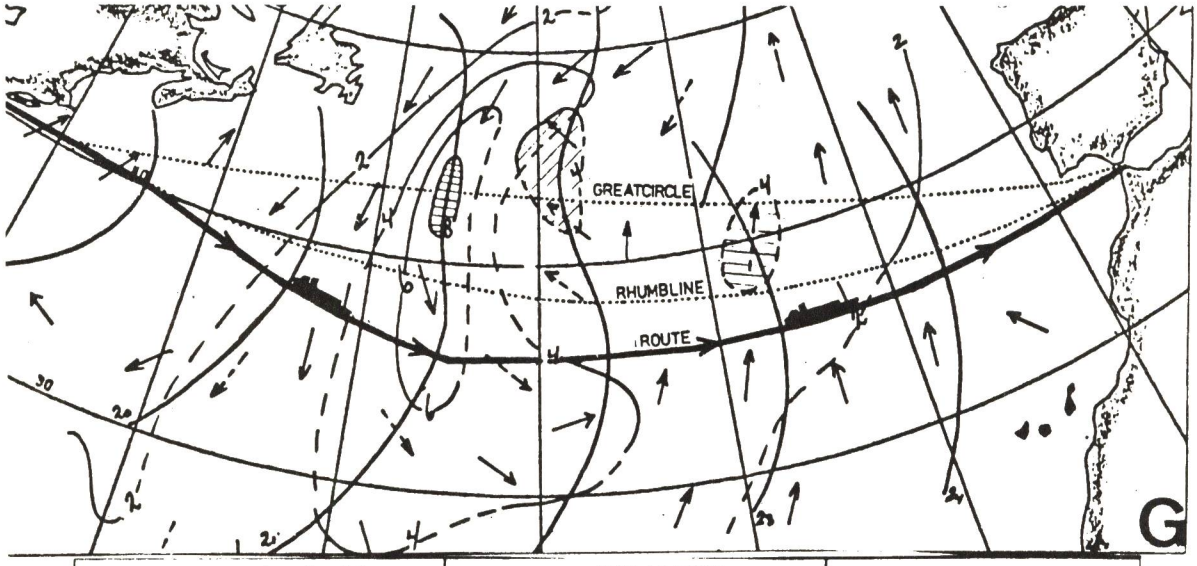
European Centre
for Medium Range Weather Forecasts

ECMWF NEWSLETTER

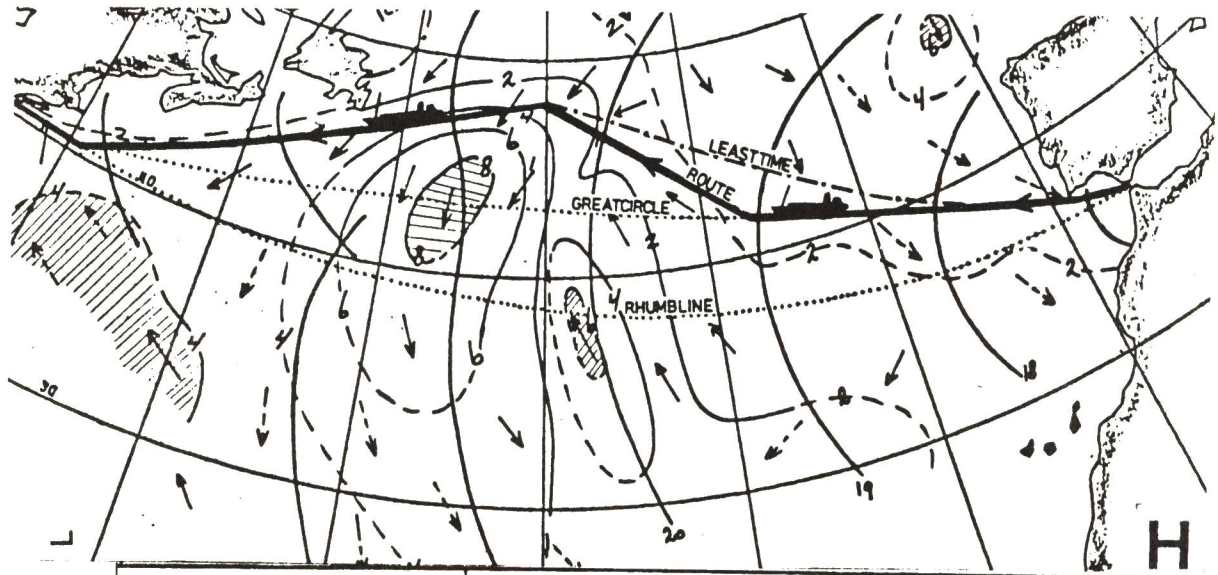
NOT TO BE TAKEN AWAY

Shinfield Park, Reading, Berkshire RG2 9AX, England Reading (07

Number 10 - August 1981



EVALUATION CHART	EXPLANATION	RESULTS
R 8256 MS "Nellloya Rochester"	→DIRECTION } SEA ---→DIRECTION } SWELL	ROUTE ∽ LEASTTIME
FROM New York TO Port Said	-3- HEIGHT (metres) -3-- HEIGHT (metres)	GREATCIRCLE — LEASTTIME ∽ 8 Hrs
DATE February 18-25 1981	LIMITS OF ALL KNOWN ICE	RHUMBLINE — LEASTTIME ∽ 3 Hrs
	))) OR (((12.00 GMT TIME FRONTS WITH DATE	



EVALUATION CHART	EXPLANATION	RESULTS
R 8255 MS "Nellloya Rotterdam"	→DIRECTION } SEA ---→DIRECTION } SWELL	ROUTE — LEASTTIME ∽ 2 Hrs
FROM Gibraltar TO New York	-3- HEIGHT (metres) -3-- HEIGHT (metres)	GREATCIRCLE — LEASTTIME ∽ 12 Hrs
DATE February 17-24 1981	LIMITS OF ALL KNOWN ICE	RHUMBLINE — LEASTTIME ∽ 12 Hrs
	))) OR (((12.00 GMT TIME FRONTS WITH DATE	

IN THIS ISSUE:

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

COVER: Evaluation charts of the crossings of two ships (from Gibraltar to New York and New York to Gibraltar, respectively), which had been weather routed using ECMWF forecast surface charts. See article on P.3 for full details.

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

The next issue will appear in October.

THE THIRD SESSION OF THE TECHNICAL ADVISORY COMMITTEE

The ECMWF Technical Advisory Committee held its third session at the ECMWF Headquarters Shinfield, 9-12 June 1981 under the continuing Chairmanship of Mr. J. Lepas (France).

The most important item on the agenda of the session was the consideration of the Centre's proposals regarding its technical activity and development of technical facilities contained in the Draft Budget for 1982 and the four year Plan of Activities for 1982-85, including the overall strategy for provision of computer resources for the period 1982-85 and beyond. The Committee basically agreed with the Centre's plans, particularly the provision of increasing amounts of extra "number-crunching" resources over the period 1982-85. In supporting this aspect, the Committee recognised that developments to improve the Centre's operational products (especially in the range of 6-7 days) considered by the Committee to be of the greatest importance, would require substantial extra computing resources. The conclusions of the Scientific Advisory Committee, that a successful implementation of the research programme would need considerably expanded resources, were naturally also taken into account.

The Committee also supported the Centre's plans for development of improved data storage and handling facilities and a "data highway" project over the period 1983-85. This would involve a means of storage and data handling with sufficient capacity and fast enough access characteristics to permit convenient retrieval of varying cross-sections of considerable amounts of data, a computer controlling this means of storage, and a high speed data highway connecting present (and future) computers in the Centre to the data storage and handling facility. The Committee emphasised the importance of the "data highway" aspect in providing future flexibility in the Centre's computer configuration. Also in relation to the development of the Centre's technical facilities, during the session the Committee was given a demonstration of the Centre's recently acquired AYDIN colour raster device. The Committee expressed its appreciation of this demonstration, and encouraged further tests and developments of the system, oriented towards eventual use operationally.

It is not possible at present to give further detail regarding the planned implementation of the projects indicated above, as the Draft Budget for 1982 and the four year Plan of Activities have also to be considered at the next two sessions of the Finance Committee, before being submitted to Council for final approval at its 14th session in November.

On other matters, during the session the Committee considered the report of the second Annual Meeting of Forecasters (see Article in June Newsletter). The Committee also learnt of the latest results available from the Numerical Weather Prediction Inter-comparison project, proposed by the Commission of Atmospheric Sciences Working Group on Weather Prediction Research, and being carried out by the Finnish Meteorological Institute. These results show that the Centre's forecasts at three days as verified by objective measures such as standard deviations and anomaly correlation coefficients were notably superior to the other three day forecasts and that the Centre's more recent forecasts show a higher degree of skill than those made one year previously.

The Committee also considered the needs for liaison and exchange of information between the Centre and Member States in evaluation, and uses and interpretations, of the Centre's forecasts, and also the desirability of co-operation between the Centre and Member States in the interpretation of the Centre's medium range products. The Committee recommended, on the basis of a joint proposal from two Member States, the establishment of a Working Group on ECMWF products and their interpretation, particular tasks to be undertaken being:

i) methods of using and interpreting the Centre's products
ii) product development
iii) co-ordination of requirements for the range of data disseminated from the Centre's forecasting system to Member States in terms of parameters, standard levels, grids, etc.

