European Centre for Medium Range Weather Forecasts

ECMWF NEWSLETTER

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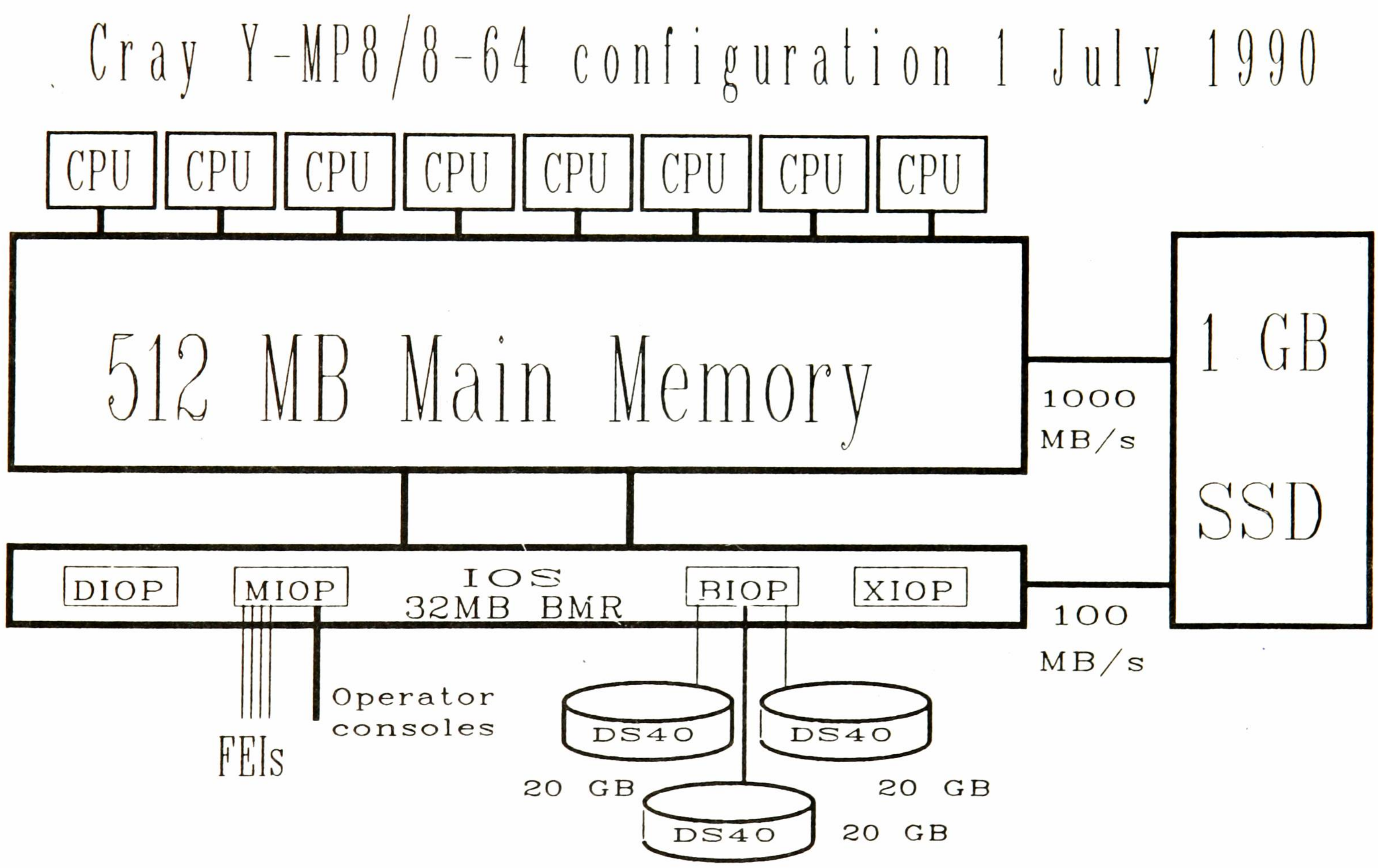
ECMWF New HSC Facility



IN THIS ISSUE

COVER: First phase configuration of the new ECMWF high speed computing facility to be installed by 1 July 1990.

This Newsletter is edited and produced by User Support.

The next issue will appear in June 1990.

The first article in this issue describes the 'Monte Carlo' forecast - the technique for determining how forecast skill varies according to variations in the initial state of the atmosphere.

The Centre's newly-arriving high speed computing facilities are the subject of the next article, with the planned schedule for their installation. Member States' users may take note of the proposed availability of the new facilities to them for migration purposes.

An introductory article on MicroMAGICS follows. This is associated to the recent publication and distribution of the MicroMAGICS users guide. Two further articles reflect the effects of the forthcoming change to UNICOS.

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CHANGES TO THE OPERATIONAL FORECASTING SYSTEM

Recent changes

No changes which would have had a significant impact on the performance of the ECMWF analysis and forecast system have been introduced during the last three months.

Planned changes

A revision to the assimilation scheme will be introduced in order to improve the use of the first-guess in the analysis. The scheme under test provides first-guesses at the appropriate observation time by interpolation between three forecast states centred around the analysis time. This will reduce first-guess errors compared with the current procedure in which a single first-guess is used for all observations in a ± 3 hour time window of the analysis time.

The first-guess checks of upper-air wind data will be enhanced.

Several modifications will be made to the physics of the forecast model, mainly to the surface albedo, surface roughness, cloud cover for non-precipitating cumuli and run-off for convective precipitation. In addition, the parametrization of surface fluxes for free convection will be revised.

- Bernard Strauss

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THE MONTE CARLO FORECAST

Introduction

Looking back over meteorology in the 1980s, there is no doubt that there has been a steady improvement in the quality of numerical weather forecasting. However, forecast models still show considerable variability in skill from day-to-day. Clearly, if one could forecast the occasions when above average skill can be expected, then the usefulness of a forecast could be greatly enhanced. What causes day-to-day variability in forecast skill? In part it is due to the fact that uncertainties in the initial analyses amplify at a rate determined by the flow at the time of the forecast. That is to say, day-to-day variability of forecast skill is in part associated with day-to-day variability in the intrinsic predictability of the atmosphere.

Since the notion of predictability is related to the rate of divergence of forecasts started from almost identical initial states, one technique for estimating predictability would be to construct an ensemble of initial states, each one being, a priori, equally likely. We could then run our numerical model from each initial state, and produce an ensemble of forecasts for day 1, day 2, etc. A priori, each member of the ensemble would be equally likely. By studying the dispersion of the ensemble as the forecast proceeds, one could determine whether or not the uncertainties in the initial analyses were having a serious detrimental effect on forecast quality.

Since each member of the ensemble is supposed to be equally likely, the forecast must be couched in probabilistic terms. At day 3, for example, the ensemble may be able to give probabilities for the timing of fronts, and probabilities of the amount of associated rain. At day 5, it may be able to warn if there is a significant chance of an exceptional event (which may have been missed in the deterministic forecast). At day 7 it could give the probability of a significant change in weather regime.

The term 'Monte Carlo' forecast is often used to describe these ensemble predictions. The notion of Monte Carlo forecasting in meteorology is not new (Leith, 1974). However, we consider that the time is now ripe for the concept to be developed for operational medium-range forecasts. In the course of time it may be useful even for short-range predictions.

