European Centre for Medium Range Weather Forecasts

ECMWF NEWSLETTER

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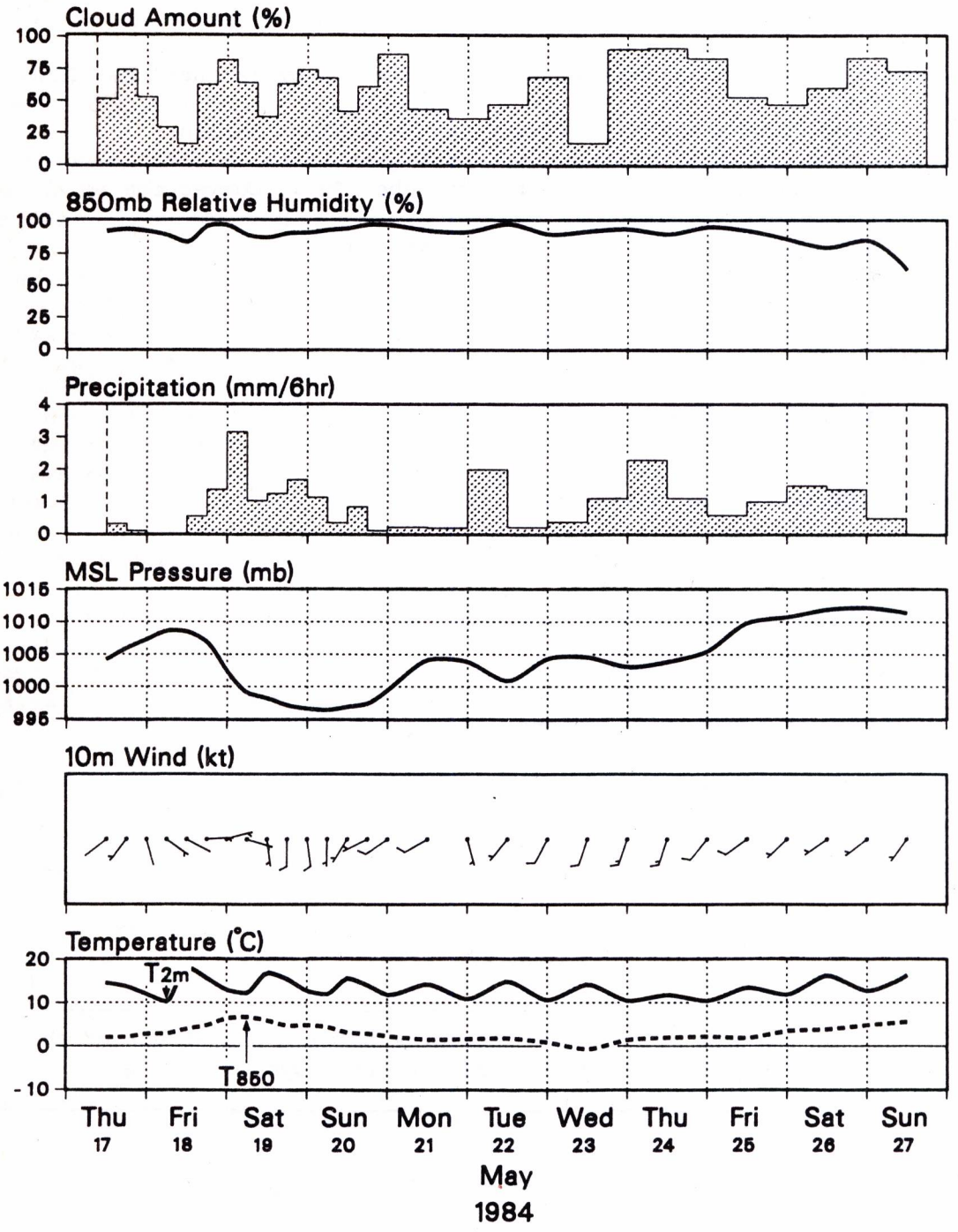
Number 26 - June 1984

BRUXELLES (B) 51° N 5° E

ECMWF Forecast from 17 May 1984 12 GMT



Page

IN THIS ISSUE

METEOROLOGICAL

COMPUTING

COMPUTER USER INFORMATION

GENERAL

COVER: An example of an ECMWF meteogram showing the effect of the introduction of the diurnal radiation cycle

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This Newsletter is edited and produced by User Support.

The next issue will appear in September 1984

THE INTRODUCTION OF THE DIURNAL RADIATION CYCLE INTO THE ECMWF MODEL

A diurnal cycle of solar radiation was introduced into the physical parameterisation scheme of the ECMWF operational model on 1 May 1984. A series of tests carried out before the operational introduction of the diurnal cycle indicated that there is no significant impact on the upper-air height,wind,and temperature fields (standard operational products) away from the model's boundary layer - apart from the small amplitude of the diurnal and semidiurnal atmospheric tides which are now to be found in the forecast fields. Consequently, objective verification scores can be expected to remain unchanged, and systematic errors do not seem to be affected.

This new formulation replaces the previously used daily average radiation properties, and has a noticeable influence mainly on boundary layer temperatures, but also on weather parameters such as relative humidity, cloudiness and to a lesser extent, 10m winds and precipitation.

This article will attempt to highlight those changes in the forecast products that are most likely to be important for users.

The products which show the impact of the changes most significantly are among those used for the ECMWF Meteograms. The example of such graphs for Belgrade, given in Fig. 1, serve to illustrate the most important features:

1. Cloudiness and relative humidity:

The cloudiness parameter of the model is a function of relative humidity. This, in turn, depends on the model temperatures. It can be seen that around local noon (approx. 12 GMT), when the temperatures reach their daily maximum, the relative humidity at 850mb drops, and consequently a relative minimum of cloudiness is predicted. The presence of convective clouds is at present underestimated, and therefore the usual increase in cloud cover in situations where convective activity is high will not be found in the forecasts.

2. Precipitation:

The introduction of the diurnal cycle had little impact on the predicted precipitation amounts over most areas, but an increase in the precipitation predicted over steep topography in summer may be experienced. In the Tropics, a diurnal variation with most precipitation predicted in the afternoon can be found.

3. Mean Sea Level Pressure:

In areas of high model topography the necessary downward extrapolation of surface pressure,which is dependent on the temperatures at the lowest model level, leads to a diurnal variation of mean sea-level pressure similar to the one found in observations from high level Synop stations. The corresponding "heat low" e.g. over Spain at 12 GMT appears quite realistic in the forecasts.

4. 10m Winds:

The only visible change to this parameter was found over large mountain massifs, e.g. Himalayas, Andes, where mountain-valley wind systems with upslope winds during daytime and katabatic winds at night are now seen.