The Committee requested Dr. A. Baede (the Netherlands' delegate) to undertake responsibility for initiating the work of the group.

The Committee dealt with its annually recurring tasks of recommending an updated schedule for the implementation of the remaining medium speed circuits in the telecommunications network linking the Centre and Member States, and the allocation of computer resources between Member States in 1982, taking into account the rules established by Council in this matter.

It is not possible fully to report here all the results of the four day committee session. However, overall, the third session of the Technical Advisory Committee was highly constructive and successful, and many useful comments and recommendations in relation to the Centre's operational activity were made. The fourth session of the Technical Advisory Committee is planned for June 1982.

- Roger Newson

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THE APPLICATION OF ECMWF FORECASTS TO WEATHER-ROUTING OF SHIPS

Introduction

The Royal Netherlands Meteorological Institute (KNMI) has been engaged in weather-routing of ships since 1959, and about 8,500 crossings have been weather-routed using surface weather patterns, subjectively derived from the best available 500mb charts, as guidance.

Now, however, ECMWF forecast surface charts are used, allowing the procedure to become more objective. This article illustrates the use of ECMWF forecasts by following the voyages of two vessels which were actually routed according to the Centre's forecasts during last February, viz:

the "Nedlloyd Rotterdam" from Gibraltar to New York sailing Feb. 17, and
the "Nedlloyd Rochester" from New York to Gibraltar sailing Feb. 18

These vessels are large container-ships which take approximately 7 days to complete the crossing.

Experience with these vessels has shown that they should avoid beam-waves >6 metres in order to prevent damage to the cargo and to the ship due to excessive rolling.

In weather-routing several nautical terms are frequently used, viz:

great circle	= shortest distance between two points on the earth's surface
rhumb line	= line running south of the great circle (on the northern hemisphere) making equal angles with the successive meridians
least-time route	= a theoretical route via which the vessel reaches its destination in the quickest possible time; this route is graphically constructed after the ship has arrived and all wave-conditions are known.

The Forecast

During the morning of February 19th, advice was transmitted to both ships based on the Centre's 1000mb progs of 1200 GMT February 18th. The charts A - D show the forecast developments on the North Atlantic from D+1 to D+4. The most important phenomena are a slowly northward moving low near 30N 40W and a high moving east from Labrador. In the charts the ships' positions have been inserted on the recommended routes at the corresponding time. The low is expected to become almost stationary near 40N 40W by D+3 (see chart C). At that time, a high will have developed over Newfoundland and a very high northerly wavefield will be generated on the west flank of the low along longitude 50W.

It is obvious that if no evasive action were taken both vessels, following the great circle route, would pass through this dangerous wavefield. In order to avoid damage, the westbound vessel was advised to deviate to the north (48N 40W) to pass north of the high waves with mainly following waves (extra mileage about 110 nm). The eastbound vessel was recommended to deviate to the south taking the waves from the quarter (extra mileage about 135 nm) and avoiding SE-ly seas and swells later.

The charts E and F show the actual weather and wave-analysis at 1200 GMT Feb. 21st and should be compared with chart C. The resemblance is striking, although the low actually is deeper than forecast. Both vessels have successfully avoided the high beam waves.

The charts G and H shown on the cover of the Newsletter, are the evaluation charts of the entire crossing showing the actual wave-conditions along alternative routes. The least-time route has been constructed with the aid of a diagram in which the relation between wave-height and speed is given. Differences in steaming-time between the least-time route and the other routes have been computed. Chart G shows that the eastbound route followed corresponds to the least-time route.

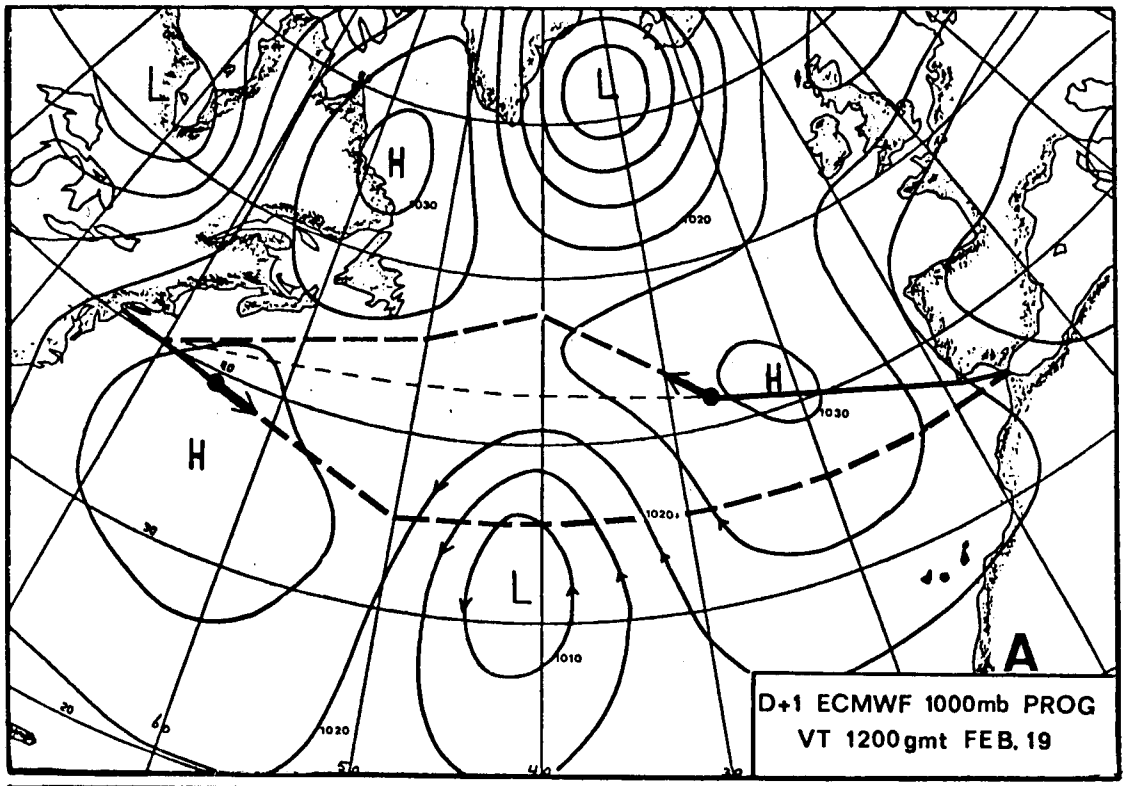
Chart H shows that a further two hours would have been saved by the west-bound ship if the deviation to 48N 40W had been advised one day earlier.

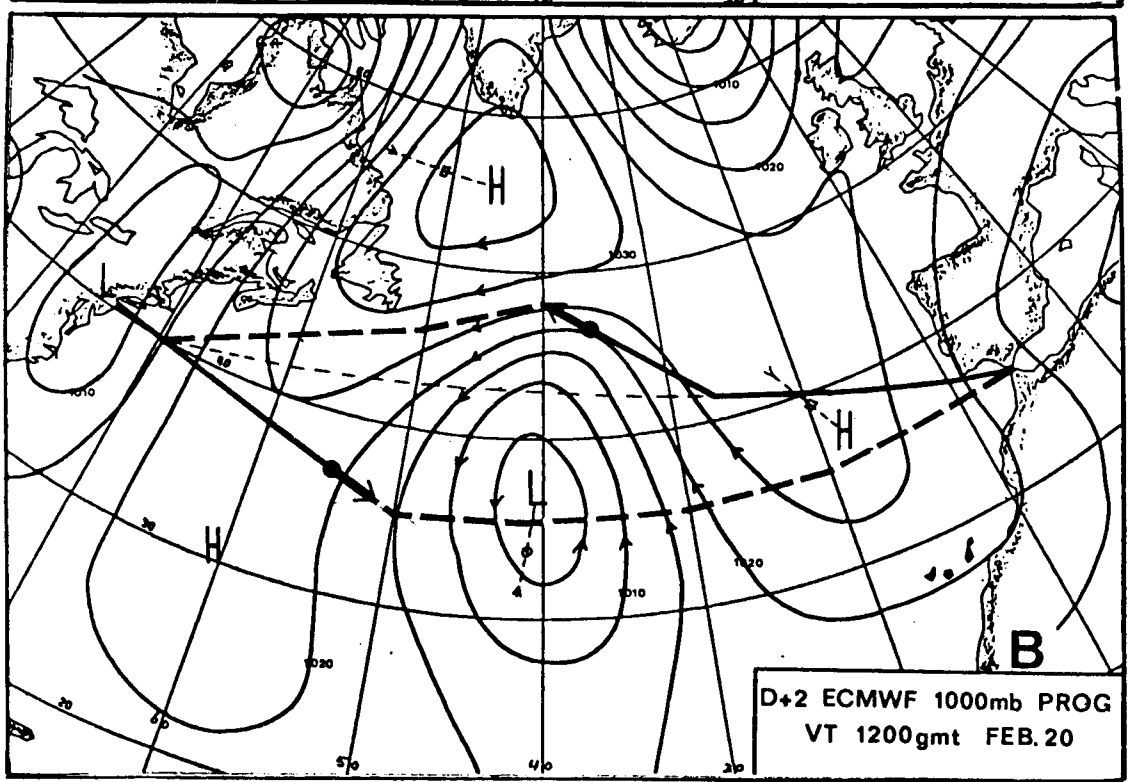
The series of charts shows that with the aid of the Centre's forecasts the vessels make a detour of 6-7 hours and arrive about 12 hours earlier than on the shortest route, without damage, and with a satisfied master.

