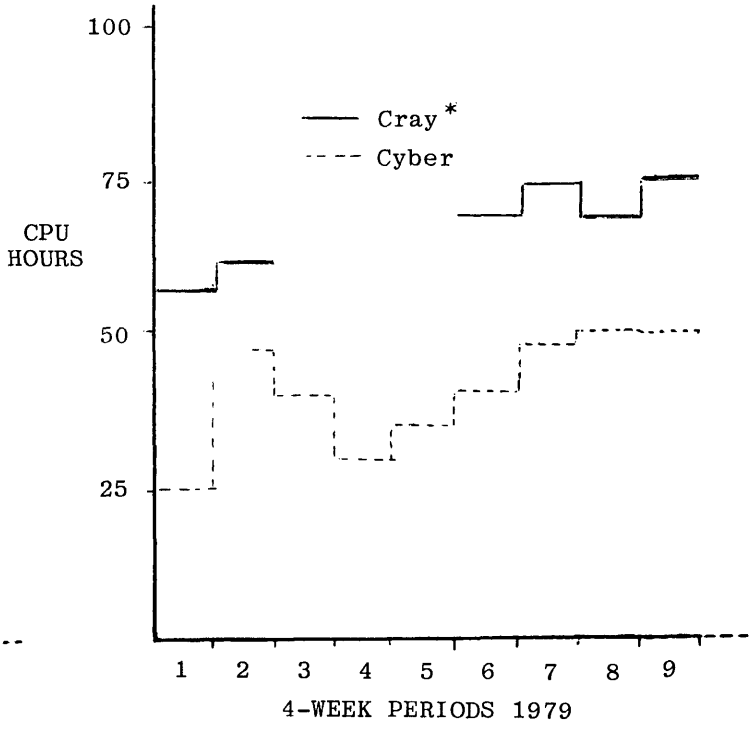
STATISTICS

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.

Average number of jobs per week within each period



Average CPU hours used per week within each period



* CRAY statistics for periods 3, 4 and 5 are not yet available.

DOCUMENTATION *

Reference sets of manuals were distributed to Member States in July and we are now hoping to hear from Computing Representatives who have not yet contacted us of their parcels' safe arrival.

Copies of the External Reference Specification (ERS) of the ECMWF Front End Subsystem have been added to Centre reference sets. There are a few spare copies available should any Centre staff require individual copies.

A revised version of Computer Bulletin B2.7/1(2) (Cyber-Cray job Transmission and File Staging) was distributed.

Both the Front End subsystem ERS and the revised Bulletin B2.7/1(2) will be despatched to Member States in the near future.

Pam Prior

STILL VALID NEWS SHEETS

Below is a list of News Sheets that still contain some valid information that has not been incorporated into the Bulletin set (up to News Sheet 62). 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 & program termination
17	Private packs and interactive jobs
19	CRAY UPDATE (temporary datasets used)
23	Cyber PF space control
31	Fortran callable tape REQUEST
37	IN trays for Cray & Cyber jobs
42	Cyber scheduler (see News Sheet 48 also)
43	Cray AUDIT
	Transfer of coded files
45	DISPOSE - WAIT (see News Sheet 50 also)
47	Libraries on the Cray-1
48	ECMWF Cyber Scheduling (see News Sheet 42 also)
50	DISPOSE - WAIT becomes the default (see News Sheet 45 also)
	8 disc CRAY system
	Terminal procedure
51	Cyber disk reconfiguration
53	Cyber job card priority usage
	Writing 6250bpi 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)

News Sheets which can now be thrown away since this list was last published are numbers 22, 58, 60, 61 and 62.

Andrew Lea

A KEY TO SCIENTIFIC RESEARCH

WHAT HE SAID	WHAT HE MEANT
It has long been known that	I haven't bothered to look up the original reference but....
Of great importance and theoretical significance....	Interesting to me
Three of the examples were chosen for detailed study	The rest of the others didn't make sense
Typical results are shown.....	The best results are shown...
It is suggested that... it is believed that... it may be that.....	I think
It is generally believed that	A couple of other guys think so too.

Acknowledgement to: Milton Hodge, Univ. of Georgia
from 'The American Psychologist'

INDEX

INDEX of Still Valid Newsletter Articles

This is an index of the major articles published in this ECMWF Technical Newsletter series, plus those in the original ECMWF Computer Newsletter series. Articles in the original series which are still valid will eventually all be reprinted in this Technical Newsletter, making the Computer Newsletter then obsolete. Currently, Computer Newsletter numbers 1 to 10 can be thrown away. Some back copies of Computer Newsletter number 11 are still available, please apply to Mrs. P. Prior (ext. 355).

As one goes back in time, some points in these articles may no longer be accurate. When in doubt, contact the author, or User Support.

	Newsletter No.*	Date	Page
CRAY-1			
Audit of permanent files	1	Feb. '79	15
Computer - Architecture	2	April '79	10
	3	June '79	10
	4	August '79	8
- Configuration	1	Feb. '79	11
File transfer to a named device	2	April '79	14
Libraries - CRAY	5	Oct. '79	6
- NAG	2	April '79	15
- Public Libraries	5	Oct. '79	6
Software - Level 1.05 of COS	3	June '79	5
- Level 1.05 of CFT and DEBUG	3	June '79	6
UPDATE - advice for users	1	Feb. '79	16
CYBER 175			
Computer configuration	1	Feb. '79	11
Disks - (844-41, double density)	3	June '79	17
- recent changes	3	June '79	15
- short term file storage (SN=TEMP)	3	June '79	16
- use of private packs	2	April '79	24
Libraries - NAG	C11	Nov. '78	14
	5	Oct. '79	7
- Public Libraries	5	Oct. '79	6
INTERCOM Procedure Library	3	June '79	18
Jobs - hints on processing	2	April '79	23
- scheduling	5	Oct. '79	5
LIMIT control card	3	June '79	17
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		Room*	Ext.**
ADVISORY OFFICE Open 9-12,14-17 daily		CB 037	308/309
Computer Division Head	- Rob Brinkhuysen	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 Officer	- Pam Prior	OB 016	355
Libraries (ECMWF,NAG,CERN, etc.)	- John Greenaway	OB 017	354
METEOROLOGICAL DIVISION			
Division Head	- Roger Newson	OB 008	343
Operations Section Head	- Austin Woods	OB 107	406
Applications Section Head	- Joel Martellet	OB 011	360
Meteorological Analysts	- Ove Akesson	OB 106	380
	- Horst Böttger	OB 104A	378
	- Rauno Nieminen	OB 104A	378
	- Herbert Pumpel	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
Tape Requests	- Pauline Litchfield - George Stone	CB Hall	335/334
User Support Section Head	- Andrew Lea	OB 003	348

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* CB - Computer Block
OB - Office Block

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