<u>The requirements for an ensemble forecast</u>

Before showing an example of a Monte Carlo forecast, we ask ourselves what factors determine the overall skill of the ensemble forecast.

Firstly, the model should have no large systematic shortcomings. The method is only as good as the model. Secondly, probabilities based on small sample sizes could be quite unrealistic. The question of what constitutes a reasonable sample size is dealt with later. In relation to this point, we may consider, given projected computer power, how many integrations will be possible in the future. The ECMWF T106 10-day forecast currently takes about 2½ hours to integrate on the CRAY X-MP/48. In just a few years the same forecast will take about 2½ minutes on the CRAY Y-MP/16. In the same time as it takes to run the current model, we could perform a 60-member ensemble! Looking a little further ahead, and bearing in mind the development of machines with very large numbers of parallel processors, perhaps 100-member ensemble forecasts could be envisaged.

The third criterion that will determine the overall skill of the ensemble is its initial construction. Some of the earlier attempts at producing an initial ensemble of states used the simple technique of adding to a given analysis spatially uncorrelated random noise at each model grid point. However, if we integrate such perturbed analyses forward, the dispersion of the ensemble will at some stage start to decrease, since the perturbations will in general project onto non-meteorological modes which will be dissipated in the model. In such a situation, the eventual delayed dispersion of the ensemble overestimates meteorological predictability.

We must also ask what should determine the geographical structure of the initial perturbations? Basically, the amplitude of the perturbations can be larger over the oceans where data is sparse, than over, say, Europe and North America, where good quality data is relatively plentiful.

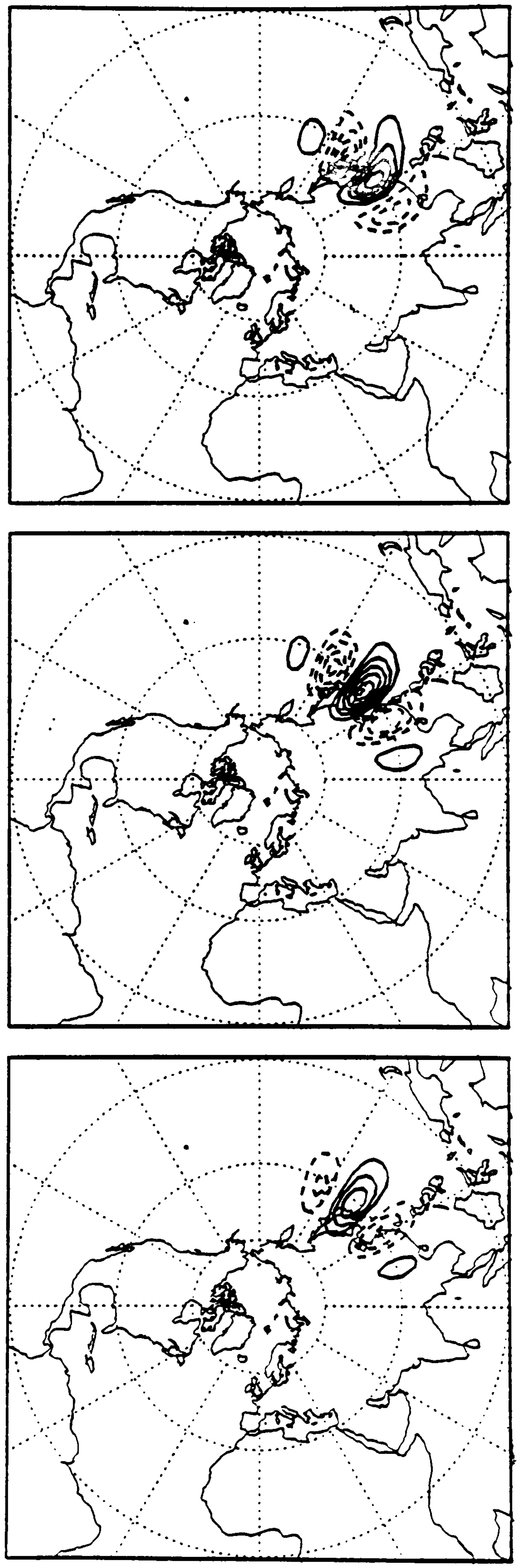

Fig. 1: Structure of perturbation whose energy is initially growing most rapidly in a 3-level quasi-geostrophic model linearised about a climatological winter mean flow.

There is an even greater constraint. Uncertainties in the initial data are much more important in regions where the atmosphere is baroclinically and barotropically unstable, than in regions where it is stable. We therefore need to perturb the analyses in these regions, and with the vertical and horizontal structure that will most readily excite the appropriate unstable modes.

To calculate these 'optimally-growing' modes requires knowledge of relatively recent developments in instability theory. The classic normal-mode baroclinic instabilities are by no means the fastest growing perturbations over periods of time relevant for medium-range prediction. Techniques have been developed to calculate the optimally-growing perturbations for a given time-evolving basic-state flow (LaCarra and Talagrand, 1988). Hence, basic dynamical meteorological research may have a substantial input into the future development of numerical weather prediction.

In Fig. 1 we show a calculation, in a quasi-geostrophic 3-level model, of such a perturbation relative to a climatological wintertime basic state. It has a completely different structure to that of a normal mode (more localised, both in the vertical and horizontal) with a growth rate about 8 times faster than the fastest-growing normal mode. Preliminary calculations suggest there are about 50 modes important for a realistic flow. This number would therefore approximately represent the ideal size of a Monte Carlo ensemble.

<u>An example of an ensemble forecast</u>

In this section we discuss an example of a 25-member ensemble made with a (T63) version of the ECMWF model. To date 7 different ensembles have been run; this one was run from 2 December 1988. The technique used to construct the initial perturbations from this ensemble made no use of calculations of dynamical instability; these calculations are still at an early stage. The technique used for this preliminary set of forecasts was somewhat simpler. Specifically, suitably orthonormalized 6-hour forecast error fields of forecasts immediately preceding 2 December 1988 were taken.

In order to give an impression of the synoptic development of the individual members of the ensemble, we show 500 hPa height maps for the first 8 members at day 0 and day 7 (Figs. 2 a) and b)). At day 0, one can barely discern any differences between members of the ensemble; by day 7 there is noticeable divergence.

In Fig. 3 a), we show the rainfall, between day 3 and day 5, for the deterministic forecast. In Fig. 3 b) results are shown from the Monte Carlo forecast. It gives the probability that, between day 3 and day 5, rainfall will exceed 10 mm per day (result obtained by counting the number of individual forecasts where the threshold is exceeded). The stippled area indicates probabilities in excess of 60%. Much of mainland Europe can be confidently predicted as having at least 20 mm of rain between day 3 and 5. It is again interesting to examine some of the details. A relatively small spatial area of significant rain is forecast for southern Yugoslavia in the deterministic forecast. When we look at the Monte Carlo forecast, it is very confidently predicted; indeed, almost every forecast in the ensemble predicts rain for this area. However, the rain predicted for the region to the south west of Crete,