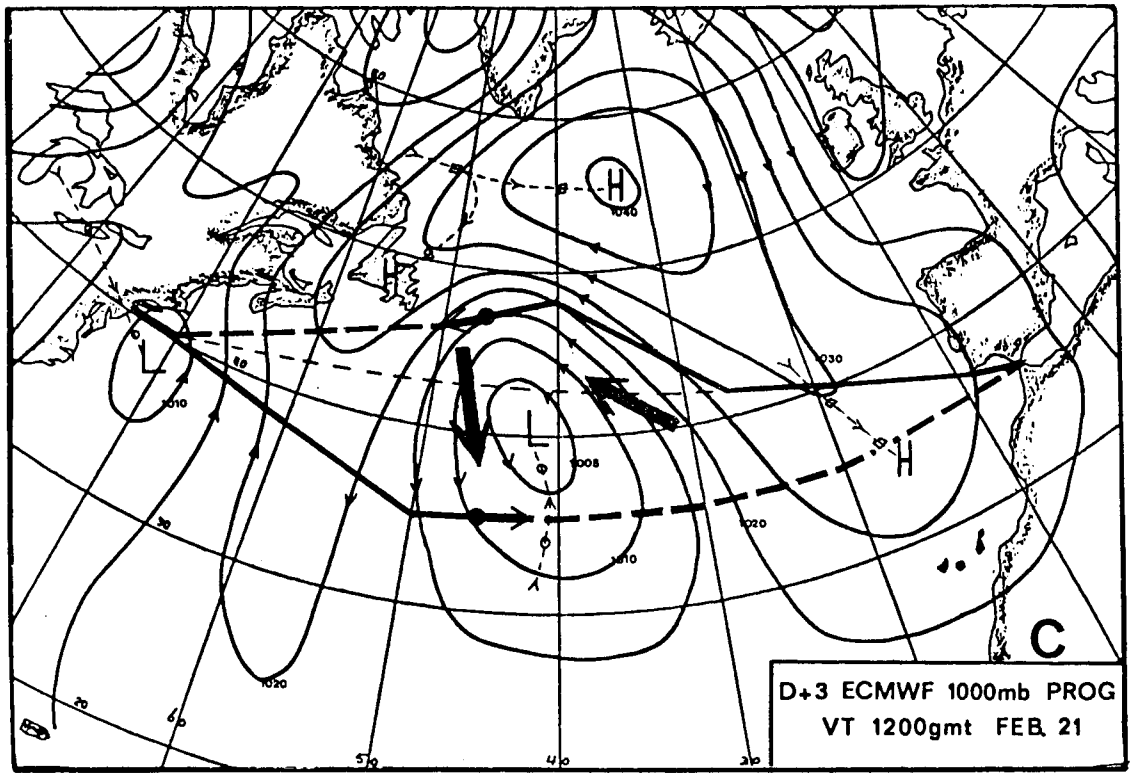
The Future

The K.N.M.I. has available a very sophisticated program for computing a least-time route with the aid of forecast wavefields and a wave-height/speed diagram. With a computer model, the predicted 1000mb wind field can be converted into wave-height (taking into account the fetch and duration). By executing this procedure as a daily routine, the overall least-time will be approximated closely and the results of weather-routing will certainly improve.

- D. Heijboer
Koninklijk Nederlands Meteorologisch Inst.



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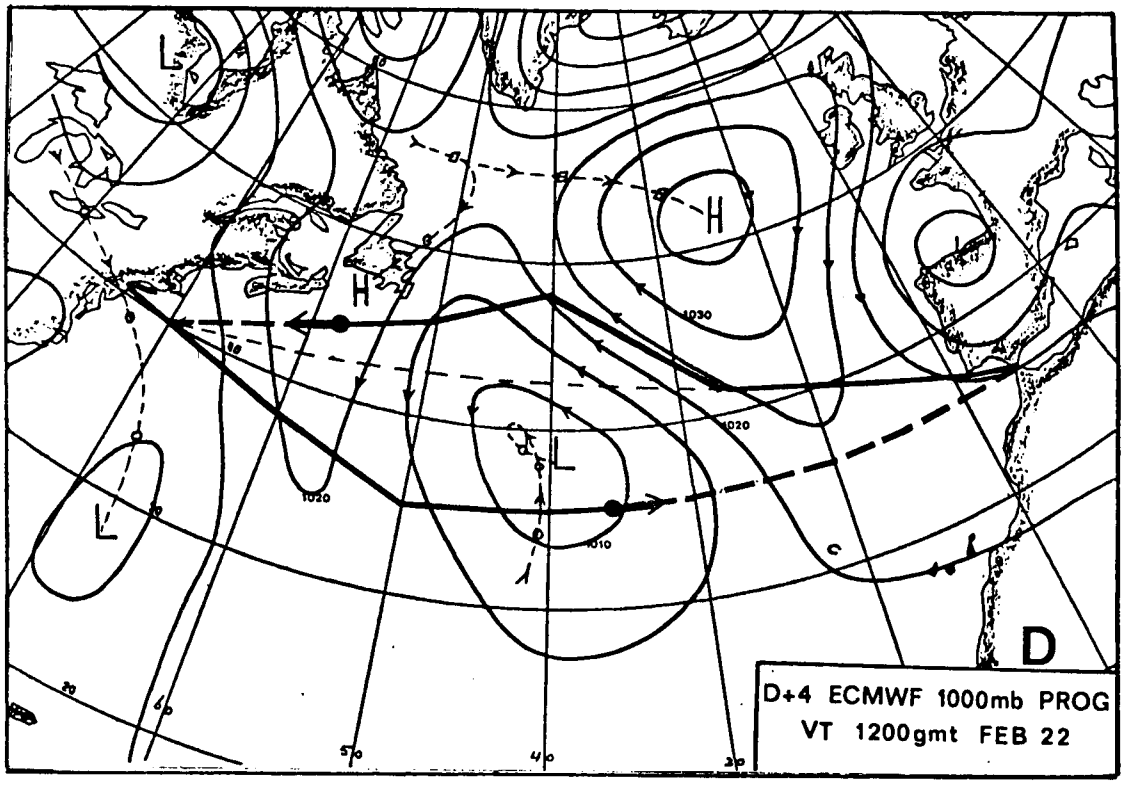
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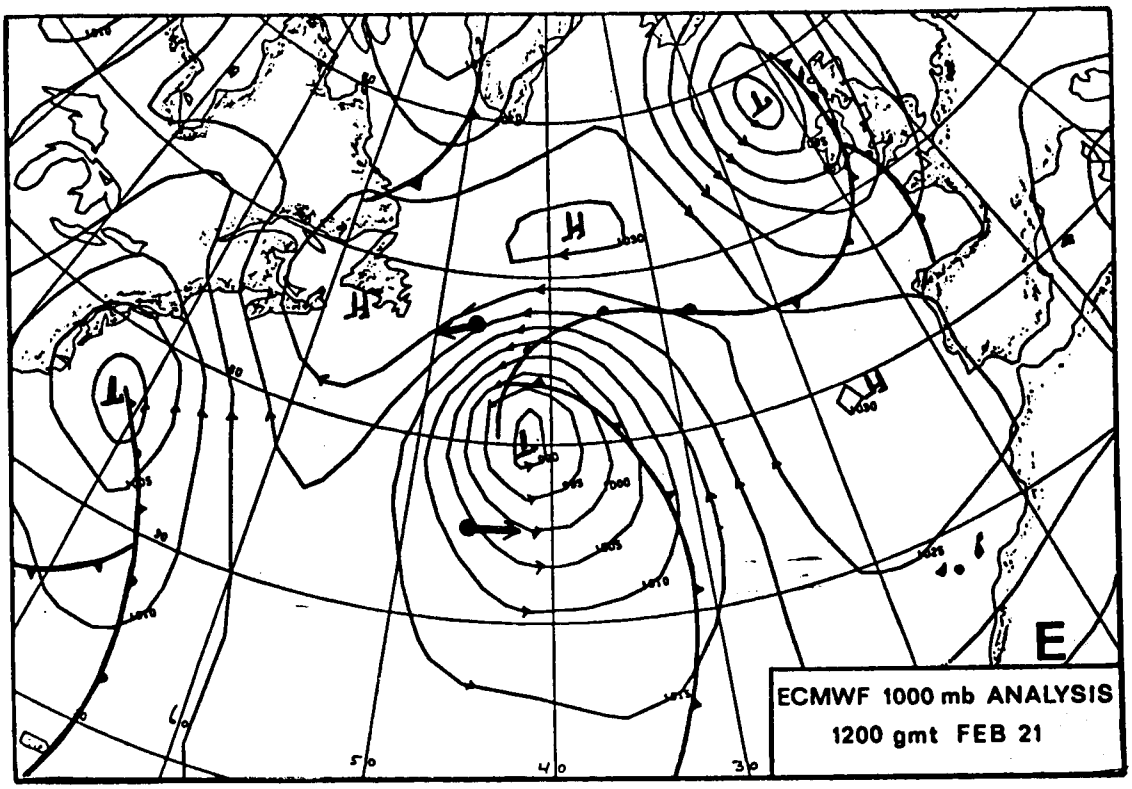
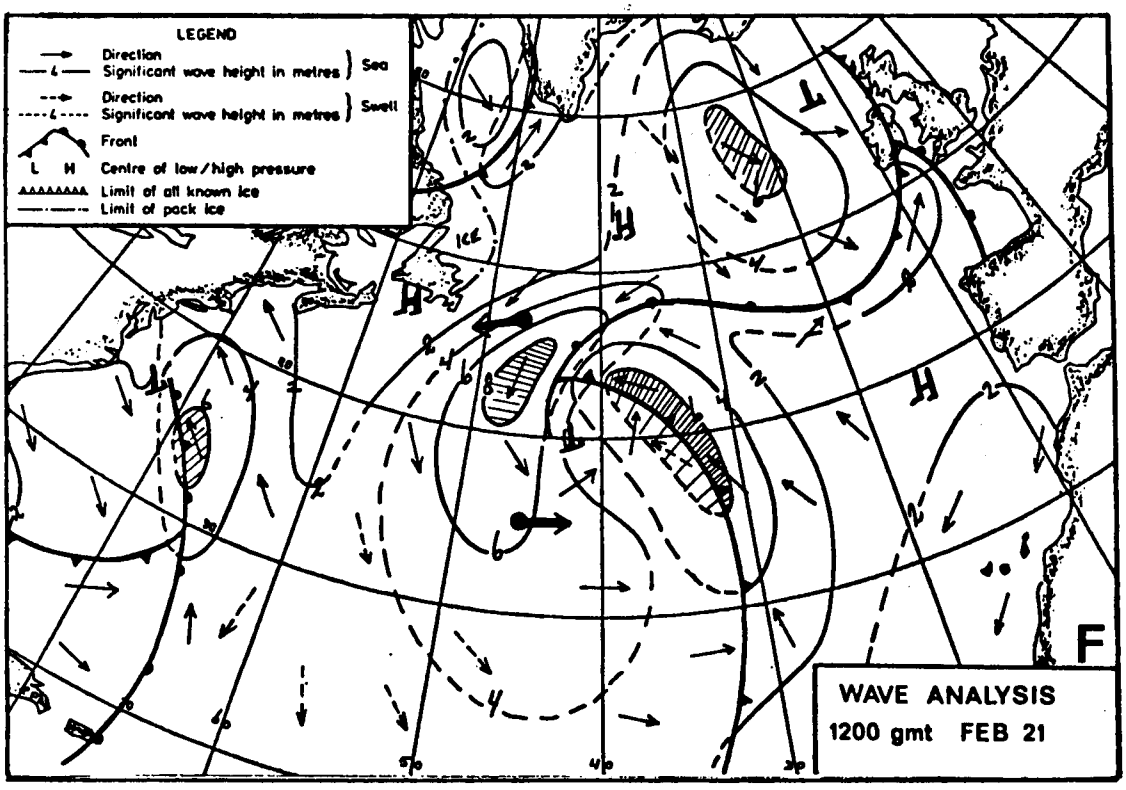