5. Temperatures:

The 2m Temperatures of the model show the influence of the diurnal cycle very strongly. The predicted amplitudes closely match the ones found in the synoptic observations, and are realistic in most cases.

In areas of high model topography a bias correction based on the difference between model and station heights still needs to be applied and provides good results. Both raw and bias corrected 2m Temperatures are available for dissemination to Member States.

Users of these temperatures should be aware,however, that the predicted diurnal variation will depend on the surface conditions in the model: for example, if grid points are defined as sea points in the land-sea mask, only a very small amplitude will be found. This is particularly important to bear in mind where secondary grids interpolated from the model grid are being used. Where the model topography is near or above the 850mb level, a strong daily variation of 850mb temperatures has also to be expected.

Generally it could be said that the introduction of the diurnal cycle of radiation has led to more realistic near-surface parameters in most conditions. Further improvements, e.g. in the cloudiness parameter, will depend on developments in the convection scheme and the treatment of the planetary boundary layer.

- Herbert Pümpel

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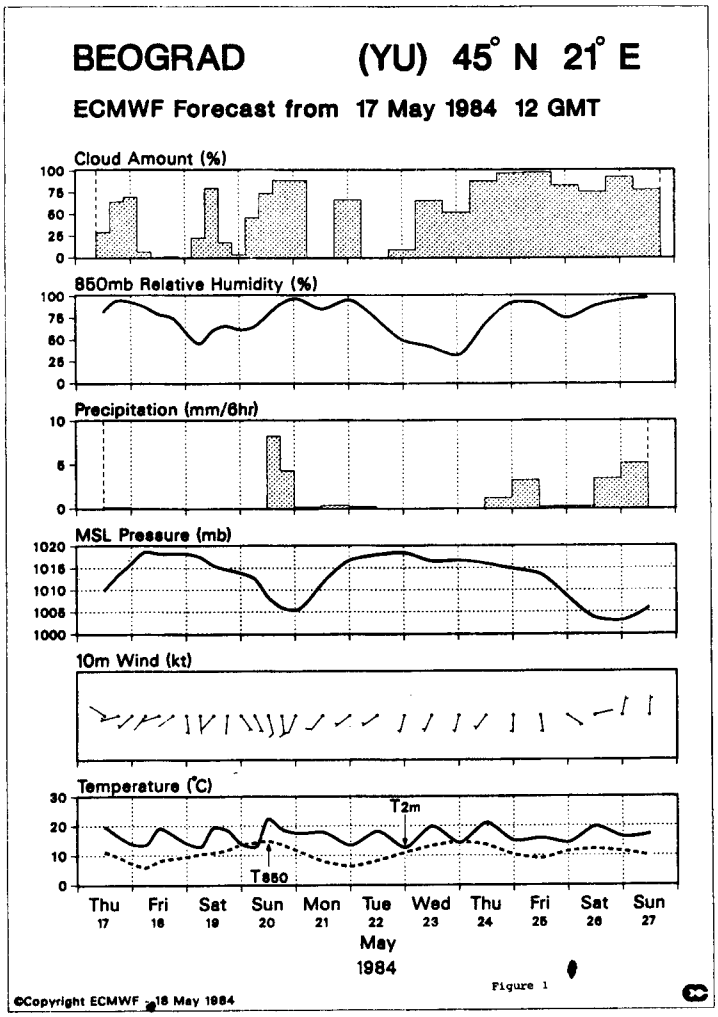

Figure 1

ECMWF STRATOSPHERIC FORECASTS FOR STRATALERT BERLIN

The following article has been received from the Freie Universität Berlin, describing how ECMWF forecast products are used to produce daily bulletins on the state of the circulation in the stratosphere.

"The STRATALERT messages are prepared daily during winter and give advice to experimenters on the state of the circulation in the stratosphere. The main objective is to help in the scheduling of special experiments, like flights into "polar stratospheric clouds" within the extremely cold polar vortex, or detailed measurements during minor and major stratospheric warmings. The latter was one objective of the MAP/WINE campaign (Winter in Northern Europe) which took place during the winter over Northern Scandinavia.

For the forecast development of planetary waves and warmings in the stratosphere, the 3- and 5-day forecasts from ECMWF were used extensively. Starting on December 15, 1983, we received daily bulletins from ECMWF via Deutscher Wetterdienst, Offenbach, consisting of the 3- and 5-day forecasts for 30 hPa in spectral components of height waves 1,2 and 3, for latitudes 40°, 50°, 60°, and 70°N. From these components we calculated the amplitudes and phases of the planetary waves, and grid points for plotting the predicted fields. These forecasts gave valuable information on the development of the circulation, which was used for the preparation of the daily STRATALERT report. Fig. 1 shows a comparison of the amplitudes of height wave at 60°N, as analysed in Berlin, with the predicted values at day 3 and 5, respectively. The relatively uniform distribution around the line of zero deviation does not indicate a systematic error at day 3; however, at day 5 the amplitudes are often too large. This might be due to the model's tendency to deepen the lows too much, as mentioned by E. Klinker (ECMWF Newsletter, No.14, April 1982). The correlation coefficients between the Berlin analyses and the ECMWF prognoses were 0.90 for day 3, and 0.86 for day 5. Similar values were found for wave 2.

Fig. 2 shows the westward movement of height wave 1 (at 60°N) during the period of one month. In general, the phases are in very good agreement. This period was characterised by undisturbed winter conditions in the lower stratosphere, with a very cold polar region at the end of January (Fig. 3.). Minor warmings developed in the upper stratosphere following two peaks of wave 1 in mid-January and at the beginning of February, but these were accompanied by strong amplitudes of wave 2. It is well known, however, that "major" warmings develop if height wave 1 amplifies concurrently with a pronounced minimum of height wave 2. Such a development began after 10 February when the travelling wave 1 had reached the position of the quasi-stationary wave (Fig. 2). Now, the westward movement stopped, wave 1 amplified, again well forecast by ECMWF, a very intense "major Final Warming" developed (Fig. 3) and the transition into summer started in the middle stratosphere. Also, the decrease of the total wave activity in the stratosphere due to the transition to easterly winds was well forecast by ECMWF during March. Our experience during this winter shows that the ECMWF stratospheric forecasts are a very valuable help for the preparation of the STRATALERT messages.