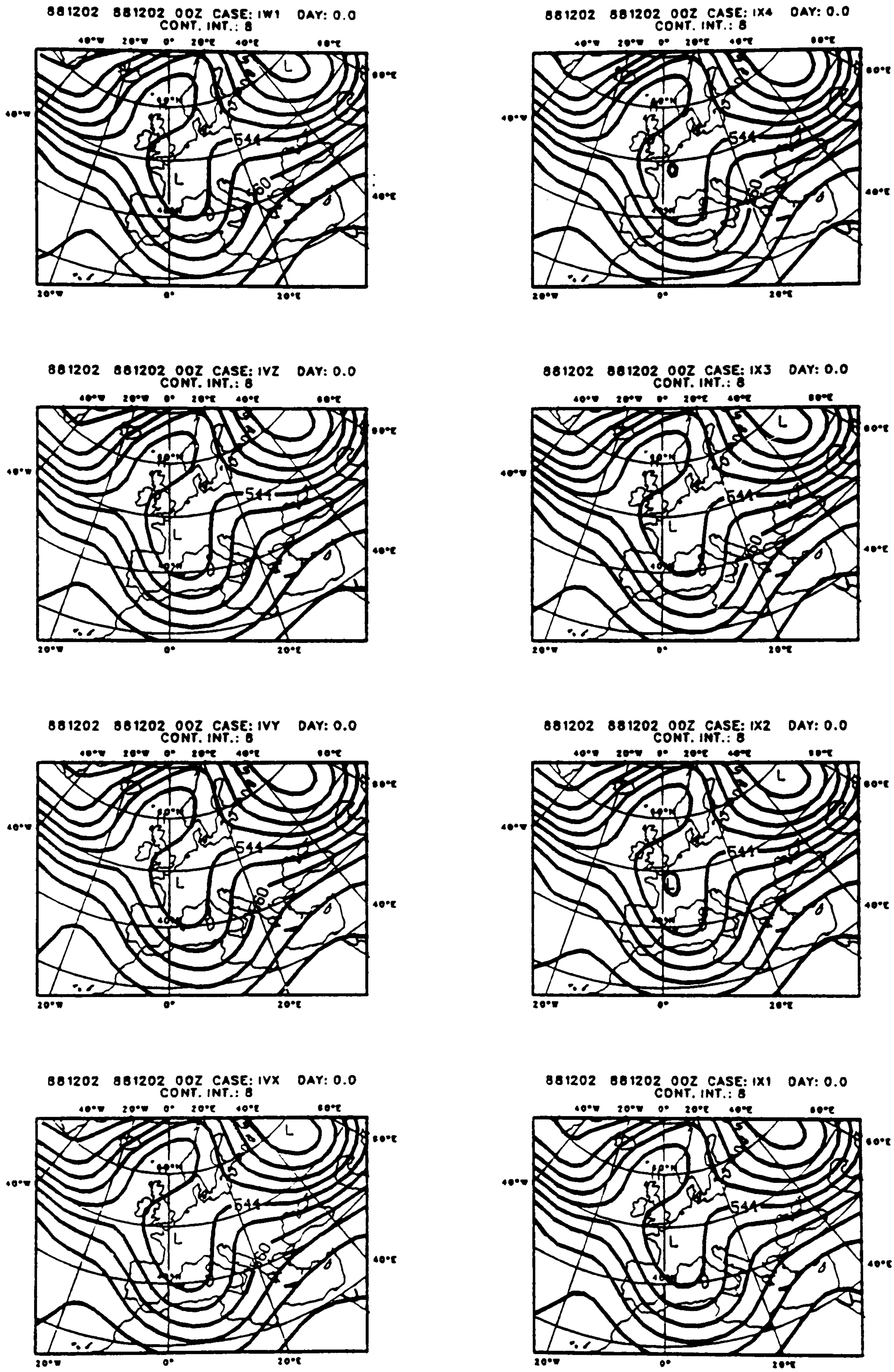

Fig. 2 a): 500 hPa height fields of 8 members of a 25 member ensemble, initial analyses.

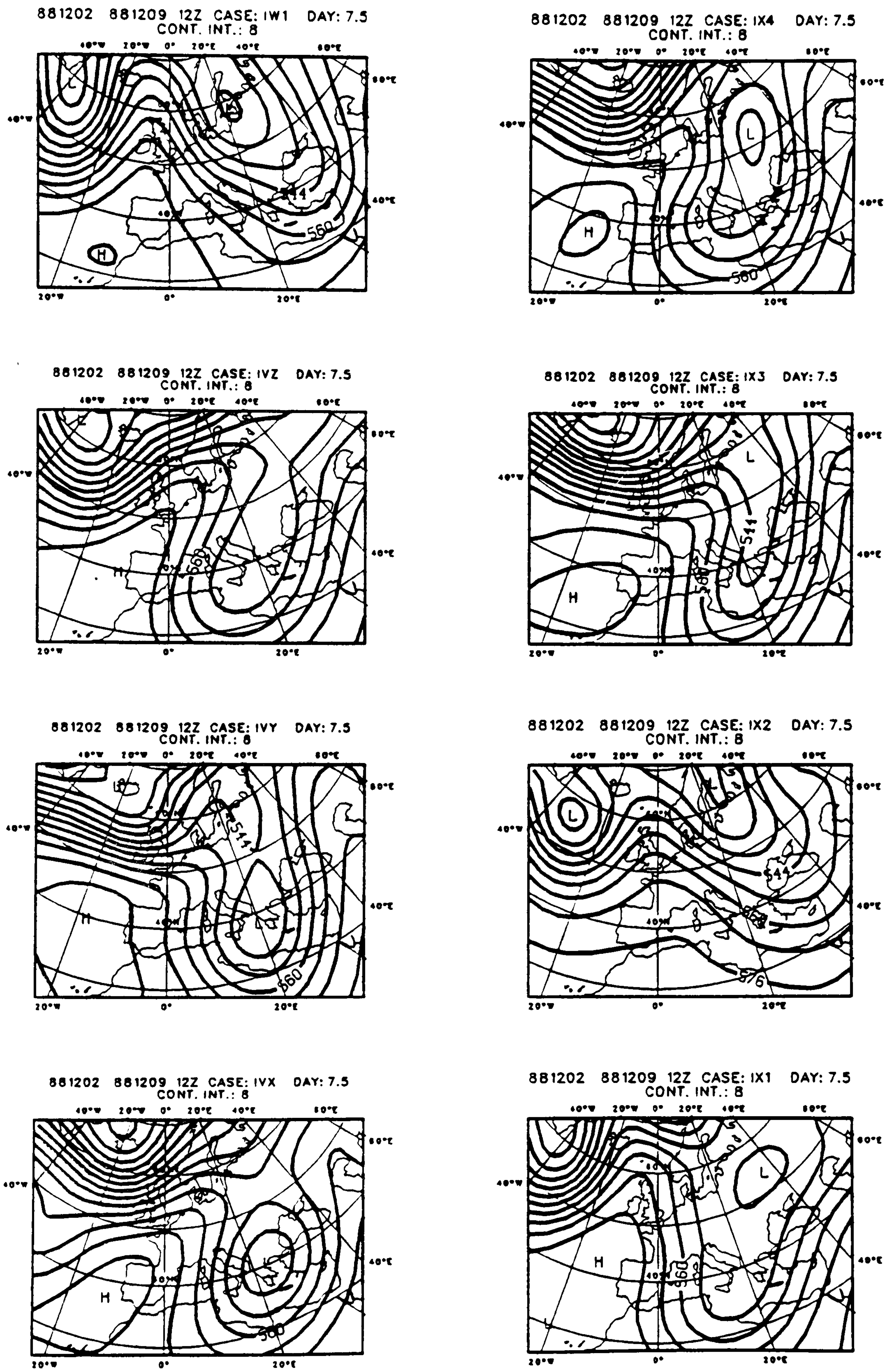

Fig. 2 b): Day 7 forecasts.