E
ECMWF 1000 mb ANALYSIS
1200 gmt FEB 21


LEGEND
Direction
Significant wave height in metres
Sea
Direction
Significant wave height in metres
Swell
Front
L H Centre of low/high pressure
Limit of all known ice
Limit of pack ice
ICE
F
WAVE ANALYSIS
1200 gmt FEB 21

METEOROLOGICAL TRAINING AND EDUCATION ACTIVITIES AT ECMWF

The meteorological training and education program at ECMWF consists of a set of courses and a seminar series intended for meteorologists in the Member States. The Meteorological Training Course, which takes place once every year, is divided into three spearate parts which last from two weeks to one month each. The subject of the course is basic dynamic meteorology and numerical weather prediction, some parts of it concentrating on the ECMWF forecasting system. The ECMWF seminars are held once each year and normally last for one week. They concentrate on a particular subject in the general area of meteorology and numerical weather prediction and are attended by 40-50 Member State meteorologists each year.

The contents of the Meteorological Training Course are almost unchanged from year to year, only slight alterations are made to adapt the course to changes in the ECMWF forecasting system and to correct planning mistakes. The course is divided into the following three parts:

1.	Basic dynamic meteorology	1 month
2.	Theoretical presentation of the ECMWF forecasting system.	2 weeks
3.	Operational aspects of the ECMWF forecasting system.	2 weeks

The first part covers all areas of basic meteorology which are relevant to numerical weather prediction. The ECMWF lecture notes are used as course literature and the course includes both lectures and exercises. The second part gives an in-depth theoretical description of the various components of the ECMWF forecasting model and data assimilation system. Both the theoretical concepts underlying the model formulations and programming aspects are taken up. Documentation manuals of the ECMWF forecasting system and reports published by ECMWF are used as course literature. The third part of the course concentrates more on the operational aspects of the ECMWF forecasting system and the phenomenological behaviour of the ECMWF model. This part of the course is mainly intended for "bench forecasters" who will use output from the ECMWF model in their daily forecasting job. Both lectures and practical exercises are included to familiarise the participants with the products available from the ECMWF model. Each part of the training course is normally attended by around 10 participants coming both from Member States universities and meteorological services. Only a few of the participants attend all three parts of the course, most seem to settle for one or perhaps two parts.

The Seminars have a slightly different purpose from that of the Training Course. They only last for one week and the number of participants is much larger for the Seminars than for the Training Course. Each Seminar concentrates on one specific subject and both basic and advanced lectures on that subject are given. Lecturers come from ECMWF and meteorological research institutes all over the world. Normally, the budget permits about five invited lecturers. The seminars take place in September and this year they will be devoted to "Problems and prospects in long and medium range weather forecasting". Since the start of the ECMWF Seminars in 1975, they have had the following titles:

1975	Scientific foundation of medium range weather forecasts.
1976	The treatment of the boundary layer in numerical weather prediction.
1977	The parameterisation of the processes in the free atmosphere.
1978	The interpretation and use of large-scale numerical forecast products.
1979	Dynamical meteorology and numerical weather prediction.
1980	Data assimilation methods.

All of the lectures given during the seminars are written up and the proceedings are published by ECMWF.

Announcements about the Seminars and the Training Courses are sent out to Member State Meteorological Services and other meteorological research institutes well in advance of the event. Because of the difficult accommodation situation in Reading, applications for participation have to be sent to ECMWF a few months before the start of each course. The application deadline for the 1981 Seminars has already passed (1 June 1981), but we welcome you to apply to take part in any of the 1982 courses!

- Erland Källén

DAILY FORECAST COMPLETION TIMES

The suite of jobs comprising the nightly operational forecast is very large, and on average consists of more than 300 Cyber jobs and 150 Cray jobs each 24 hours. The scheduling of these is handled by the supervisor, a continuously running Cyber job which controls the launching of all operational forecast work on both machines (see ECMWF Technical Newsletter, No. 1 for a description of ECMWF's operational system, known as EMOS). The main forecast is started on the Cray each night at about 21.30 GMT.

To measure the reliability of our daily operation a record is kept of the termination times of the 10 day forecasts on the Cray-1. Currently, it takes about 3½ hours on the Cray, hence it should complete at about 01.00 GMT. Figure 1 shows the percentage of occasions on which the forecast ended up to 15 minutes after the theoretical end time, 15 to 30 minutes after, and so on, over a 10 month period. Approximately 45% terminate within 15 minutes of the scheduled end time, while 90% terminate within an hour. Less than 1 forecast in 20 is delayed more than 2 hours, the usual reason for these long delays being computer malfunction. In the period in question no forecast was lost completely.