Barbara Naujokat and Karin Labitzke, Freie Universität, Berlin

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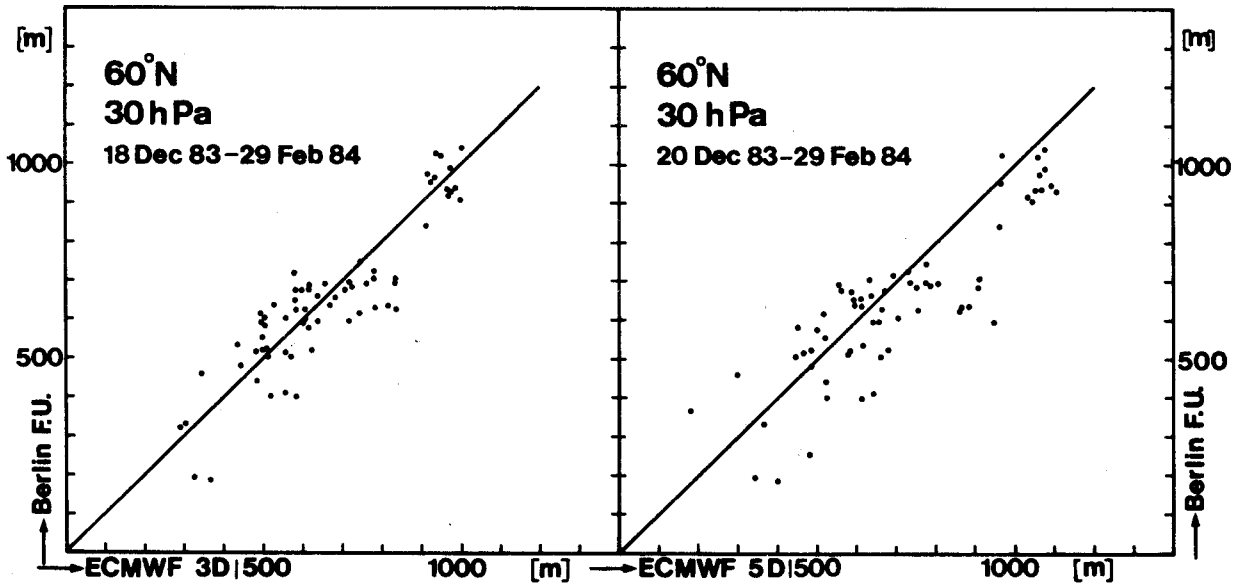

Fig. 1 Comparison of amplitudes [m] of height wave 1 between the analyses of Berlin and the ECMWF 3 and 5 day prognoses, respectively

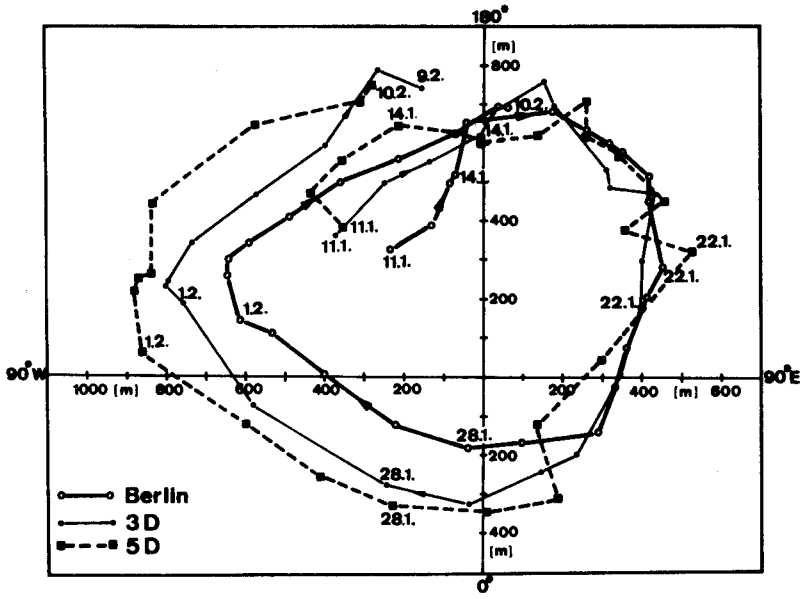

Fig. 2 Polar diagram of height wave 1 at 30 hPa and 60°N, for the analyses of Berlin and the ECMWF 3 and 5 day prognoses. Plots illustrate the amplitude [m] and the phase of the ridge at the indicated date.
Period: 11 January through 10 February 1984

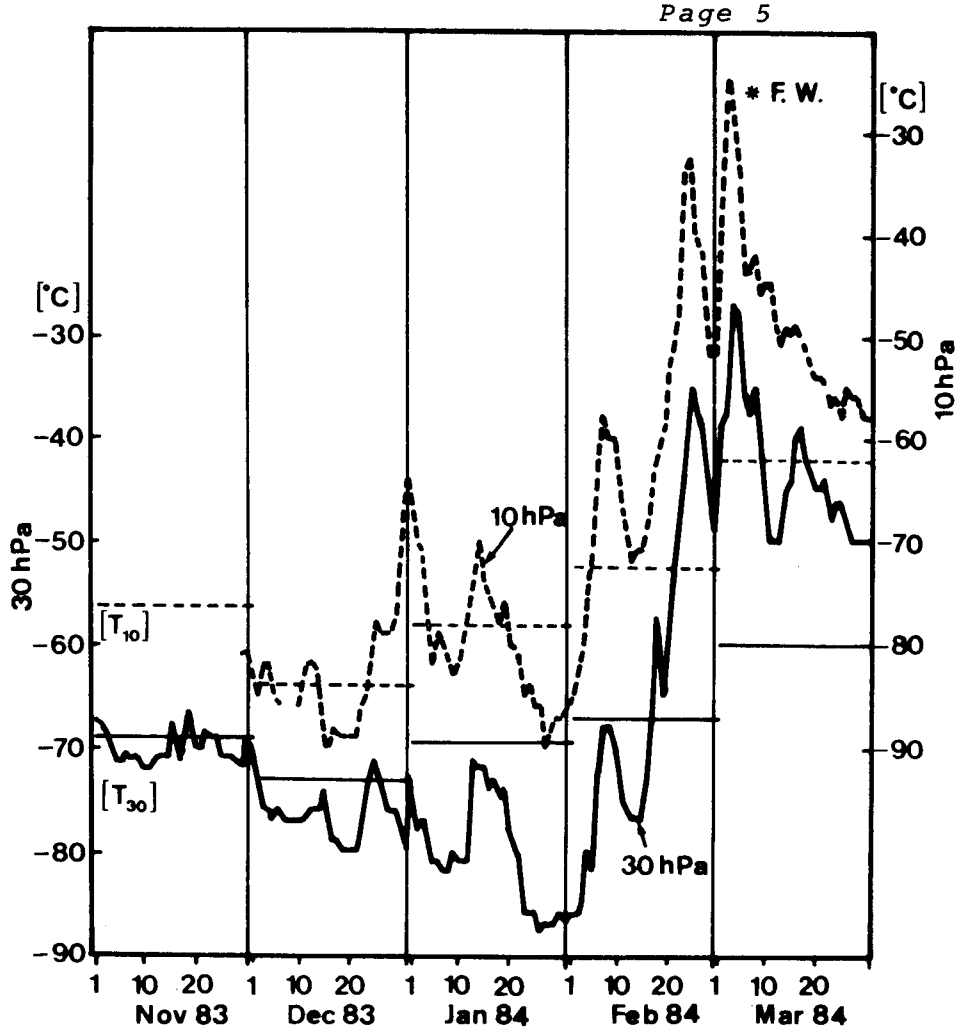

Fig. 3: March of 10 and 30 hPa temperatures [°C] over the North Pole, Berlin analysis (horizontal lines are long-term monthly means)