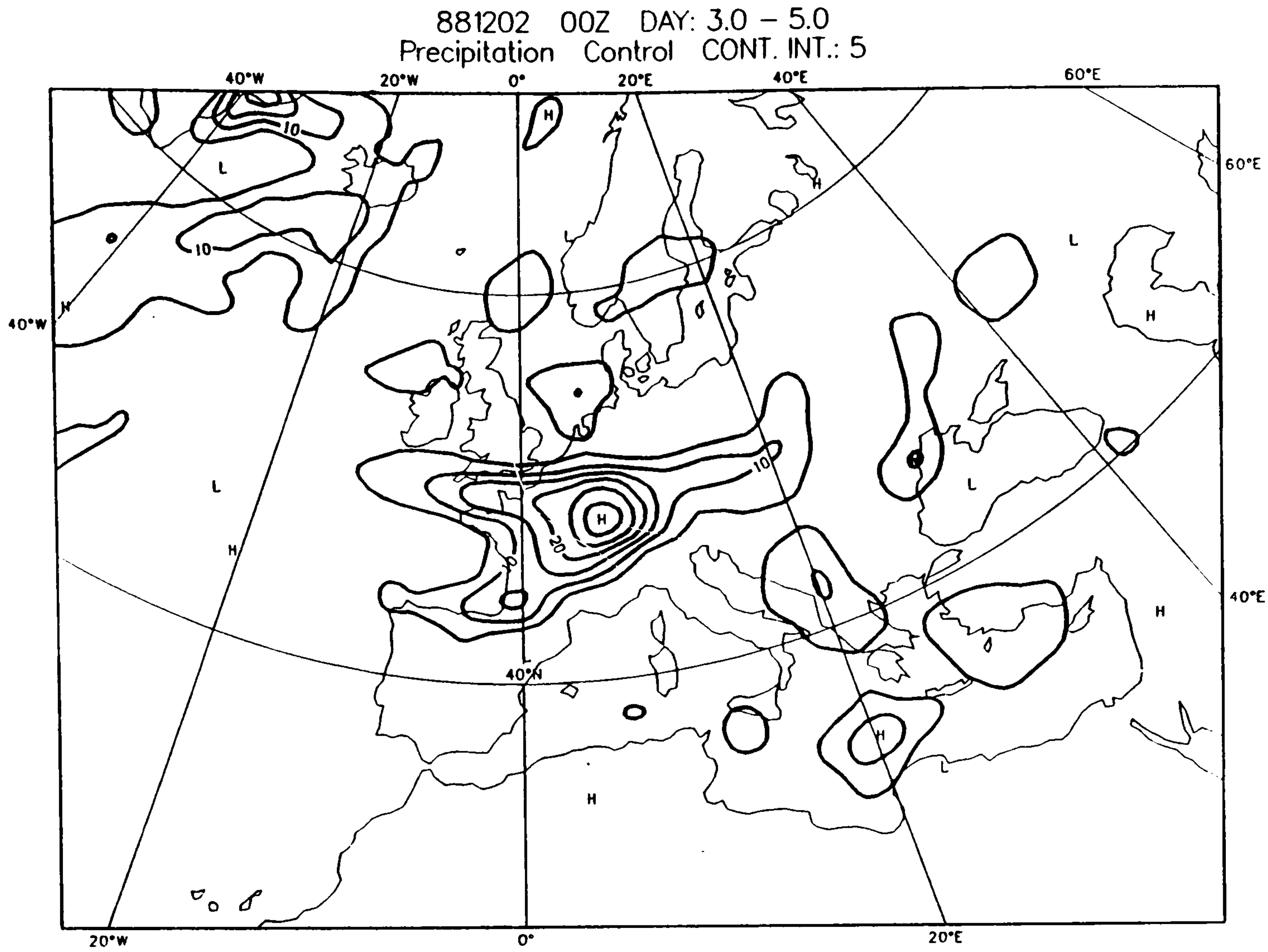

Fig. 3 a): Deterministic forecast from 2 December 1988, of rainfall accumulated between days 3 and 5.

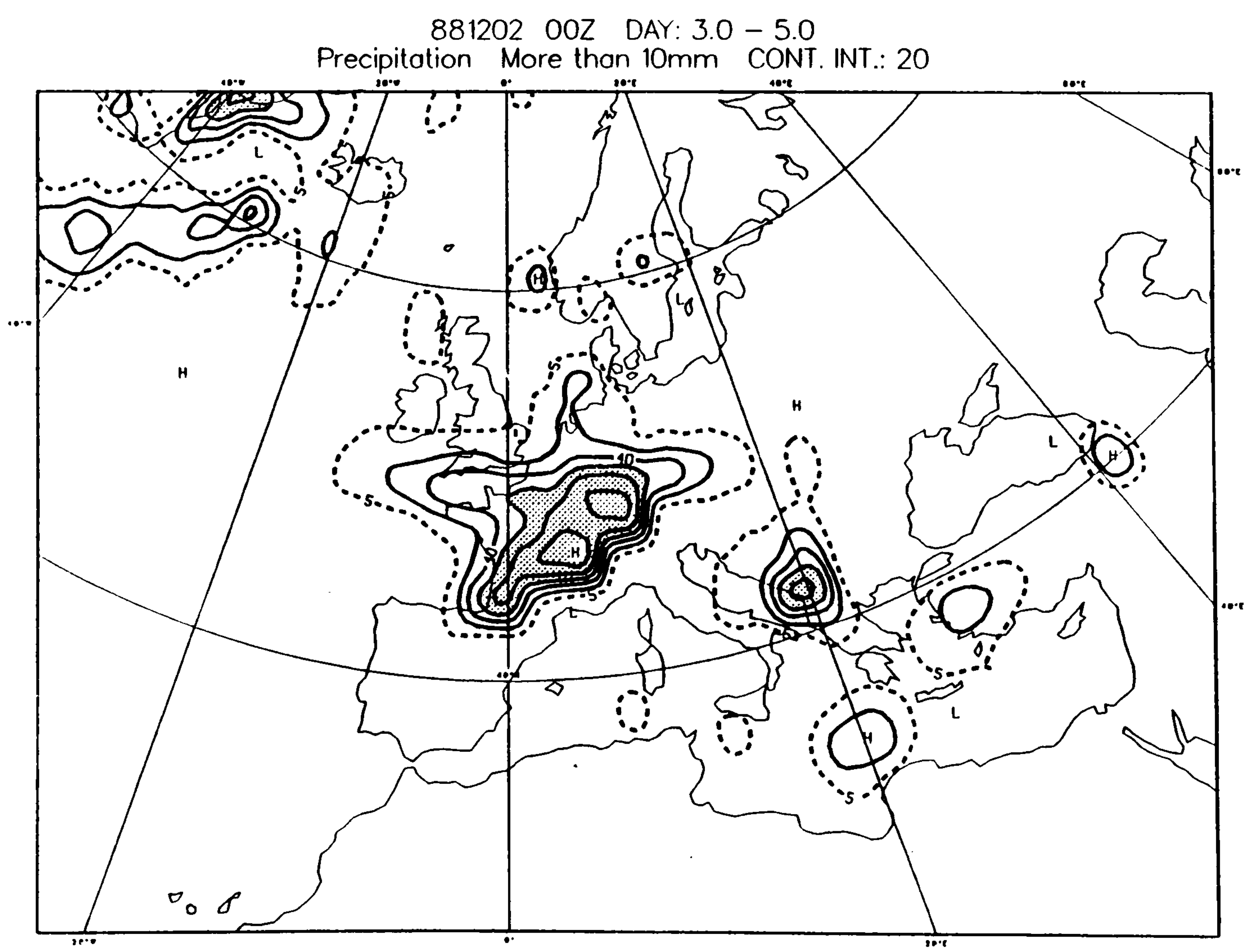

Fig. 3 b): Monte Carlo forecast of rainfall between day 3 and day 5 from 2 December 1988. Contours show probability that rainfall will exceed 10 mm/day. Contours 5%, 20%, 40%, 60%, 80%, 100%. Stippled area indicates probability greater than 60%.