- Andrew Lea

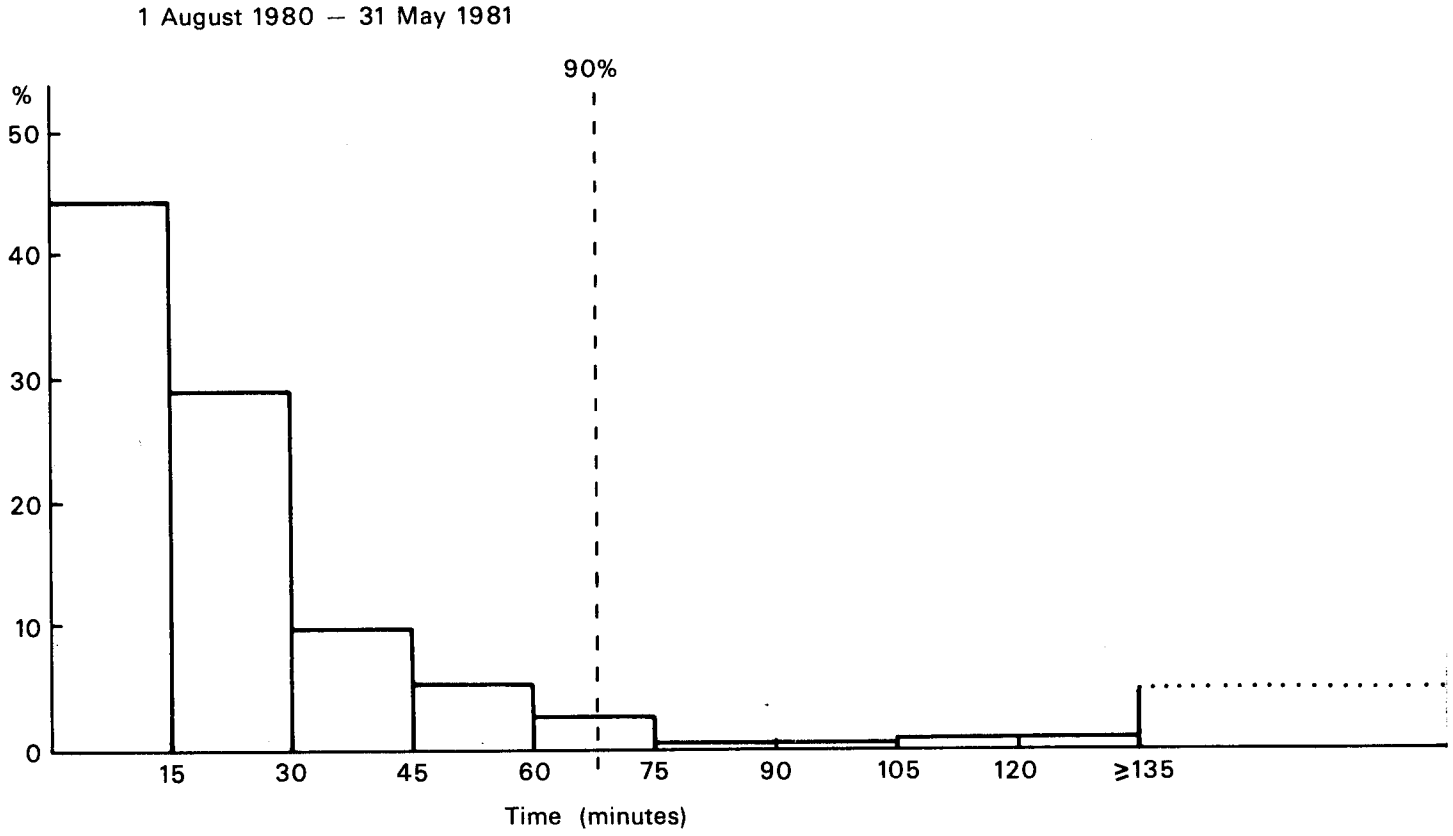


Fig. 1 Forecast completion times

CRAY DD-29 DISC STATUS

Following a successful 48 hour trial on 13-15 July, the new discs entered service on 15 July. However, on 17 July a problem occurred which was serious enough to warrant their removal from service.

At the time of writing (20 July), the problem has been identified as a hardware design problem, which can be avoided by a software modification. So the new discs have re-entered service, and will hopefully remain in service.

- Peter Gray

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* USING DF=BB AND DF=TR ON THE STATION

When the Cray station was specified, we included DF=TR transfer mode to minimise the overhead of transferring files which would never be processed on the Cyber. In practice, the differences, in Cyber time and transfer time, between a DF=TR and a DF=BB transfer are so small as to be almost not measurable, so the motivation for using DF=TR no longer exists.

Since there are other useful consequences of having data in a format which the Cyber understands (such as being able to use Cyber SKIP, COPY and ITEMIZE on the file, for instance), we would like to recommend that DF=BB is used in future for all large data transfers through the station, even though the data is not expected to be used on the Cyber.

For those with large quantities of transparent format data already on Cyber disc or tape, a conversion utility which will convert to block binary format without going through the station is available in ECLIB. This may be useful if you wish to select part of a file to be sent to the Cray, or if you want to do some processing on the Cyber.

- Dick Dixon

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* CRAY 'PROTECTED' DATASETS

It has recently come to my notice that some users have been confused by the term 'protected datasets' on the Cray.

As you are no doubt aware, we do NOT guarantee any datasets on the Cray. An INSTALL, which deletes all datasets from the Cray discs,can occur at any time, though nowadays such events can usually be scheduled and warning given.

After an INSTALL, the only datasets whose restoration we guarantee are the system files (CFT, LDR, etc), the user support libraries (ECLIB, NAGLIB, etc) and certain crucial datasets used by the FORECAST and EXPERIMENTAL models. If you wish to ensure that your datasets are safe from INSTALLs you must back them up on the Cyber and ACQUIRE them.

Every hour on the Cray, a job runs to attempt to ensure that the Cray discs do not become full. It does this by looking at the dataset catalogue and deleting 'permanent' datasets until enough free space is available. Obviously, this utility, 'SELECDS/DELETDS' will not delete system files, User Support libraries or the special FORECAST/EXPERIMENT datasets. These datasets are therefore known as PROTECTED datasets. Similarly, certain other datasets are given the attribute 'PROTECTED'. The only property of 'PROTECTED' datasets is that they are not deleted by SELECDS/DELETDS. They are NOT backed up automatically, in fact:

NO DATASETS ARE AUTOMATICALLY BACKED UP ONTO THE CYBER.

- Neil Storer

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SECOND CYBER NEWS

It is still too early to give exact dates for the expected delivery of the second Cyber and its peripherals. CDC are at present having difficulties scheduling the delivery of disc drives and controllers (you will recall similar problems late in 1980 with the 885 disc deliveries) and so the full configuration may not be installed until early January 1982. However, we hope that this is a pessimistic estimate.

We have found a few areas of potential problems on the Cyber 730E, and although some have been published previously, they are restated here in their entirety.

1. FTN LEVEL statements

On the Cyber 175, FTN LEVEL 2 and 3 statements are all treated as if the arrays referenced are stored in central memory. On the Cyber 730E, LEVEL 2 or 3 requests will result in the job being aborted. This is only likely to affect programs brought to the Centre from sites having a 7600 or Cyber 76 computer, or sites having ECS.

2. DOUBLE PRECISION speed

On the Cyber 175, the speed of double precision instructions is hardly slower than the speed of single precision instructions. On the Cyber 730E, double precision instructions are approximately ten times slower than single precision instructions. Any users using double precision should carefully re-evaluate their needs. If double precision is still required, they should be prepared to run their jobs only on the Cyber 175. Information on how to do this will be provided later.

3. Code self-modification

Any user having self-modifying COMPASS code should check with User Support, as this code may not work as expected on the Cyber 730E.

4. Dependent jobs

Dependent jobs on the Cyber have always caused difficulties and the situation will be made worse by the fact that dependencies are not passed between mainframes. Therefore, it is necessary to ensure that all jobs in a dependent string run on the same physical mainframe. Users using dependencies should re-evaluate their needs, and discuss them with User Support. It would be preferable if the use of dependencies were to end.

- Peter Gray

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FULL TRACKING OF 885 DISCS ON THE CYBER

Since June, the Cyber NOS/BE level 530 system has been enhanced to support full tracking of 885 discs, thereby enabling data to be transferred at a maximum rate of 9.58 Mbits per second.

Currently, the MSET10, MSET11, TEMP and SCRATCH discs are running with full tracking enabled. On Sunday, 26 July, SYSSET will be re-initialised to allow the 3 x 885 discs to be full tracked, and finally, DSET01 will be re-initialised to be full-tracked before the end of July.

- Tony Stanford

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* CATALOG-ING CYBER OUTPUT FILES

It often happens that users make output files LOCAL to an INTERCOM terminal and then CATALOG those files. Later attempts to ATTACH these files fail. The reason for this is that all queue files reside on the queue device, and not on the default permanent file set (SYSSET).

Before trying to CATALOG any output file users should enter

```
REQUEST,file,*PF.
REWIND,output.
COPY,output,file.
```

- Tony Stanford

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CMM-FORTRAN INTERFACE OR HOW TO SAVE CENTRAL MEMORY

Those of you long acquainted with CDC, may remember the 'BLANK COMMON extension' technique used to increase array sizes at run-time. With the introduction of CMM (Common Memory Manager), to allocate buffers, load and unload capsules etc., this was no longer possible.

The problem of "DYNAMIC ARRAY ALLOCATION" was then solved by writing Fortran interfaces to CMM (KCMGET,KCMREL); they were not widely advertised because CDC had announced that they would provide such routines; this has now been done at level 518, and the Fortran callable subroutines are described in detail in the CMM Version 1 Reference Manual (Revision E).

The basic syntax for the most common routines is described in the Fortran Extended Version 4 Reference Manual (Revision F, pages 8-52, 8-53) and its counterpart Fortran Version 5 Reference Manual (Revision D, pages 8-41, 8-53).

Example: Usage of a latitude/longitude grid with a different mesh:

```
      .
      .
LDSET,LIB=SYMLIB.        (the routines reside in system library
LGO.                     SYMLIB which is not searched automatically)
      .
      .
*EOR
      PROGRAM MAIN (------)
      DIMENSION GRID (1)
      .
      READ(5,*) NMAX,MMAX
      ISIZE=NMAX*MMAX
C     requests ISIZE words
      CALL CMMALF(ISIZE,0,0,IFWA)
      IOFFSET=IFWA-LOCF(GRID(1))+1
      CALL SUB (GRID(IOFFSET),NMAX,MMAX)
      .
      .
C     Release the memory if no longer needed
      CALL  CMMFRF(IFWA)
      .
      .
      SUBROUTINE SUB (GRID,NMAX,MMAX)
      DIMENSION GRID(NMAX,MMAX)
      DO 10 I=1,NMAX
         DO 10 J=1,MMAX
         GRID(I,J)=....
         WRITE(1) GRID
```

Advantages

- User should have declared an array of 29000 (over 70000 octal) for all grid sizes if the possible mesh range was $1.5^{o}*1.5^{o}$ to 5^{o}x 5^{o}; the latter mesh requires only 5000 octal.
- It can run from compiled code using just that amount of central memory needed at run time.
- Turnaround of the jobs in general will be improved.