MONITORING ASAP UPPER-AIR METEOROLOGICAL DATA AT ECMWF

Since 1982 the Canadian and U.S. meteorological services have been operating a mobile upper-air observing programme called the Automated Shipboard Aerological Program (ASAP). Using a modified container carried on board a ship in the Pacific, upper-air soundings are produced almost automatically and are relayed via GOES-West to NCAR, Boulder and further on to the Pacific Weather Centre at Vancouver. These data, from an area otherwise almost devoid of radiosonde observations, are extremely valuable. However, experience so far has shown that the ASAP system suffers from deficiencies in the processing and/or transmission of the data. In cooperation with Atmospheric Environment Service (AES), Vancouver, ECMWF has been monitoring the ASAP/TEMP reports very closely in the past.

A summary of the monitoring period 20 December 1983 to 20 January 1984 is given in Operations Department Technical Memorandum No. 87 which was published in March 1984.

The goal of the ASAP project is to provide a mobile system to obtain upper-air soundings in an efficient and cost effective way. This was achieved by developing a self-contained and portable device, reducing the necessary manpower to a minimum by using automatic data processing and modern communications links.

The ship-board observing system includes the balloon inflation and launcher facility, the sonde tracking and data reception unit, the data processing computer and the transmission system. The system is highly portable, being housed in a container placed on the upper aft deck of the ship. The TEMP data are transmitted via satellite GOES-West to the ground station at NCAR in Boulder, Colorado and relayed from there via minicomputer to AES Vancouver, where they are manually inserted onto the Global Telecommunication System (GTS) of the WMO.

During the voyage (22 December 1983 to 20 January 1984) of the "M.V. Friendship, (call sign ELXP), a container ship participating in the Automated Shipboard Aerological Program (ASAP), the TEMP reports received via the GTS from that ship were monitored carefully at ECMWF. It was agreed with AES Vancouver that at the end of the voyage, ECMWF should receive by mail, copies of the TEMP reports recorded on board ship, copies of the transmission via satellite from the ship to Vancouver via NCAR, Boulder, and copies of the outgoing traffic from Vancouver. Any problems with the TEMPs with respect to coding errors or garbling in transmission could therefore be traced to its source.

Of 32 upper-air observations which were made on board ship, only 26 bulletins reached the Centre, and in 12 cases errors were detected in the code either in part A or part B of the TEMP. Although they were regularly sent from the ship, no EXLP TEMPs part C or D have ever reached ECMWF. The majority of errors in the code were introduced at Vancouver on input of the bulletin into the Global Telecommunication System of the WMO. The observations were of good quality and the transmission from the ship to Vancouver via satellite and onwards on the GTS to ECMWF was satisfactory.

Problems were encountered at ECMWF with the quality control of the TEMPs; for ships, the height of the launching platform of a radiosonde is assumed to be at sea level, whereas in the reported heights an elevation at launch of approximately 20 metres was used.

Full automation, including automatic insertion of the data onto the GTS, will help to overcome the present deficiencies and will provide extremely useful observations and be beneficial to the meteorological community for global data analysis.

The ASAP programme will continue in 1984 and additional ships will be involved in the project providing upper-air soundings from the Pacific and the Atlantic. ECMWF will continue monitoring these observations carefully and give feedback as to its usefulness and quality.

- Horst Böttger

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ECMWF WORKSHOP, 28 NOVEMBER-1 DECEMBER 1983:CONVECTION IN LARGE-SCALE MODELS

Cumulus convection in the atmosphere is one of the main energy producing mechanisms which occur at scales unresolvable by forecast models and which strongly interact with large-scale processes. The accuracy of its parameterisation has become more crucial due to the rapid development and sophistication of numerical weather forecasting and climate modelling. Moreover, it is now evident that the large-scale circulation in the tropical areas has a strong influence on mid-latitude systems and on the general circulation as a whole. The fact that large-scale tropical systems are largely driven by convective processes emphasises the importance of the quality of convective parameterisation schemes.

The requirements of convective schemes are now much more subtle than those which existed when general circulation models were in their infancy, where the main purpose of the convection was to maintain a stable vertical profile. Modern ideas lead to refinements in formulations in order to produce a realistic cloud cover and to take into account radiation interaction and the influence of convection on boundary layer processes. However, the question of how much sophistication is necessary for convective parameterisation in medium range weather forecasting is still open. Furthermore, the relative importance of dynamic transports compared to thermodynamic transports is a very debatable point, to which no answer exists at present.

The workshop was intended to give an overview of the latest development in the field of convection parameterisation in large-scale numerical models. This includes the various steps which lead from the design of schemes to their actual use and validation within models.

The Centre has already dedicated major effort to the development and testing of convection schemes, as well as to theoretical approaches to the impact convection may have on the large-scale dynamics of the atmosphere. The present operational convection scheme, adapted from the "Kuo" scheme has definite shortcomings which may be overcome by present research developments and the main goal of this workshop was to evaluate and compare the various possible alternatives. Special attention was also given to the dynamical impact of diabatic processes, which needs a more global approach to understanding the relationship between dynamical and thermodynamical process.

Apart from the presentations, discussions were held in four working groups on the following topics:

1. Design of the optimal parameterisation scheme and its interaction with other physical processes.
2. Verification methods for convection schemes.
3. The impact of convection schemes on large-scale forecasts and on the climatology of General Circulation Models.
4. Large-scale response to diabatic heating.

A report of the discussions and recommendations of the working groups, along with the papers presented at the workshops, will soon be published by the Centre. Copies of the proceedings can be obtained by writing to the Librarian at the Centre.

- Gilles Sommeria

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DATA ASSIMILATION - A COMPREHENSIVE CHANGE

A substantial revision of the operational Data Assimilation Suite occurred on 22 May 1984. Users of the analyses for diagnostic studies need to be particularly aware of this revision since the impact on the analysed fields is considerable.

The revision is made up of many individual changes (more than 20) which cannot be described in detail here. A full account will be written up as a Scientific Advisory Committee paper, and the ECMWF Data Assimilation Scientific Documentation will be updated in the near future. In summary the changes are:

1. A revision of the optimum interpolation statistics - new first guess error variances, new horizontal and vertical structure functions and newly ascribed observation error values.