while more extensive than the Yugoslavian rain in the deterministic forecast, has much less probability than the Yugoslavian rain in the Monte Carlo forecast.

In principle, any variable produced by the model (e.g. wind speed, surface temperature) can be treated in this way. On the longer timescale, in situations of severe drought, the Monte Carlo forecast may be able to give indications of possible breakdown in a large-scale blocking pattern.

It might be asked how well the particular example shown above verified against observations. Not all the local rain maxima predicted with high probability were well located. Of course, since one is discussing probabilities, rather than definite predictions, this may not invalidate the forecast. On the other hand, as discussed above, the technique used to produce this ensemble is not seen as likely to give the best results; in particular, it is likely to be biased towards high probabilities because the perturbations are not designed to project onto modes of instability.

Conclusions

In order to provide an a priori estimate of forecast confidence, multiple integrations of a numerical weather prediction model can be made from analyses which differ by amounts consistent with uncertainties in data. Such a technique gives an essentially probabilistic forecast. Before any operational implementation, however, it is important that forecasters themselves be able to determine the most useful real-time products that could be made available from the Monte Carlo forecast. (Readers in our Member States are invited to comment on this matter.)

A crucial aspect in the production of the initial ensemble is the knowledge of the most rapidly growing meteorological modes of instability of the actual flow. Techniques to calculate these modes are based on recent dynamical theory, which itself has arrived in part from a return to very idealised instability studies. In this sense it can be argued that dynamical theory will be directly relevant to current and future developments in numerical weather prediction.

- T. Palmer, R. Mureau, F. Molteni

References

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Leith, C.E., 1974: Theoretical skill of Monte Carlo forecasts. Mon.Wea.Rev., 102, 409-418.

LaCarra, J.-F., and Talgrand, O., 1988: Short-range evolution of small perturbations in a barotropic model. Tellus, 40A, 81-95.

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NEW HIGH SPEED COMPUTING FACILITIES AT ECMWF

At its 31st session held on 29-30 November 1989 the Council approved the Centre's proposed replacement for the existing Cray X-MP/48. The chosen solution was tendered by Cray Research (UK) Ltd. and covers a four and a half year period during which three phases of upgrade will take place.

The first phase, comprising a Y-MP8/8-64 with eight processors, 512 Megabytes of memory, 1 Gigabyte of SSD (Solid state Storage Device) and 60 Gigabytes of disk space (see front cover) is due to be installed by 1 July this year. Its peak performance rate is 2.67 GFlops and it will run the Centre's operational forecast model approximately 3.5 times faster than the present Cray X-MP/48. The cycle time of the Y-MP8 is 6 nsecs; this and the doubling of the number of processors accounts for the increase in speed compared to the current machine.

On 1 July 1992, the Cray Y-MP8 will be replaced by a Y-MP16/12-128 with 12 CPUs and 1 Gigabyte of main memory. It will retain the same amount of SSD and disk space as the previous system. The architecture of the Y-MP16 series is similar to that of the Y-MP8, except that the former has more processors and each processor has twice the number of pipes, so that two results can be generated in each clock period.

In July 1994, the Y-MP16/12-128 will be upgraded to a full 16 processor machine (Y-MP16/16-128). The peak performance of the 12-processor Y-MP16 has been extrapolated from benchmarks carried out on the Y-MP8 and Cray 2 and is expected to be 12 Gigaflops; for the 16-processor version the peak rate is anticipated to be 16 Gigaflops and this upgrade should provide a realisable performance approaching 18 times that of the Cray X-MP/48.

The introduction of the Y-MP8 necessitates transition to the UNICOS operating system, that is, the Cray operating system based on AT&T System V version of UNIX, extensively enhanced to provide facilities suitable for high speed computing facilities. It is functionally equivalent to COS, but many aspects, for instance job scheduling and security in particular, have been brought up to date. The Y-MP8 and Y-MP16 are upwardly compatible, both in UNICOS and in their source code interface, although the Fortran code will need recompilation.

Preparations for the installation of the new computer are now well under way. The Y-MP8 is an extremely compact machine, which means that its initial parallel run with the Y-MP/48 will require minimal reorganisation of the Computer Hall. Nevertheless, the whole telecommunications system has had to be relocated from one end of the Computer Hall to the other. This move is now complete and preparations are continuing with the strengthening of the Computer Hall floor and the installation of additional cooling capacity. UNICOS courses have already been held for those ECMWF staff involved in the migration of major items of software and migration trials have commenced, using a UNICOS system with access via Cray's bureau service in Bracknell. It is hoped to provide Member States with access to the Y-MP8 for migration purposes during the period of parallel running with the old system and Member State user training is planned at ECMWF for September. Details of these courses will be published in due course.

\- Pam Prior

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MicroMAGICS: AN OVERVIEW

MicroMAGICS (Meteorological Applications Graphics Interactive Colour System for Microcomputers) is a software system for the interactive display and animation of meteorological 2-D scalar and vector fields, whose graphical functions enable the plotting of contours, wind fields, streamlines and isotachs.

The MicroMAGICS system is an adaptation of the MAGICS/GKS software package from ECMWF for meteorological charts plotting including a user-friendly interface and an animation module. Through an agreement between CPTEC (Centro de Previsao de Tempo e Estudos Climáticos) and ECMWF, CPTEC was responsible for making the conversion to microcomputers, with technical assistance from ECMWF.

MicroMAGICS was developed to operate in a standard PC environment (MS-DOS operating system with EGA graphics board) and it is based on the GKS standard.

MicroMAGICS contouring is based on a linear contouring package developed at the Image Processing Department of Brazil's Institute for Space Research. MicroMAGICS streamline plotting is based on an algorithm supplied by Florida State University to ECMWF.

Data fields to be plotted must comply with the GRIB standard format, on regular and Gaussian grids. Due to microcomputer processing limitations, data in spherical harmonics format is not accepted. A conversion from the GRID standard to GRIB is included as one of the utilities.

MicroMAGICS does not support observation plotting. However, a later version of it will enable the plotting of BUFR-encoded observational data.

The output of MicroMAGICS can also be made in the standard GKS metafile format. Therefore, the graphics generated on the screen can be shown on any device that supports the GKS standard.