Note: The CM occupation forms part of the calculation of units which you are charged for running your job.

Cautions

- Although CMM will not allocate you a block of CM which is reserved,for instance, for CRM, any over-indexing or under-indexing is bound to cause more harm than usual; but as experienced users never allow indices to overflow arrays.....
- Should you cause a lot of CMM activity (e.g. in a loop) it could have adverse effects on your job performances; one easy way to monitor that is to use the "Get statistics options" at any point in the program,(see example on next page).
- Do not forget that the CM parameter of your job card must allow for your maximum memory usage.

Example: 'Get statistics':

```
LDSET,LIB=SYMLIB...
:
:
*EOR
      PROGRAM
      DIMENSION CMMADD(1)
      :
      :
      CALL CMMGSS(CMMADD)
      IADD=1-LOCF(CMMADD)+CMMADD(1)
      MAXALL=CMMADD(IADD)   (maximum no. of allocated words)
      MAXFL=CMMADD(IADD+1)  (maximum field length)
      NFLI=CMMADD(IADD+3)   (number of field length increases)
      NFLD=CMMADD(IADD+4)   (number of field length decreases)
      PRINT *,MAXALL,MAXFL,NFLI,NFLD
```

NFLI and NFLD will report all CMM activities including the ones due to record manager.

- Michel Miqueu

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ECLIB CHANGES

The next version of ECLIB, due to be released shortly, will contain the following additions:

a) Cyber:

BBCONTR -	file conversion utility from Cray TRansparent format to Cyber WI format (as if it had been disposed with DF=BB)
GPGRAPH -	a graph plotting package including the original GPINIT package with calls to GPGRFX and GPGRFG.
XREF -	global cross-reference program for Fortran programs
MAKEPL -	generate an Update PL from a Fortran program
ORDERPL -	re-order the decks of an Update PL into alphabetic order
UV2SD and SD2UV -	conversion between used vectors and components
GBYTE,GBYTES SBYTE,SBYTES -	field manipulation routines

b) Cray

GPGRAPH -	see Cyber
XREF -	see Cyber
random I/O -	allow random I/O on unblocked datasets
CDCCON -	addition to the CONVERT package (64 to 60 bit words without output)
SYMSOL -	solves a linear system Ax=b for positive definite symmetric A
UV2SD and SD2UV -	see Cyber
GBYTE,GBYTES SBYTE,SBYTES -	see Cyber

- David Dent

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HOW TO BE AN EFFECTIVE FTN5 PROGRAMMER

PART 2 from a talk given by Richard R. Ragan, CDC at a joint ECODU/VIM Languages Committee, Manchester, September 1980. (Part 1 appeared in the June Newsletter).

While we are on the subject of I/O, lets look at some new things in FTN5. It is no longer necessary to declare each file name on the PROGRAM statement, unless you are running a STATIC mode program. Initially, no space is allocated for files. When a file reference occurs, the FIT and buffer space are automatically allocated. If you need direct control over the size of the buffer, you can use the BUFL parameter of the OPEN statement to specify the size. If you use the new CLOSE statement to close a file, the storage that was initially allocated will be released. This feature gives the user a means to restrict the amount of storage for I/O operations to just what is needed. The main reason you might want to leave the file names on your PROGRAM statement is to allow file substitution on the LGO call as in FTN4. If you don't want to put files on your PROGRAM statement, there are still two ways to do file substitution. The first method uses the Record Manager FILE statement. For example, if I have a file called TAPE1 that I want to substitute to be XPOINTS, I would write

```
FILE,TAPE1,LFN=XPOINTS.
LGO.
```

The other method of file substitution uses a new FTN5 library routine, GETPARM, to access parameters from the LGO call. For example, if I want my program's input data to be specified by I=lfn with a default of INPUT, I might write

```
PROGRAM XYPLOT
CHARACTER *7 KEY, VAL, LFN
DATA LFN/'INPUT'/
CALL GETPARM(KEY, VAL, IC)
IF ( IC .GE. 0)THEN
  IF ( IC .EQ. 0)THEN
    IF(KEY .EQ. 'I')THEN
       LFN = VAL
    ELSE
       STOP 'INVALID KEYWORD'
    ENDIF
  ENDIF
ENDIF
OPEN(1,FILE=LFN)
```

Once the parameter value for I=lfn is obtained, we simply use the OPEN to associate TAPE1 with the file name from the LGO call. For a production program, a keyword interface is much better for the user.

The PARAMETER statement is a new statement that you should get into the habit of using. It allows the programmer to assign a name to a constant value in a single place, the PARAMETER statement, and then use the name in place of the constant.

```
      PROGRAM CIRCLE
      PARAMETER (PI=3.1415925)
      PARAMETER (M=200, N=2*M)
      CHARACTER FMT*(*)
      PARAMETER (FMT='(A,3X,F10.2)')
      REAL RADIUS(M), RAD2(N)
      DATA RADIUS, RAD2 / M*0, N*0 /
      DO 10 I=1, M
      READ(1, FMT,END=999), RADIUS(I)
 10   CONTINUE
```

In general, symbolic constant names declared in a PARAMETER statement should be typed. All of the above examples, except the character one, rely on the implicit typing rules of FORTRAN. The CHARACTER declaration, however, declares a length of (*) which is normally only allowed for dummy arguments. In this case, it is a permitted convenience and means "make the symbolic constant exactly the length of the constant assigned to it in the PARAMETER statement". This avoids having to count characters.

In the second PARAMETER statement, M is defined to be 200 and N is defined to be twice M. Expressions involving constants and symbolic constants but not functions or exponentiations are allowed in FORTRAN 77. FTN5 relaxes this and permits those intrinsic functions which the compiler is capable of emitting as inline code. Note the use of M and N in the array declarations, the DATA statement, and the DO loop. If the value of M must be changed, it can be done in only one place.

Unlike FTN4, the DO loop in FTN5 will not execute at all if the loop termination conditions are initially satisfied. This zero trip DO loop behaviour can affect program execution speed, especially with OPT=2, since the initial test for loop satisfied inhibits moving invariant code outside the loop and costs additional time for the test. FTN5 provides a control statement option, DO=OT and a program embedded C$ DO(OT=1) directive that allow the user to assert that none of the loops will be zero trip. This permits the compiler to leave out the initial test and allows faster OPT=2 code. In order to be portable, programs using this facility must not contain zero trip DO loops.

Another efficiency concern that mostly affects program load time and size of the relocatable binary text is the way arrays are initialised. If several arrays are to be initialised, each should be initialised separately, not interleaved.

```
INEFFICIENT  DATA (A(I),B(I),I=1,250)/500*0/
EFFICIENT DATA (A(I),I=1,250),(B(I),I=1,250)
              * / 500*0 /
```

The first form is inefficient because the compiler must start a new loader table for each word A(1), B(1), A(2), B(2), etc. since they are not contiguous.

FORTRAN 77 provides a combination of features which allow writing programs that can be easily transported between mainframes with different precisions. The recommended practices for portability are:

1) declare all real or double precision variables via an IMPLICIT
2) define any constant values in DATA statements using double precision values with as many digits as you will ever want
3) use only generic function names to reference library functions
4) do not rely on storage association in COMMON if it depends on overlaying double word items by single word items.

If you do this, then only the IMPLICIT declaration will need to be changed from REAL to DOUBLE PRECISION, or vice versa.

The new FORTRAN 77 feature of lower as well as upper array bounds can be used to make a program more understandable. For example, a program segment dealing with an array of years from 1964 to 1980 might be easier to comprehend if the array is declared as:

```
INTEGER YEARS(1964:1980)
```

FTN5 offers array bounds checking as an aid to debugging. There are many subroutines which declare a dummy argument array to have a dimension of one to get more efficient code for array references. Unfortunately, such references will be flagged as out of bounds array references. The preferred method for such arrays is to replace the one by an asterisk. This will retain the efficiency but suppress the bounds checking errors.

There is a trick which can help you detect undeclared variables or typographical errors in variable names. If you add an IMPLICIT LOGICAL (A-Z) to each program unit, virtually all variables that are not explicitly declared will cause an error. This is because type logical values can only be mixed with other values of type logical. Another way to find program errors is to study the cross reference map after your first clean compilation.

We have looked at a number of ways to be a better FORTRAN 77 programmer. Some are aimed at programming style considerations which should make your program more portable, and some just show how to use some of the new features. I hope all of the above tips will help you to become a better FORTRAN 77 programmer.