2. A revision of the quality control checks of the analysis.

3. A revision of the data selection algorithms of the analysis.

4. A revision in our data usage - in particular, the avoidance of extrapolation of near surface sonde wind data, and the discarding of all land SYNOP wind data.

5. A revision of the analysis in the upper levels such that thickness, rather than geopotential, is now analysed.

The combined effect of these changes on the assimilation can be summarised as:

1. A better fitting of the observational data by the analysis.

2. A better discrimination of correct and incorrect data used in the analysis.

3. Better vertical structure in the analysis increments.

4. Better analysis of surface features over land.

5. Small initialisation increments.

In the Northern Hemisphere, the impact on the analyses is discernible and appreciable; in the Souther Hemisphere and tropics, where the data networks are sparser, the impact is substantial.

As for the ensuing forecasts, tests suggest a modest overall improvement, which is difficult to quantify. For example, based on a sample of 12 test forecasts, the Northern Hemisphere 0.6 anomaly correlation threshold (our most standard measure of skill) is advanced on average by 3 hours; however, this average is very sensitive to the scores of individual forecasts within the sample, and so is not very reliable. A better perspective will be gained after a few months of operational working.

If you have particular queries, or comments, on the changes please contact the Data Assimilation Section.

- Peter Lönnberg

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DISSEMINATION CHANGES

The volume of data that is disseminated to Member States as forecast and analysis products has grown considerably over the years. By last autumn it became clear that the Network Front End Processor (NFEP) had become so overloaded that a degradation in line speeds of a factor of 10 were being observed at peak periods. The NFEP was planned to perform the dissemination of 10 mega-characters over a 10 hour period. In fact, it was endeavouring to disseminate 24½ mega-characters in 5 to 6 hours! Clearly, something had to be done.

A review was conducted, and Member States were requested to discontinue those products which were no longer required, to change, where possible, to ECMWF bit code for efficiency of data compression, and to make use, where appropriate, of a facility to define one "special" area on which to base some of their products.

The response was gratifying and indicated that careful thought and considerable effort had been given to the suggestions made. Many changes have since been made to the catalogue of dissemination products, most are now complete or in the final stages of testing. When the last change becomes operational, the total data volume will have been reduced to less than 21 mega-characters - a reduction of some 15%. It is believed that this reduction has been made without the need to reduce in any way the availability of products (currently in excess of 9,000) to the Member States.

In the longer term the problems associated with the large volumes of data required by Member States will be resolved by the planned replacement of the NFEP in 1985/86. It is envisaged that, with the advent of a New Telecommunications System, a new, comprehensive dissemination service will be possible.

- Rex Gibson

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USING THE CRAY X-MP

1. Introduction

On 13 March 1984 the CRAY X-MP was introduced into full service. Since then all CRAY work, has been run on the X-MP. To most users, the CRAY X-MP will appear so similar to the CRAY-1 that no action will be required of them to enable their jobs to run successfully. There are real differences, however, and these differences will have an impact on the use of the X-MP. The CRAY X-MP possesses several new features which cannot be used optionally until sufficient experience has been gained. Other features can, and are being used already with some considerable success, indicating promise for the future.

2. The CRAY X-MP configuration

A full description of ECMWF's CRAY X-MP was given in Newsletter No. 21 - June 1983, page 16. Figure 1 illustrates the overall system configuration of the CRAY X-MP. Currently, the mainframe and Solid State Storage Device (SSD) are complete, but the Input Output Subsystem (IOS) is somewhat degraded compared to the planned final configuration. 8 DD-29 and 3 DD-19 disks are connected to a buffer input output processor (BIOP). The front-end transfers are controlled by a master input output processor (MIOP). Buffering and IOP communication is performed using the 1 million word IOS buffer memory. Data transfer between the IOS and the CRAY X-MP is via a high speed channel, the maximum transfer rate of which is 100 million bytes per second.

After final acceptance, the 5 DD-19 disks currently attached to the CRAY-1 will be added to the X-MP configuration. The IOS will be enhanced by the addition of a disk input output processor (DIOP), a further high speed channel and 6 DD-29 disks.

3. Use of some CRAY X-MP special features

The ECMWF spectral forecast is by far the major user of CRAY facilities, using in excess of 70% of all available CRAY time. In consequence, initial efforts are being concentrated on improving the performance of the forecast on the CRAY X-MP. The first step was to modify the forecast program to make use of the SSD. This has been completed, enabling a T63 forecast to run to 10 days in 2½ hours, compared with 4 hours when disks are used. Most Research Department experiments now use SSD, and operational forecasts will be modified when final acceptance is complete (currently this is not possible, as the Operational Suite must be capable of being run on the CRAY-1 should problems be encountered with the X-MP). Secondly, work on a multi-tasking version of the forecast has reached an advanced stage. To run high resolution forecasts (e.g. T106) as single tasked jobs on the CRAY X-MP is not efficient, as they require much of the available memory while using only one of the two available CPUs. The multi tasked version will use both CPUs; it will not be as efficient in terms of computer units as the single tasked version but, by optimising its use of resources it will take much less wall clock time (about 1 to 1.7) and consequently reduce the time it would otherwise block other jobs. In this way more units of CRAY X-MP time will become available, and a higher throughput will be achieved.

The ECMWF analysis has also been adapted to use SSD, and will be increasingly run in this mode.

4. Some problems associated with the CRAY X-MP

Although the CRAY X-MP has twice the amount of memory compared to the CRAY 1-A, this has to be shared between two processors. In consequence, it is not in the interests of good throughput to allow user access to the whole memory unless the job concerned is multi-tasked. In practice, some large memory, high resolution forecasts are being run as an aid to research; as mentioned above, all such jobs will be multi-tasked in the near future.

The extra memory bandwidth provided by the additional ports to memory on the CRAY X-MP are an important means to faster processing. Since one aspect of the use of these extra ports, termed "bi-directional memory" is potentially unsafe, it has, initially, been disabled by default. Various articles have been circulated detailing the hazards associated with bi-directional memory. CRAY Reseach have recently modified CFT to guard against most of the potential problems with the result that the majority of ECMWF codes can now be successfully run with this feature enabled. Users may make use of bi-directional memory by coding

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MODE,BT=ENABLE.
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before the LDR statement in their job control. At a later date, after a period to allow users to check their code, this default will be reversed.