MicroMAGICS features

Important features of MicroMAGICS include:

- user-friendly interactive interface
- animation capabilities
- default values for all plots
- comprehensive list of simple English language parameters
- storage and retrieval of typical parameter sets (specification groups)
- extensive use of colour

- selection of geographical area and direct projection of data
- zooming facilities
- shading between contour lines
- device independence, by use of GKS and metafiles
- support for WMO standard GRIB

MicroMAGICS working environment

MicroMAGICS was designed with the following user perspective in mind:

- The environment consists of an IBM-PC or compatible, using the MS-DOS operating system, with a standard EGA graphics board.
- The data is composed of meteorological fields or graphical plots on standard formats, already resident on the micro-computer. The fields are in the GRIB format.
- The typical user is interested in generating and animating a sequence of plots.

In normal operational mode, the user first selects a sequence of fields for examination, establishing which graphical function and geographical area are desired for each field. As each plot is generated on the screen, the user may save it for creating an animation sequence. In this case, a frame (slide) is created; after a sequence of frames (slides) is generated, the user may view them in a carousel-like fashion.

MicroMAGICS enables the storage and retrieval of a set of parameters to generate the plots (called a specification group). This mechanism is very useful when it is already known how the output appears. The user has complete control over the plots to be generated, since the plotting parameters are shown as a comprehensive list of English-language parameters.

A facility for batch processing is also available. In this case, the user may specify a sequence of actions to be performed by the system.

General concepts

The following concepts represent the "building blocks" of MicroMAGICS:

- GRIB files: primary source of input data; each file contains one or more GRIB fields. GRIB fields relating to the same meteorological variable (in the same forecast) are grouped together as field sequences.
- Specification Groups: a specification group is a set of MicroMAGICS parameters. All of MicroMAGICS actions are associated with two types of specification groups:

- Action specification group: choice of parameters for the graphical functions to be applied to the data. The action specification group may refer to a contouring action (including shading) or to a wind (vector) field plotting (including arrows, flags and streamlines).

- Map specification group: controls the output generation and associated information (including page layout, geographical area, map projection and text).

• Chart Sequences: MicroMAGICS stores graphical pictures corresponding to successive time-steps of a meteorological field together in a chart sequence. Each sequence may contain one or more charts.

• Carousel: a sequence of slides used for animation purposes. A slide results from storing a chart plotted on the graphics screen in an image-like format. This special format is used for faster retrieval of the slides.

<u>Interactive interface</u>

The user interface in MicroMAGICS is composed of a set of menus; the interactive interface is "product-oriented". In a normal operating mode, the user would decide beforehand what the final products to be generated by the system are and how they should appear on the screen. It is composed of 5 command menus:

• The DATASEL menu, where the input data are chosen.

• The VIEW menu, where the graphical output is controlled.

• The SPECGROUP menu, where the user may inspect or modify the specification groups currently available.

• The BATCH menu, where a batch processing sequence of commands can be selected and executed.

• The UTILITIES menu, where general book-keeping and maintenance functions are executed.

The DATASEL option enables the user to select one of the following to be viewed: GRIB-encoded fields, chart sequences and carousels (animation sequences). When selecting a GRIB field, the corresponding action and map specification group must be indicated. A default option is always available.

The VIEW menu controls the graphical output, and the options available are: CREATE CHART (a new chart is created and shown to the user); GRAPHICAL EDITOR (enables graphical manipulation of chart sequences); ANIMATE (animate the sequence of frames selected by the user).

The SPECGROUP menu enables the user to select, modify, create and delete specification groups.

The BATCH menu has two options: SELECT (a command file is chosen) and RUN (perform the batch operation).

The UTILITIES menu contains general bookkeeping and maintenance functions, such as: conversion from GRID to GRIB, file deletion and colour palette display.

Contour plotting

MicroMAGICS contouring is based on a fast, linear method. A smoothing procedure is added to enhance the visual appearance of the lines. The parameters enable the user to define the contour levels required and related attributes.

Wind field plotting

Wind fields can be plotted as standard WMO flags, or as wind arrows. There are also facilities for streamline and isotach plotting.

Wind fields can also be plotted in MicroMAGICS combined with any other meteorological variable (such as temperature). In this case, the colour of the wind arrow (or flag) is determined by the relevant parameter.

- G. Camara, J. Daabeck, P. O'Sullivan

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COMPUTER RESOURCE ALLOCATION TO MEMBER STATES

At its 31st session, the Council approved the allocation of computer resources to Member States for 1990 as shown below. These allocations came into effect on Monday, 1 January 1990.

Details of how a unit is constructed are given in ECMWF Computer Bulletin B1.2/1. For guidance, note that for the 'average' job 1500 Cray units equal approximately 1 CP hour.

Table 1: Allocation of Cray resources and data storage to Member States in 1990

	Cray (kunits)	Data (Gbytes)
BELGIUM	300	10.1
DENMARK	253	8.6
GERMANY	1291	43.6
SPAIN	436	14.7
FRANCE	1073	36.3
GREECE	218	7.4
IRELAND	186	6.3
ITALY	894	30.2
YUGOSLAVIA	239	8.6
NETHERLANDS	385	13.0
NORWAY	255	8.6
AUSTRIA	273	9.2
PORTUGAL	191	6.5
SWITZERLAND	333	11.3
FINLAND	248	8.4
SWEDEN	324	11.0
TURKEY	249	8.4
UK	952	32.2
TOTAL	8100	273.9
SPECIAL PROJECTS*	900	26.1
OVERALL TOTAL	9000	300.0

* This allocation is distributed between Special Projects as shown in Table 2 overleaf.

Table 2: Special Projects Allocations 1990

Member State	Institution	Project Title	1990 Resources Requested	
			Cray Kunits	Data Storage Gbytes
Continuation Projects				
Austria	Institut für Meteorologie und Geophysik, Vienna (Hantel)	Subsynoptic vertical heat fluxes: Comparison diagnosed vs. modelled data	25	1.5
France	CNET/CRPE, Issy-les Moulineux (Eymard)	Determination of ocean surface heat fluxes using satellite data and the ECMWF model	25	1.4
	Laboratory of Atmospheric Optics University of Science and Technology, Lille (Fouquart)	Intercomparison of radiation codes for climate models	20	1.0
Germany	Institute for Geophysics and Meteorology, Cologne (Speth)	Interpretation and calculation of energy budgets	15	0.4
	Fraunhofer Institut für Atmosphärische Umweltforschung, Garmisch-Partenkirchen (Seiler)	Container Project	5	1.0
	Institute for Geophysics and Meteorology, Cologne (Raschke/Rockel)	Parametrization of radiation and clouds for use in general circulation models	20	0.2
Italy	Istituto per lo Studio della Dinamica delle Grandi Masse, Venezia (Cavaleri)	Testing and applications of a third generation wave model in the Mediterranean Sea	25	0.5
	FISBAT-CNR, Istituto di Fisica "A. Righi", Bologna (Speranza)	Statistical properties of a symmetrically forced atmospheric circulation	10	0.5
Netherlands	KNMI, De Bilt (Komen)	Testing and evaluation of a third generation ocean wave model at ECMWF	260	2.0
	KNMI, De Bilt (Siegmund) and UK Met Office, Bracknell (Mitchell)	Analysis of a CO_2-experiment performed with a GCM	15	0.1
	KNMI, De Bilt (Kattenberg)	North Atlantic ocean modelling	25	1.5
	KNMI, De Bilt (Haarsma/v Dorland)	CO_2 transient atmosphere model	25	1.0
	KNMI, De Bilt (Duynkerke/Cuijpers)	Large eddy simulation of stratocumulus	20	1.0
United Kingdom	Imperial College of Science and Technology, London (Marshall)	A North Atlantic ocean circulation model for WOCE observing system simulation studies	60	5.0
	Meteorological Office, Bracknell (Bromley/Cullen)	Model intercomparison project	15	1.0
Yugoslavia	University of Belgrade, Belgrade (Mesinger/Janjic)	Contamination modelling	35	1.0
New Projects				
France	CNRM, Toulouse (André)	Impact of land-surface processes on atmospheric circulation	150	2.0
Sweden	SMHI, Norrköping (Gustafsson)	The HIRLAM 2 project	150	5.0
		TOTAL REQUESTED	900	26.1
		AMOUNT AVAILABLE	900	30.0