* * * * * * * * * * *

A RETROSPECT ON COMNET '81, THE INTERNATIONAL SYMPOSIUM ABOUT 'COMPUTER NETWORKS FROM THE USER'S POINT OF VIEW'

The major news of the COMNET '81 Symposium in Budapest on 11-15 May came right at the start of the conference in the keynote speech of Mr. P.T.F. Kelly of British Telecom. The more than 400 registered participants were surprised to hear that concrete steps have been agreed by the major European PTT's to de-realise (close down) EURONET in the coming years although it has only just become operational. The PTT's confirmed their intention to replace Euronet by the interconnection of their respective packet-switching networks, but not to interfere with the DIANE data base enquiry service which will remain within the domain of the EEC.

COMNET '81 proved to be a major, almost unique, meeting point between Eastern and Western European countries, with participants coming from as far afield as Australia and Japan. Interesting insights into the progress in the COMECON countries were provided by about half of the 80 presented papers.

The PTTs took an active part in the Symposium,with such distinguished speakers as Bill Medcraft and Phil Kelly of the UK, and Hermann Gabler and Walter Tietz of FRG. They outlined the implementation experience and future plans in data communication in their respective countries. The major points were that reliability and delivery still need improvement. TRANSPAC, as Mr. Simonet mentioned, does not have a reliability problem, but suffers from long delays in the delivery of data access lines to users. It was interesting to hear that only (or as Dr. Raubold of GMS Germany remarked that *already*) 40% of the TRANSPAC hosts have a full X25 interface, whereas the other hosts use black-box X25 converters or even asynchronous PAD access!

Compared to the earlier COMNET Symposium in 1977, it was amazing to note the progress achieved in the data communication field. X25 networks have become a reality in many places, local networks have quickly grown into an area of great interest,with many implementations underway. Teletex, Computer-based Messaging and computer/ communication based information services like Videotex are with us.

There was an exchange of viewpoint between implementors of local networks, using coaxial cable (Ethernet) and the Cambridge Ring. William Newman, famous in computer graphics, presented the work done by Logica in office automation,using the Cambridge Ring. However, this ring approach was put under scrutiny in the contribution by Professor Danthine of the University of Liege, the Chairman of IFIP Technical Committee 6. In the COMECON countries there is great research interest in the local networking area and this topic led to many discussions outside the official Symposium program.

From the Centre, Aaron Haag and I attended COMNET '81 and presented the paper "A Review and Re-assessment of ECNET, a Private Network with Open Architecture". Copies of this paper are available to our Member States; it is currently reproduced in the form of an ECMWF report. I was pleased to see COMNET '81 as almost a sub-meeting place of people who had been involved in the development of our network, which has now become an established and mature entity. Phil Rakity, the deputy project-leader of the NFEP project, was representing his new employer Perkin-Elmer UK in the prominent panel discussion (see below). James Aitken was there, the project leader of the joint NTS development. Tom Jacobsen of Regnecentralen Computers gave an interesting presentation of the current development of protocol standards for the so-called transport layer. James and Tom are now closely involved in an EEC-funded project for the development of a generalised EURONET (X.25) terminal, a project which is in some respects a by-product of their joint involvement in our program. Last,but not least, there were three representatives from Trinity College Dublin at the Symposium, namely Ahmed Patel, John Sheehan and Bryan Alton, who presented one of the technically most interesting and best prepared papers including a review of their PDP-11-based ECMWF link development for the Irish Meteorological Service.

Finally, a highlight of the symposium was a panel discussion chaired by Louis Pouzin of France, whom some of you might remember as the manager of the METEOS development, a realtime operating system for the French Meteorological Service. He had earlier presented, with his inimitable, witty intelligence, his view of the existing computer communication gaps. The discussion was to compare the expectations of users in data communication and data networks with the sometimes frustrating reality. Participants in this discussion came from the PTTs (like Mr. McDonald, Chairman of CCITT Study Group VII, Phil Kelly of British Telecom), from manufacturers, users and from the research field. It was undeniable that PTTs as well as manufacturers are facing great difficulties in defining and implementing network solutions, when, at the same time they have to spend a lot of effort in participating in an often tiring international standardisation effort.

- Fritz Königshofer

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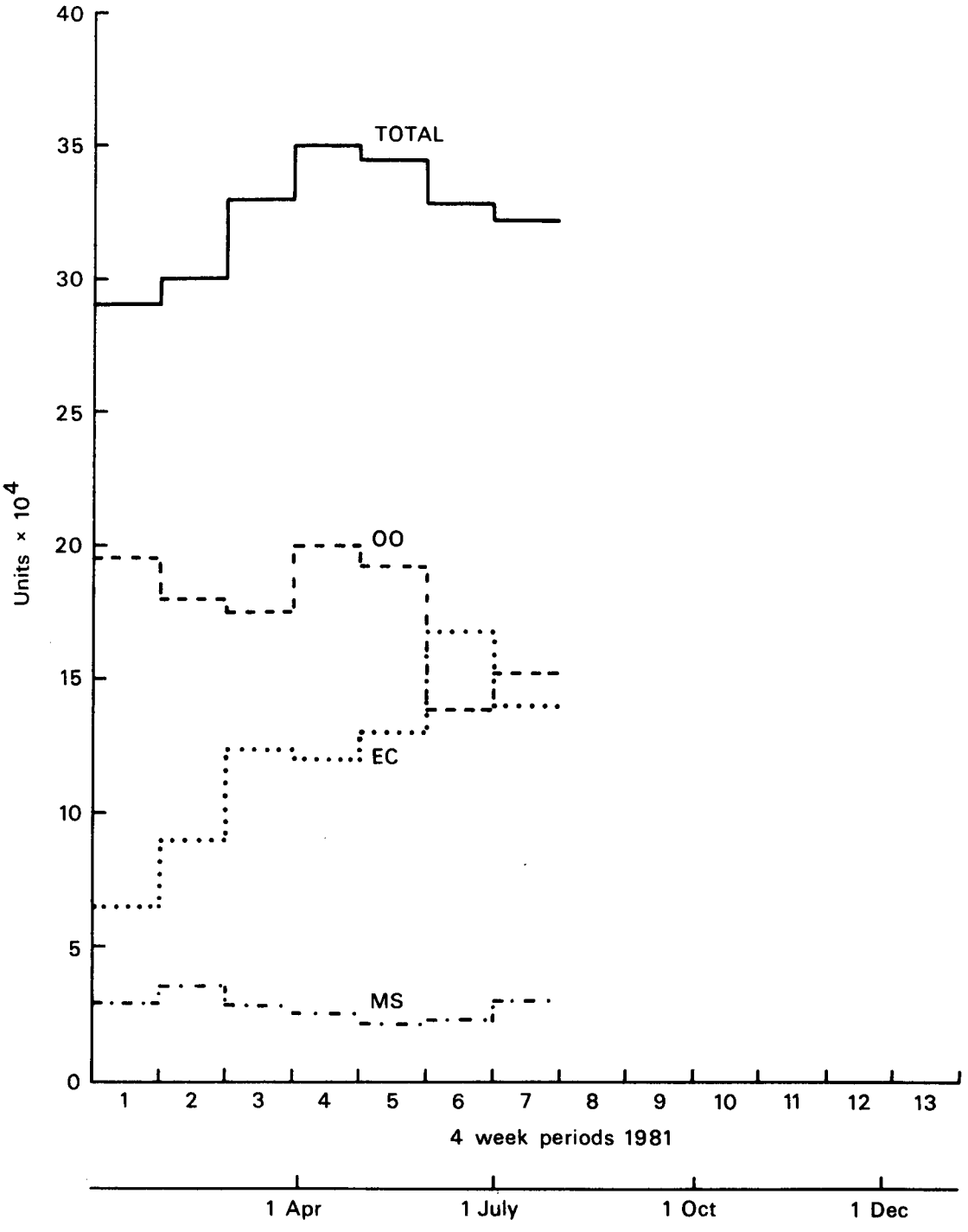
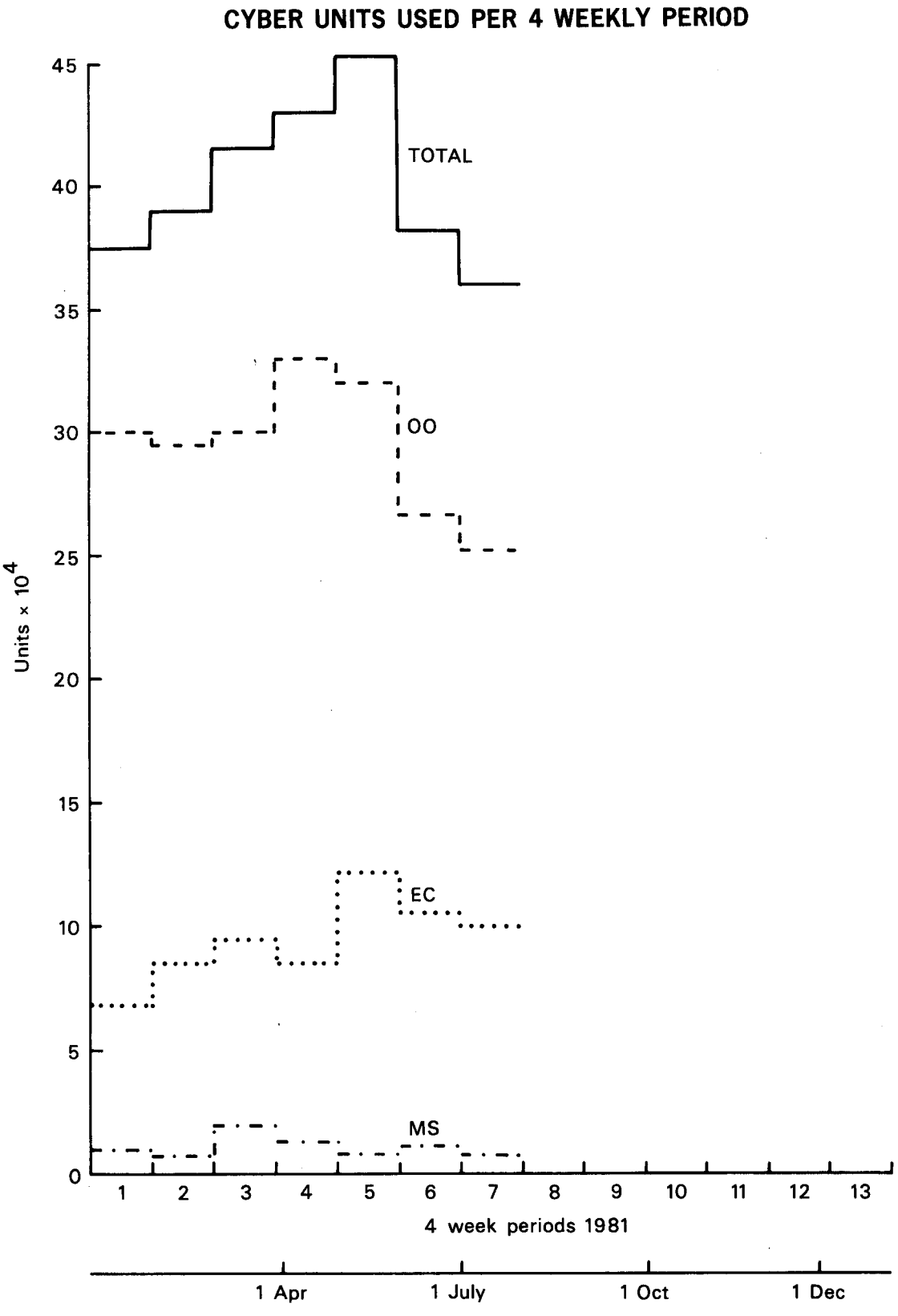
COMPUTER USAGE STATISTICS 1981