The memory of the CRAY X-MP is, like that of the CRAY 1-A, contained in 16 banks. Unlike the CRAY 1-A, a single job can simultaneously read 2 vectors from memory, write one vector to memory and control I/O processes involving a fourth path to memory. These four processes together can cause all 16 banks to be busy simultaneously if ideally overlapped; if not ideally overlapped memory bank conflicts will occur. Consequently when only one job is executing, there is already four times more likelihood of memory bank conflict than was the case on the CRAY 1-A. With two jobs executing, one in each CPU, the likelihood of bank conflict is increased to 8 times that on the CRAY 1-A. Fortunately, the CRAY X-MP has a much superior method of recovery from bank conflict which involved only a minimal delay. However, the bank conflict interaction between two jobs executing simultaneously is unpredictable, and can lead to differences in running costs, in terms of units, for two identical jobs. Users should note that, whereas on CRAY 1-A loop increments of 8 or 16 gave rise to bank conflicts, on CRAY X-MP even increments of 2 are undesirable. Loops involving complex variables have an inherent but not necessarily obvious increment factor of 2.

A number of problems are of a temporary nature, in that they exist through operating system deficiencies which will be corrected in future versions of the CRAY Operating System (COS). When two jobs on the CRAY-1A perform I/O to a single, common disk unit both are degraded, due to head contention on the disk drive. With twice as much memory available for processing jobs on the CRAY X-MP the frequency in which this set of circumstances can arise is greatly increased. Requesting specific devices may not resolve the problem, as it is possible for two identical jobs requesting the same set of specific devices to be executing simultaneously, one on each CPU. Disk contention has been identified as the most serious problem resulting in poor performance of the jobs currently executing on the CRAY X-MP. The extra disks that will become available when the CRAY 1-A is disconnected will help, and the additional disks to be added to the system at a later date will improve matters considerably.

The single, most powerful feature for optimising CRAY X-MP throughput is the SSD. I/O to and from SSD is almost instantaneous, whereas disk I/O does not match the performance rate of the computational capabilities of the machine. Currently, a large memory or low priority job which is difficult to schedule could retain all the available SSD space. This is unsatisfactory, and for this reason only specially approved jobs are allowed access to SSD. The longer term solutions to these problems will be addressed in COS by the introduction of a system of resource management. This will enable users to state their resource requirements in a sensible manner, allowing scheduling algorithms to allocate resources to jobs so as to optimise throughput. Additional facilities will enable operator control of SSD, so that jobs making use of SSD can be temporarily suspended while high priority jobs such as the operational forecast take over; the contents of SSD would have to be dumped and restored so that work data sets used by the interrupted jobs would not be lost.

5. Looking ahead

The CRAY X-MP is already handling a throughput equivalent to two CRAY 1-A's, despite the initial problems associated with learning to use an apparently similar but really rather different machine. With increased use of SSD and bi-directional memory and the addition of the 5 disks currently attached to the CRAY 1-A, the throughput is expected to reach three times that of the CRAY 1-A. Optimisation of the ECMWF forecast model will be the main vehicle for the achievement of higher CRAY X-MP throughput - its increasing efficiency enabling the Centre to move forward to higher resolution operational forecasts. Continuous monitoring will enable optimum strategies for operating the CRAY X-MP to be developed and will form the basis for advice to users on how to get the best out of the new machine.

The CRAY X-MP offers an exciting challenge in terms of programming and operation. It is proving extremely reliable, having completed over 450 hours of checked computation without error. As soon as production tests are complete we will look forward and work towards the twin goals of a second generation forecast model and increased computer power for our Member States' users.

- Rex Gibson

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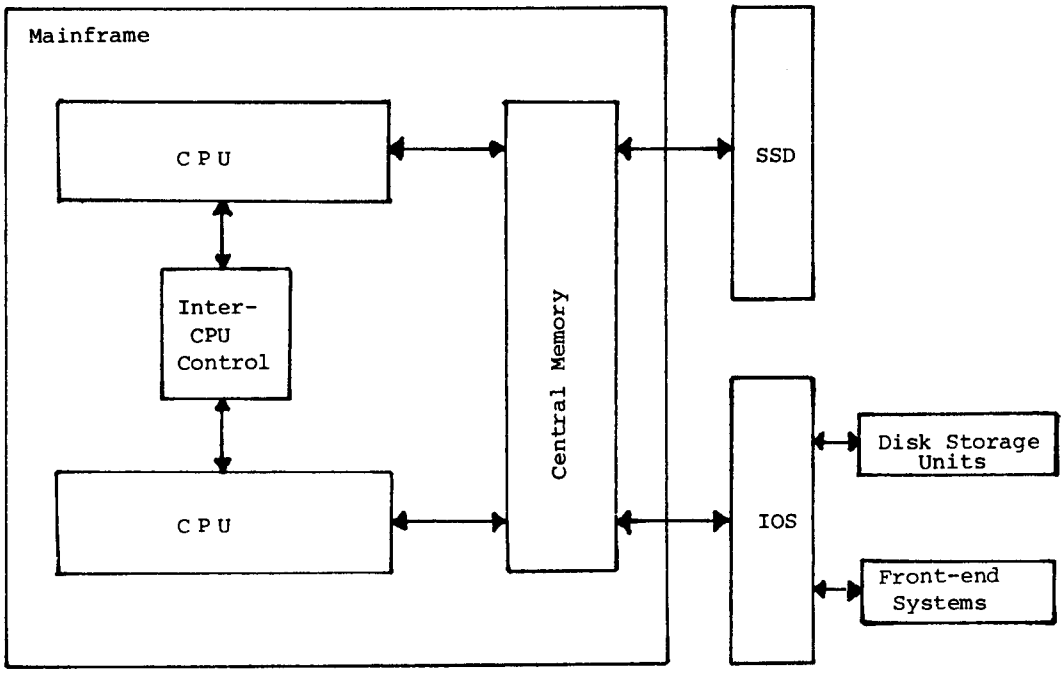

Fig. 1 CRAY X-MP Overall System Organisation

NEW CFT CALLING SEQUENCE

A version of CFT 1.11 which generates the new calling sequence is now available. Details of how to use this new compiler will be available in a News Sheet. New calling sequence versions of the system libraries and the libraries provided by ECMWF, i.e. ECLIB, NAGLIB, NCARLIB, IMSLLIB, VARLIB and CONTLIB, but NOT DISSPLA, will also be available.

For FORTRAN programs and routines, this change should be fairly transparent - all you should need to do is to recompile your code. The three main problems which could occur are as follows:

1. Attempting to call routines using the new calling sequence which have been compiled using the old calling sequence, or vice versa. This will be detected by LDR, and will cause the job to abort.

2. Argument association across CALLs will no longer work. This is the (non-ANSI) practice of calling a subprogram with fewer arguments than on a previous occasion and assuming that the arguments not supplied still retain the values given in a previous call.

3. The maximum number of common blocks allowed is reduced from 124 to 123.

If you use the new calling sequence compiler and libraries, any libraries which you use must have been recompiled using the new calling sequence compiler. LDR will check that all modules which it loads have been compiled using either the OLD or the NEW calling sequence.