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MIGRATION OF LIBRARIES MAINTAINED BY USER SUPPORT TO UNICOS

Introduction

User Support is currently responsible for maintaining the following libraries:

NAG library
IMSL library
ECLIB.

The proposed migration plans for each of these libraries are given below and will be adhered to, unless users inform ECMWF User Support Section of overriding reasons to change them.

NAG

The NAG library will be migrated to UNICOS. This is not expected to be a problem, as all code is Fortran.

IMSL

It is not intended to migrate this library to UNICOS. It has, in fact, evolved into three separate libraries (with separate pricing for each section), MATH/LIBRARY, STAT/LIBRARY and SFUN/LIB corresponding to the maths library, statistics and special functions sections. In ECMWF Computer News Sheet No. 222 (September 1988) existing and prospective users of IMSL were asked to contact User Support, if there was a continuing requirement for this library (or parts of it). Would any users who still wish any part or parts to be kept please contact User Support giving the routines/section used and the purpose for which they are required.

ECLIB

ECLIB is the most complicated of the three libraries, as it comprises a number of different parts and each will require different action. There are six categories involved:

1. Fortran code that is not COS dependent and does not do I/O (Input/Output) internally - this should pose no migration problems (majority of library)

2. Fortran that is not COS dependent but does some I/O or file handling - this can usually be migrated by changing the code to use OPEN statements rather than COS dependent features such as ATTACH/ATTACHL/ACCESS (e.g. MARSINT subroutines)

3. Routines that are written in CAL but do not use COS features and which do not do I/O - these should migrate satisfactorily, albeit with some minor changes needed. Examples of this type are SYMINV, MATCH, FFT codes

4. Routines/packages which do I/O in CAL (e.g. Random I/O package, CONVERT) or use COS dependent features (e.g. GETHLM) - these would require considerable effort to migrate to UNICOS

5. Fortran routines using COS dependent features - these will not be ported

6. Obsolete routines will be removed (e.g. general purpose plotting package GP routines, TIMING, XREF etc.).

Routines in categories 1, 2 and 3 will be automatically migrated to UNICOS, but it is not intended to migrate any routines in categories 4-6, unless there is justified user demand. A comprehensive list of ECLIB routines and their type has been distributed to Member State Computing Representatives, and users who are concerned that routines they use might be in categories 4-6 should consult this list, and contact User Support as soon as possible, if they foresee problems. Suggested alternative replacements are given where applicable.

Please note that only the stack version of the library will be migrated to UNICOS. Those who use NEXT(PROD=ECLIB,SEQ=MULTI) will already be using this version. Anyone using LAST(PROD=ECLIB) or using NEXT without the SEQ=MULTI parameter will be using a statically compiled version. Such users should check that their code runs correctly with the stack version as soon as possible.

- Andrew Lea, John Greenaway

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WITHDRAWAL OF SUPPORT FOR SOME CRAY PACKAGES

It has been decided that the following Cray packages will not be migrated to UNICOS. They will, therefore, cease to be supported once the COS system is terminated.

Please check now whether any of your programs use one or more of these packages. If you are not sure what to replace them with, please contact User Support.

GRAPHICS

Contour Package (CONTLIB)	ECMWF's first graphics contouring package
Varian Basic Software (VARLIB)	Low level graphics package
QMSLIB Library	Support for the Varian Basic Software to drive the QMS plotters
GPGRAPH Package	A very old x-y plotting package (part of ECLIB)

LIBRARIES

IMSL	The general purpose mathematical & statistical library
NCARLIB	The NCAR library

UTILITIES

CONVERT	Converts between Cray and Cyber (NOS/BE) word formats
RDMS, WRMS, etc.	ECMWF's original random I/O package
TIMING	Package which reported on the time taken in each part of a user's program
XREF	A global cross referencing utility for use on Fortran codes

SYSTEM SOFTWARE

LDR	The old loader LDR is not provided under UNICOS by Cray
CFT	The original Cray Fortran compiler is not supported on Y-MP systems

- Andrew Lea

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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 or republished in this Newsletter series (up to News Sheet 243). All other News Sheets are redundant and can be thrown away. (Please note that termination of the NOS/BE operating system service has resulted in many News Sheets recently becoming obsolete.)

No.	Still Valid Article
89	Minimum field length for Cray jobs
135	Local print file size limitations
158	Reduction in maximum print size for AB and AC
187	Maximum memory size for Cray jobs
194	Preventive maintenance schedules
201	New Cray job classes
204	VAX disk space control
205(8/7)	Mispositioned cursor under NOS/VE full screen editor
207	FORMAL changes under NOS/VE
	Job submission from within a Cray job, using LAUNCH
208	Restriction of Cray JCL statement length
212	MFICHE command from NOS/VE
214	NAG Fortran Library Mark 12
	News Sheets on-line
215	MARS - data retrievals and model changes
219	MARS-Retrieval of most recent fields extraction utility
223	Corrections to ECFILE bulletins B8.3/1 and B8.3/2
	Aborting programs under VAX VMS
224	CRAY deferred class
	Job information cards
226	CRAY Class X
227	Extension of NOS/VE SUBCJ.
229	ECFILE audit facility
230	Access to AB printer via NOS/VE CDCNET
	Replot facility for DISPLOT
231	METGRAM under NOS/VE
232	NOS/VE passwords - how to change
235	VAX public directory - how to create
236	Alternative VAX graphics service for in house users
241	SENDTM - Cray file transfer to Member States
242	MARS - various changes

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TABLE OF TAC REPRESENTATIVES, MEMBER STATE COMPUTING REPRESENTATIVES AND METEOROLOGICAL CONTACT POINTS

