

Meteorology is international



Closer European co-operation in the field of meteorological research, and the practical application of the results of that research for forecasting the weather, has been of interest for a very long time. In 1967, following an initiative from the Council of the Commission of the European Communities – at the time a community of only six countries – a group of visionaries drew up a list of scientific and technical challenges in which “the possibility of international co-operation could be discussed”. By the end of that year, a proposal had been made for the establishment of a “European Meteorological Computing Centre”. This far-sighted initiative led to setting up the European Centre for Medium-Range Weather Forecasts (ECMWF), which formally came into existence on 1 November 1975.

Under the guidance of the Council and its Committees, and with the hard work of its talented and capable staff, the Centre has achieved much of what was envisaged. It has developed areas of research and applications that could not have been foreseen at the time of its establishment.

The public has become accustomed on Monday or Tuesday to being presented with a normally reliable outlook for the coming weekend’s weather. Thirty years ago, this would not have been possible. The Centre’s medium-range predictions have been of benefit at times of natural disaster, for commercial activities, in planning power supply, in planning sporting and marine activities, and much more.

ECMWF is a fine example of the advantages of international co-operation in science and technology.

The political origins

The original concept of a “European Meteorological Computer Centre for Research and Operations” had an unusual starting point: politics, not science. In the past, it had been customary for meteorologists to develop plans for the improvement of their services. These plans were submitted to their Governments, who were asked to provide the financial resources required.

In the case of ECMWF, however, the stimulus came from the Governments. In 1963, in a recommendation to its Council, the Commission of the European Communities called attention to the importance of scientific and technical research. A Working Group on Policy in the Field of Scientific and Technical Research was set up within the EC Committee for Medium-Term Economic Policy to:

define those areas in which the efforts in the field of applied research, especially in comparison with the efforts of other countries, had evidently been insufficient, and those developed areas in which the dynamic forces closely and directly depended upon the development of scientific and technical research.

By 1967, it was recognised that:

The individual European countries can no longer develop and implement their own policies in the field of technology; on the contrary, they must unite their forces, and aim at a common organisation.

In October 1967, the Council of Ministers of the European Communities required the Working Group to examine the opportunities for co-operation in six fields, one being meteorology.

Expert Groups for each of these areas were set up. The Council requested Reports before 1 March 1968, allowing only four months for their preparation, so that it could submit conclusions before 1 June 1968. It required that the Reports should

take into consideration the co-operation existing at the present time in other international organizations, and should seek means to enable other European States to participate in such projects.

This was particularly relevant for meteorologists, already used to working with colleagues in other countries; they were more than willing to study, by official order, the fields in which joint actions were possible.

UNITED KINGDOM

The 1971 Project Study and cost-benefit analysis

The basic idea on the organisation, implementation and performance of the Centre was laid down in a report: “Project Study on European Centre for medium-range weather forecasts” prepared by a Study Group chaired by Dr Heinz Reiser. The impressive and important 76-page report, with annexes totalling 130 pages, was presented to Dr Süßenberger, Chairman of the Working Party on the European Meteorological Computing Centre, on 5 August 1971.

A project of the magnitude needed to create the Centre, based as it was on the initiative of the European Common Market, had to be scrutinized with a view to its own economic benefits. A cost/benefit analysis was carried out.

As a general principle for the analysis, it was assumed that the quality of a six-day forecast would be about the same as the quality of the best of the two-day forecasts then available in Western Europe. Since existing literature on benefits of medium-range forecasting offered little quantitative information, and since development of suitable models was not feasible within the time limits given, the group decided to seek the views of people involved in weather sensitive activities. In all, 156 interviews were held in 15 countries. The interviews covered meteorological requirements for a variety of sectors: agriculture, construction, electricity and gas production and distribution, transport, food merchandizing, water supply and protection against natural disasters. It was found that there was a general interest in medium-range forecasts for the period 4 to 10 days ahead.

The annual gain, mainly to agriculture, construction and transport, from better medium-range forecasts was estimated to be 200 million Units of Account (UA). On 1 January 1972, 1 UA = £0.437. The cost of the Centre during the first five years of establishment was estimated to be nearly 20 million UA. During the operational phase, the annual cost would reach 7.5 million UA, so that the cost/benefit ratio was about 1 to 25.

The Convention

COST, an intergovernmental framework for European **CO**-operation in the field of **S**cientific and **T**echnical Research, is one of the largest frameworks for research cooperation for peaceful purposes in Europe. COST Action 70 was unique – ECMWF evolved to become an independent international organisation with its own headquarters.

The key roles played by COST in establishing ECMWF are reflected in the many files in the Centre’s archives from the period 1970 to 1975. They included arranging the many meetings of working groups and expert groups that lead to the decision to establish the Centre. It was at these meetings that the text of the Convention was agreed, the United Kingdom chosen as host country, the Centre’s first Director was appointed, and more.

In November 1971, some four years after initiating the project, and following painstaking studies, the Council of Ministers of the EEC at last decided to establish ECMWF. A Convention was required to bring this international organisation into existence.

A first draft of the Convention was considered on 9–10 December 1971. Thirty-two senior representatives from 14 of the participating states attended. Many further drafts of the Convention and its associated Protocol of privileges and immunities were prepared throughout 1972 and 1973. The Convention, signed in 1973, came into force on 1 November 1975. It set up the Centre as an independent international organisation.