If you have CFT callable subroutines written in CAL, these must also be reassembled, and changes may have to be made to the code. A version of CAL and a $SYSTXT (system text) which specified the calling sequence to be used will be made available when the new calling sequence is used. Provided the CAL code contains ENTER and EXIT macros, and uses only ARGADD to access parameter addresses, and does not use B registers B02, B66 or B67, then the CAL code should work correctly.

The next release of CFT (CFT 1.13), which should be available in the next few months, will only support the new calling sequence.

This version of the new calling sequence is a STATIC version, i.e., all variables are allocated storage prior to execution. The difference between the current (OLD) calling sequence and the new static calling sequence is the method used to pass addresses of parameters to a subroutine.

In the old calling sequence, the addresses were passed to the locations immediately preceding the entry point of the subroutines (i.e., the parameters for subroutine SUB were passed to SUB-1, SUB-2 etc.). With the new calling sequence, the calling routine builds a table containing a header word followed by the parameter addresses. The start address of this table is then passed to the subroutine called in register 'A6'.

This method therefore allows a STACK calling sequence to be used, in which space for variables used within a subroutine is allocated dynamically upon entry to the subroutine. This will be familiar to those of you who have programmed in ALGOL, PASCAL or any other block structured language. Dynamic allocation of variables is essential if a subroutine is to be re-entrant, which is necessary for multitasking. However, any programs which rely upon local variables used in a subroutine retaining their values across CALLs will not work with the STACK calling sequence, unless SAVE statements are added for such variables.

Provided a program is single tasking, STATIC and STACK calling sequence routines can be intermixed. It will therefore be simple for users to use the STACK calling sequence (which is enabled by a parameter on the CFT control statement), if they wish to, but without the need to re-compile all the libraries used, provided the libraries have been compiled with a version of the new calling sequence. Further information on using the STACK calling sequence will be made available later.

- Richard Fisker

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STILL VALID NEWS SHEETS

Below is a list of News Sheets that still contain some valid information which has not been incorporated into the Bulletin set (up to News Sheet 162). All other News Sheets are redundant and can be thrown away. The following News Sheets can be discarded since this list was last published: 47, 146, 153, 159, 160, 161.

No.	Still Valid Article
16	Checkpointing and program termination
19	CRAY UPDATE (temporary datasets used)
54	Things not to do to the Station
56	DISP
67	Attention Cyber BUFFER IN users
73	Minimum Cyber field length
89	Minimum field length for Cray jobs
93	Stranger tapes
118	Terminal timeout
120	Non-permanent ACQUIRE to the Cray
121	Cyber job class structure
122	Mixing FTN4 and FTN5 compiled routines
127	(25.1.82) IMSL Library
130	Contouring package: addition of highs and lows
135	Local print file size limitations
136	Care of terminals in offices
140	PURGE policy change
141	AUTOLOGOUT - time limit increases
144	DISSPLA FTN5 version
147	(20.7.83) NOS/BE level 577
152	Job information card
154	Cray X-MP
156	Reduced visibility of Cray jobs
158	Change of behaviour of EDIT features SAVE, SAVEX. Reduction in maximum print size for AB and AC
162	DISPOSE problem on the Cray X-MP

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Corrigendum:

Meteorological Contact Points

In the last issue of the Newsletter (No. 25 March 1984), the name of Mr. G. Stielow was incorrectly given as the Meteorological Contact Point for Germany: since 30.1.84, this function has been taken over by Dr. U. Rüge.

RANGE OF ECMWF PUBLICATIONS

Since the Centre is an international organisation, it has an obligation to keep Member States informed of its activities. Also, as part of the wider international community and with global responsibility in the field of numerical weather prediction, it is important that non-Member States are kept informed of the Centre's operational and research activities. Since, from this issue onwards, the circulation of the ECMWF Newsletter will be widened to include many non-Member State users of ECMWF products world-wide, it seems an appropriate time to give a brief summary of the wide variety of publications which the Centre produces.

The publications fall into three broad categories:

Regular Publications

Scientific and Technical Publications

Handbooks and Guides

Below there is a brief description of each of the Centre's publications with an indication of who they are intended for.

REGULAR PUBLICATIONS

ECMWF Newsletter

The Newsletter contains articles of a general meteorological and computing nature which are intended for all meteorologists and computer users who make use of ECMWF products and facilities. Included in the Newsletter is information about:

research and operational activities

future plans

educational and publicity material

The Newsletter is published every three months.

ECMWF Forecast Report

The Forecast Report is published quarterly and contains verification and diagnostic statistics, a short summary of recent changes to the ECMWF analysis and forecasting system, and maps showing the systematic errors of the model. The reports are of particular interest to researchers, operational staff and forecasters who use the Centre's products.

ECMWF Global Analyses

A selection of ECMWF analysis maps is published quarterly. Included are northern and southern hemisphere charts of the following:

500mb height and mean sea level pressure for 00 and 12 GMT

300mb and 50mb height fields for 12 GMT

Additional information about the operational data coverage and the monthly climatology is included in the publication.

The maps provide a unique reference source for atmospheric research anywhere on the globe.

Reference Charts

Charts showing mean sea level pressure and 850mb temperature, and charts of 500mb height and temperature, are printed for each operational forecast during a particular month. There are 10 charts per page with the following formats:

analysis and previous forecast from up to 10 days all verifying at the time of the analysis (verification charts).

analysis and forecast out to day 10 starting from that forecast (forecast charts).

These reference charts are published for operational and research staff.

Annual Report

The Annual Report, published in English, French and German, contains information about the major developments at the Centre in all fields of activity: Research, Operations, Education, Finance, Personnel, Council and Committees, and Publications. It is distributed primarily to the governmental authorities of the Member States funding the Centre, and also to other organisations and individuals interested in the progress made by the Centre.

SCIENTIFIC AND TECHNICAL PUBLICATIONS

Seminar and Workshop Proceedings

Every Autumn a seminar is arranged at the Centre to review the current state of some aspect of meteorology which is relevant to the work of the Centre and the National Meteorological Services of the Member States. The papers presented by the invited speakers are published in the seminar proceedings.

Each year several workshops are held to discuss specialised topics which are associated with the current research and development activities at the Centre. The published proceedings contain the papers presented at the workshop as well as a report of the discussions and recommendations of the working groups.

Both the seminar and workshop proceedings are mainly of interest to people actively engaged in research and development related to the topics chosen.

Technical Reports

These are reports of scientific work carried out at the Centre in the fields of meteorology, numerical analysis and computer applications. They are reviewed internally and contain material which is intended for eventual publication in scientific journals. The Technical Reports have a wide external distribution to universities and meteorological services all over the world.

Technical Memoranda

This series contains reports of scientific and operational matters, and is mainly for internal distribution.