Member State	TAC Representative	Computing Representative	Met. Contact Point
Belgium	Dr. W. Struylaert	Mme. L. Frappez	Dr. J. Nemeghaire
Denmark	Dr. A.M. Jørgensen	Mr. P. Henning	Mr. G.R. Larsen
Germany	Dr. R. Lamp	Dr. R. Lamp	Dr. Rüge
Spain	Mr. T. Garcia-Merás	Mr. J. Juega	Mr. R. Font Blasco
France	Mr. J. Goas	Mr. J.-P. Quinto	Mr. J. Goas
Greece	Mr. G. Barbounakis/ Mr. D. Katsimardos	Mr. I. Iakovou	Mr. A. Kakouros
Ireland	Mr. W.H. Wann	Mr. D. Murphy	Mr. P.M.P. McHugh
Italy	Dr. M. Capaldo	Dr. S. Pasquini	Dr. M. Conte
Yugoslavia	Dr. S. Nicković	Mr. M. Gavrilov	Mr. S. Nickovic
Netherlands	Mr. S. Kruizinga	Mr. H. van Soest	Mr. G. Haytink
Norway	Mr. K. Björheim	Ms. R. Rudsar	Mr. O. Nielsen
Austria	Dr. G. Wihl	Dr. G. Wihl	Dr. H. Gmoser
Portugal	Mr. A.P. Da Costa Malheiro	Mrs. M. de Lurdes Leitao	Mrs. M.I.S.A. Barros Ferreira
Switzerland	Mr. M. Haug	Mr. B. Bachofner	Mr. M. Schönbächler
Finland	Dr. M. Alestalo	Mr. T. Hopeakoski	Mr. P. Kukkonen
Sweden	Mr. H. Larsson	Mr. S. Orrhagen	Mr. R. Joelsson
Turkey	Mr. F. Geyik	Mr. F. Geyik	Mr. F. Geyik
United Kingdom	Dr. R. Wiley	Dr. A. Dickinson	Mr. R.M. Morris

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WORKSHOP ON METEOROLOGICAL OPERATIONAL SYSTEMS

The Second Workshop on Meteorological Operational Systems was held at ECMWF on 4-8 December 1989 with 58 participants, mainly from the Member States, but also a large proportion (40%) from all over the world. The programme was organised into lectures and working group sessions, with a final plenary session for the discussion of the working group reports on the last day.

The objective of the workshop was to review the progress made in establishing standards for the representation and presentation of meteorological data. Operational systems, which are essential to support numerical models in order to generate, preprocess, postprocess, monitor and display data were examined with a particular view to utilisation of such standards. The workshop was therefore organised under the following main subjects:

1. The use of binary data representation in meteorological systems

2. Observational meteorological data - requirements and monitoring

3. Visualisation of meteorological data.

A working group was formed for each of the subjects, to discuss basic issues in those fields and make recommendations for future work.

The working group on binary data representation discussed enhancements to the GRIB and BUFR code. Its report will provide valuable input for the WMO Working Group on Data Management, meeting in Geneva in March 1990. Recommendations on a further standardisation of data monitoring procedures and the exchange of the results between participating GDPS centres were made by the group on data monitoring. The working group on graphics in meteorology concentrated on the processing and display of satellite image data, the format of data exchange and the required graphics function. The report of this last group provides useful guidance in an area which is now becoming increasingly important at ECMWF, but also in the Member States.

The proceedings from the workshop, including the working group reports and the available papers presented at the meeting, are in preparation and will be published within the next few months.

- Horst Böttger

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THE ECMWF ANNUAL SEMINAR

The ECMWF Annual Seminar, entitled "Tropical extra-tropical interactions" will take place during the week of 10-14 September 1990.

The last two decades have seen extensive developments in our understanding of the behaviour of the tropical atmosphere on many time scales. The importance of tropical ocean-atmosphere interactions for inter-annual (e.g. El Niño Southern Oscillation) variations over the globe can now be clearly seen; there is extensive evidence for the global importance of seasonal monsoon phenomena, and clear evidence relating tropical intra-seasonal (30-60 day) oscillations to mid-latitude blocking events. Also, of course, there are regular reminders of the ferocity of tropical cyclones when they become extra-tropical.

The seminar will cover the following topics:

- general circulation of the tropical atmosphere;
- low frequency variability in the tropics and extra-tropics;
- modelling the tropics and operational forecasting.

The seminar will provide a timely and up-to-date pedagogical review of tropical circulations and their global influence, and of our ability to simulate and forecast the phenomena.

The format of the seminar will be the same as in previous years - formal lectures by invited speakers and staff from the Centre, followed by publication of the proceedings of the seminar.

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ECMWF CALENDAR

12 (pm)-16 April	ECMWF holiday	
23 April-15 June	Meteorological Training Course	
	Met 1	Numerical methods, data assimilation, adiabatic formulation, satellite data (23 April-11 May)
	Met 2A	Parametrization (14-24 May)
	Met 2B	General circulation, systematic errors and predictability (29 May-1 June)
	Met 3	Use and interpretation of ECMWF products (4-15 June)
2-3 May	Council - 32nd session	
7 May	ECMWF holiday	
25-28 May	ECMWF holiday	
27 August	ECMWF holiday	
10-14 September	Seminar: Tropical-extratropical interactions	
17-28 September	Computer user training course	
1-3 October	Scientific Advisory Committee - 18th session	
3-5 October	Technical Advisory Committee - 15th session	
9-11 October	Finance Committee - 45th session	
12-15 November	Workshop: Clouds and the hydrological cycle	
26-30 November	Workshop on parallel processing	
3-4 December	Council - 33rd session	
24-26 December	ECMWF holiday	

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ECMWF PUBLICATIONS

TECHNICAL MEMORANDUM NO. 164:	Software organization of the variational analysis: format of observations
TECHNICAL REPORT NO. 64:	Impact of a change of radiation transfer scheme in the ECMWF model
SEMINAR PROCEEDINGS:	Data assimilation and the use of satellite data, 5-9 September 1988 (2 volumes)
FORECAST REPORT:	Latest issue no. 47, June-August 1989

ECMWF REPORT 1987-1988

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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.

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* T indicates the original Technical Newsletter series

USEFUL NAMES AND 'PHONE NUMBERS WITHIN ECMWF

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Head of Operations Department	-	Michel Jarraud	OB 010A	2003
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	-	Telefax (No. 869450)		
	-	VMS MAIL adressed to ADVISORY		
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Project Identifiers	-	Pam Prior	OB 225	2384
User Identifiers	-	Tape Librarian	CB Hall	2315
COMPUTER OPERATIONS				
Console	-	Shift Leaders	CB Hall	3333
Reception Counter) Tape Requests)	-	Tape Librarian	CB Hall	2315
Terminal Queries	-	Norman Wiggins	CB 028	2308
Telecoms Fault Reporting	-	Michael O'Brien	CB 035	2306
DOCUMENTATION	-	Pam Prior	OB 225	2384
Distribution	-	Els Kooij-Connally	Library	2751
LIBRARIES (ECLIB, NAG, CERN, etc.)	-	John Greenaway	OB 226	2385
METEOROLOGICAL DIVISION				
Division Head	-	Horst Böttger	OB 007	2060
Applications Section Head	-	Rex Gibson	OB 101	2400
Operations Section Head	-	Bernard Strauss	OB 004	2420
Meteorological Analysts	-	Taskin Tuna	OB 005	2424
	-	Alan Radford	OB 002	2421
	-	Alex Rubli	OB 003	2425
Meteorological Operations Room	-		CB Hall	2426/2427
COMPUTER DIVISION				
Division Head	-	Geerd-R. Hoffmann	OB 009A	2050
Systems Software Section Head	-	Claus Hilberg	CB 018	2350
User Support Section Head	-	Andrew Lea	OB 227	2380
Computer Operations Section Head	-	Peter Gray	CB 023	2370
GRAPHICS GROUP				
Group Leader	-	Jens Daabeck	OB 016	2375
RESEARCH DEPARTMENT				
Head of Research Department	-	David Burridge	OB 119A	2005
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* CB - Computer Block   OB - Office Block

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