CRAY UNITS USED PER 4 WEEKLY PERIOD



Total = total usage less those jobs classed as systems overheads
OO = operational suite running
EC = Centre users
MS = Member State users, including Special Projects



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

No.	Still Valid Article
15	Private packs on the Cyber (MOUNT/DISMOUNT)
16	Checkpointing and program termination
19	CRAY UPDATE (temporary datasets used)
47	Libraries on the Cray-1
53	Writing 6250 bpi tapes (EEC parameter)
54	Things not to do to the Station
56	DISP
65	Data security on Cyber and Cray
67	Attention Cyber BUFFER IN users
71	Packs command
73	Minimum Cyber field length
89	Minimum field length for Cray jobs
93	Stranger tapes
98	Cray symmetric multiply (rounding factors)
101	Allocations and priority groups 1981
106	Gandalf PACXIV upgrade
108	SUBMIT
109	NOS/BE and products at level 530
112	Validator dayfile messages
114	Cray jobcard memory parameter
116	Cyber small job class
	TEMP
	Messages to Intercom users
118	Terminal timeout

The News Sheets which can be thrown away since this list was last published are numbers 77, 111, 115, 117.

- Andrew Lea

CALENDAR OF EVENTS AT ECMWF

4 - 19 September	ECMWF seminar. Topic this year: "Problems and prospects in medium and long-range weather forecasting".
21 - 25 September	Computer training course B: Basic computer usage.
28 Sept. - 2 Oct.	Computer training course C: Use of Cray-1
14 - 16 October	Member States Computing Representatives' meeting (2nd Session)
19 - 23 October	Graphics seminar
19 - 20 November	Council (14th Session)

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ECMWF PUBLICATIONS

Technical Memorandum No. 30:	Comparison of ECMWF forecasts starting from 00Z data with operational forecasts from the preceding 12Z data.
Technical Memorandum No. 34:	Review of computer mass storage systems
Technical Memorandum No. 33:	A Method for Solving a System of Linear Equations Efficiently in Order to Optimise the Analysis Code: Operational Experimentation.
Technical Report No. 25:	on the Atmospheric Factors Affecting the Levantine Sea.

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VACANCIES AT ECMWF

A requirement for all the posts is a very good knowledge of one of the working languages of the Centre (English, French, German); a working knowledge of one of the other languages would be a distinct advantage.

POST: HEAD OF METEOROLOGICAL DIVISION, OPERATIONS DEPARTMENT

FUNCTION:

The Operations Department at the European Centre for Medium Range Weather Forecasts is made up of two divisions - Meteorological and Computer. The Head of the Meteorological Division is directly responsible to the Head of the Operations Department for organisation and running of the Meteorological Division.

This Division comprises two sections: Meteorological Applications, which is responsible for the implementation and maintenance of the meteorological operational system, supporting the routine production of medium-range weather forecasts, and Meteorological Operations, which is responsible for the monitoring and assessing, both on a daily basis and in the longer term, the actual forecasts produced.

As well as controlling and having the overall responsibility for these sections, the Head of Division must liaise with the Head of Computer Division in determining the computer requirements to meet the needs of the operational system, and with the Research Department in providing improved analysis and forecasting schemes.

He is also responsible for liaison with Member States in meteorological aspects (e.g. the range of results to be disseminated to particular Member States) and should advise on use and interpretation of the Centre's medium-range forecasts. The Head of Division also plays a part in the liaison with the World Meteorological Organisation. He assists the Head of Department in various aspects of the overall management of the Department and in the preparation of meetings in which the Department is involved.

QUALIFICATIONS:

A university education in meteorology. Substantial experience and knowledge of meteorological operational systems, the application of numerical weather prediction techniques and modern automatic data processing in meteorology. Clear insight into subjects such as the global observing system, quality control of meteorological data, uses and applications of meteorological data. Considerable scientific knowledge in the field of numerical weather prediction or related areas. Experience in managing and leading groups involved in technical or scientific projects. Experience in international meteorology or of participation in international meteorological meetings (e.g. at the World Meteorological Organisation) would also be an advantage.

FUNCTION: HEAD OF OPERATING SYSTEMS SECTION

COMPUTING ENVIRONMENT: The computer facility currently comprises a CRAY-1 and a CDC CYBER 175 linked by telecommunications computers to a private network spanning Member States. A second CDC CYBER computer will be added to the facility late in 1981. The computer facility provides a continuous service, 24 hours per day, 365 days per year, and a continuous on-call software support service is provided by the Operating Systems Section. This may require to work outside the Centre's normal working hours from time to time.

MAIN DUTIES:

- Being responsible for the implementation, maintenance and development of the basic software of the computer complex.
- Participating in the general planning of the computer services.
- Analysing the performance of the computer complex, studying the feasibility of improvements and directing the implementation of the improvements.
- Drawing up works programmes and distributing projects to analysts in the light of their abilities and specialisation.

The Head of the Operating Systems Section will work in the Computer Division and report to the Head of that Division.

QUALIFICATIONS: University education or equivalent, completed by training in programming and analysis. Thorough knowledge of the capacities and functional limitations and of the operation of modern data processing equipment and operating techniques. Knowledge of operating systems evaluation and implementation. About nine years' practical experience of analysis and programming, with at least two years as head of a team of analysts and programmers.

STARTING DATE: As soon as possible.

FUNCTION: SENIOR ANALYST

COMPUTING ENVIRONMENT: The computer facility currently comprises a CRAY-1 and a CDC CYBER 175 linked by telecommunications computers to a private network spanning Member States. A second CDC CYBER computer will be added to the facility late in 1981. Because of the high usage of graphical tools in meteorology a number of graphical devices have been installed, e.g. VERSATEC, electrostatic plotters, Tektronix displays, COM devices, AYDIN colour raster device. Software used includes a sophisticated CONTOUR package and a GKS implementation.

The computer facility provides a continuous service, 24 hours per day, 365 days a year. Therefore, it might be required of the analyst to work outside the Centre's normal working hours from time to time.

MAIN DUTIES:

- Directing and taking part in projects regarding design, development, implementation and maintenance of basic software, with emphasis on graphics software, supporting the operational process and research facilities.

- Being responsible for the implementation, maintenance and development of the basic software to drive an AYDIN meteorological work station.

The senior analyst will work in the Communications and Graphics Section and report to the Head of that Section. There is a need to work closely with other staff providing the operational and meteorological service.

QUALIFICATIONS: University education or equivalent, completed by training in programming and analysis. A solid background in software engineering is required. Graphics experience is highly desirable. The applicant should have at least 5 years' experience working in a relevant field.

STARTING DATE: As soon as possible

CLOSING DATE FOR ALL THE ABOVE POSTS - 15 SEPTEMBER 1981.

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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

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COMPUTER OPERATIONS			
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Reception Counter Terminal Queries Tape Requests	- Judy Herring	CB Hall	332
Operations Section Head	- Eric Walton	CB 023	351
Deputy Operations Section Head	- Graham Holt	CB 033	476
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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
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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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