Lecture Notes

The Lecture Notes for the ECMWF Training Course fall into three subject areas:

dynamical meteorology and numerical methods;

analysis, initialisation and the adiabatic formulation of models;

physical parameterisation and the inclusion of orography in numerical models.

The Lecture Notes are primarily intended for Training Course participants, though they are also distributed to meteorological services and educational institutions.

HANDBOOKS AND GUIDES

Meteorological Bulletins

These are a series of individual bulletins covering the design and use of the ECMWF forecast suite and its products. They often contain reference material not found elsewhere and include detailed manuals describing the scientific basis of the Centre's analysis and forecast system. The meteorological bulletins are intended for meteorologists using the ECMWF forecast suite and its products.

Computer Bulletins

The computer bulletins detail the formal rules and working conventions needed to use the ECMWF computer system, with reference material not covered in the manufacturers' manuals. They are intended for all computer users and are distributed to Member States and the Centre's staff.

Computer News Sheets

These contain computer information of immediate but short term interest, and are sent to all computer users.

DISTRIBUTION

In order to make the publication widely accessible, the Centre prefers to have libraries on its regular mailing list, rather than individuals. However, in exceptional circumstances, individuals can be added to the mailing list for a limited number of publications. Normally a request for a particular item is met without further formality.

All requests for publications should be made in writing and addressed to the library.

- Bob Riddaway

1984 ECMWF SEMINAR

3-7 SEPTEMBER 1984

DATA ASSIMILATION SYSTEMS AND OBSERVING SYSTEM EXPERIMENTS WITH PARTICULAR EMPHASIS ON FGGE

The seminar is co-sponsored by WMO and forms part of a series of specialised scientific seminars that are planned in preparation for the Conference on the Global Weather Experiment which takes place in 1985.

The seminar has three main objectives:

1. To review the characteristics of the FGGE observing system.

2. To provide an up-to-date review of 4-dimensional data assimilation; to assess the results from different analysis systems and the effects on medium range forecasts.

3. To review recent results from observing system and observing system simulation experiments.

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 their papers in the Centre's Seminar series.

The proposed programme for the seminar falls into three main sections:

1. The FGGE observing system and data management

   B. Döös will present an overview of the FGGE observing system, and this will be followed by a more detailed description of the-space based and tropical observing systems by D. Johnson and P. Julian, respectively.

2. Data assimilation systems

   Data assimilation systems will be reviewed by L. Bengtsson. Papers describing aspects of specific assimilation systems will be presented by W. Baker (GLAS), J. Gerrity (NMC), A. Hollingsworth (EMCWF), A. Lorenc (UKMO), A. Penenko (USSR), K.Puri (AMC), and W.Stern (GFDL).

3. Observing system (simulation) experiments

   A. Gilchrist will review the results from, and philosophy of, observing system (simulation) experiments. Results from experiments carried out in this field at various institutions will be described by W. Baker(GLAS), R. Bromley (UKMO), J. Gerrity (NMC), P. Kållberg (SHMI), M. Kanamitsu (JMA), J. Pailleux (Direction de la Météorologie) and S. Tibaldi (ECMWF). The final paper will be presented by T. Mohr who will discuss how the global observing system could be improved.

The National Meteorological Services of Member States have been sent registration forms for the seminar. Further copies of the registration forms or more information can be obtained from me. Participants should register for the seminar before 29 June 1984.

- Bob Riddaway

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ECMWF PUBLICATIONS

Technical Report No. 39	On the parameterisation of vertical diffusion in large-scale atmospheric models.
Technical Report No. 40	Spectral characteristics of the ECMWF objective analysis system.
Technical Report No. 41	Systematic errors in the baroclinic waves of the ECMWF model.
Technical Memorandum No. 85	Field presentation of verification statistics: summer forecasts of 1982 and 1983 compared.
Technical Memorandum No. 86	SMS - Supervisor Monitor Scheduler
Technical Memorandum No. 87	Monitoring the ASAP upper-air meteorological data at ECMWF (22.12.83 - 20.1.84)
Operational Data Assimilation System	Daily Global Analysis, January-March 1983
Meteorological Training Course Lecture Notes No. 1.3	The Atmospheric General Circulation
No. 1.4	Introduction to numerical methods for weather prediction
No. 2.2	Meteorological Data Analysis
No. 2.3	Initialisation
No. 3.1	The general problem of parameterisation
No. 3.3	The parameterisation of moist processes
No. 3.4	The parameterisation of the planatory boundary layer
ECMWF Forecast and Verification Charts	to 31 January 1984 to 29 February 1984 to 16 March 1984
Workshop	Current problems in data assimilation (8-10 November 1982)
Forecast Report No. 24	October - December 1983

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CALENDAR OF EVENTS AT ECMWF

30 April - 22 June 1984	ECMWF meteorological training courses
3-7 September 1984	Annual ECMWF seminar: "Data assimilation systems and observing system experiments, with particular emphasis on FGGE."
12-14 September 1984	12th session of Scientific Advisory Committee
18-20 September 1984	7th session of Technical Advisory Committee
25-27 September 1984	32nd session of Finance Committee
6-8 November 1984	Workshop: "The use and quality control of meteorological observations"
20-22 November 1984	20th session of Council
26-28 November 1984	Workshop: "Cloud cover and radiative fluxes in large scale numerical models - intercomparison and verification"

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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.

*T indicates the original Technical Newsletter series

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Computer Division Head	- Geerd Hoffmann	OB 009A	340/342
Communications & Graphics Section Head	- Peter Gray	OB 101	369
COMPUTER OPERATIONS			
Console	- Shift Leaders	CB Hall	334
Reception Counter) Tape Requests)	- Jane Robinson	CB Hall	332
Terminal Queries	- Norman Wiggins	CB 035	209
Operations Section Head	- Eric Walton	CB 023	351
Deputy Ops. Section Head	- Graham Holt	CB 024	306
DOCUMENTATION	- Pam Prior	OB 016	355
Libraries (ECMWF, NAG, CERN, etc.)	- John Greenaway	OB 017	354
METEOROLOGICAL DIVISION			
Division Head	- Frédéric Delsol	OB 008	343
Applications Section Head	- Rex Gibson	OB 227	448
Operations Section Head	- Austin Woods	OB 007	344
Meteorological Analysts	- Veli Akyildiz	OB 005	346
	- Herbert Pümpel	OB 006	345
Meteorological Operations Room		CB Hall	328/443
REGISTRATION			
Section & Project Identifiers	- Pam Prior	OB 016	355
Intercom	- Jane Robinson	CB Hall	332
Operating Systems Section Head	- Claus Hilberg	CB 133	323
Telecommunications Fault Reporting	- Stuart Andell	CB 035	209
User Support Section Head	- Andrew Lea	OB 018	353
RESEARCH DEPARTMENT			
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* CB - Computer Block
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