At its first Council meeting in November 1975 the COST representative Mr C L Silver noted that:

“the Centre is a symbol, not only of the unity of the weather forecasters of Europe and of the world, but it is a symbol of the Europe of the Nine [countries of the then ‘European Economic Community’] looking outwards to the other European countries with which it has to work to exist and survive in industry and in science and in technology.”

Although conceived as a COST – European Co-operation in Science and Technology – action initiated by the EEC, the Centre has only one tenuous formal link with the European Union. “Instruments of accession” to the Convention, that is the documents confirming that States have become Member States of the Centre, are “deposited in the archives of the General Secretariat of the Council of the European Communities”, now the European Union (EU).

While in principle the Centre could have been situated in any of the Member States, and several made bids to host the new organisation, it was agreed to build it in Reading, about 60 km west of London, in the United Kingdom.

Evolution of global forecasting accuracy

Forecasts improved steadily during the years from 1980, as a result of improvements in the global observing system, more powerful computers power, and advances in the science: in the Centre's data assimilation system and forecast model. Seven-day forecasts in the Northern Hemisphere became more accurate than five-day forecasts of 1980, and five-day forecast accuracy reached that of the three-day forecasts made 30 years earlier.

In the southern hemisphere, the improvement was even more marked. In the early 1980s Southern Hemisphere three and five day predictions were not much better than those of the northern hemisphere for five and seven days respectively. Two decades later, forecasts for both Hemispheres were of similar accuracy – a gain of about four days in the accuracy of southern hemisphere predictions.

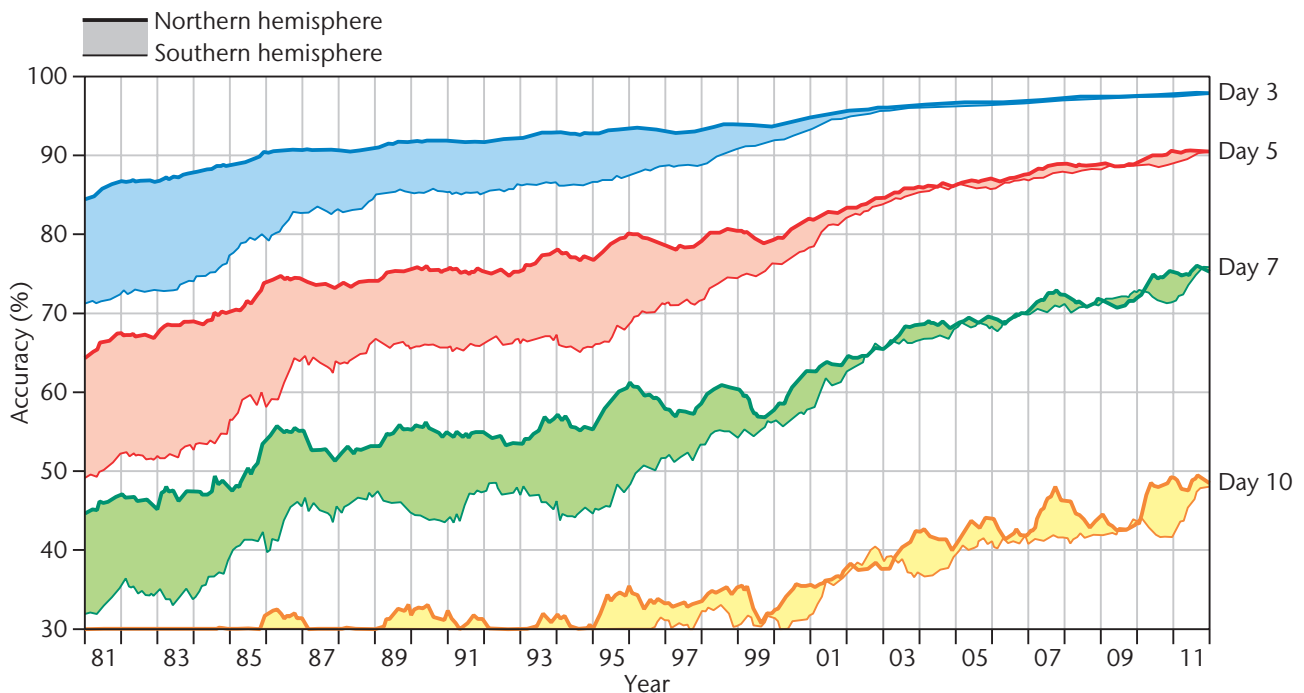
The shaded area shows the differences in forecast accuracy between the hemispheres. Score: anomaly correlation, 500 hPa height.

The first real-time medium-range forecast was made for the official opening of the building at Shinfield Park on 15 June 1979. Operational forecasting began on 1 August, with forecasts to ten days ahead five days per week. Forecasts were made seven days per week from 1 August 1980.

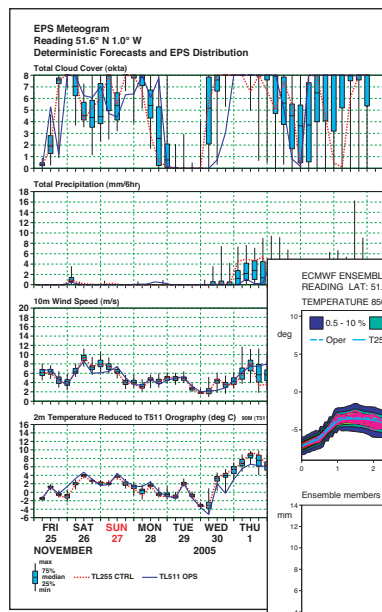
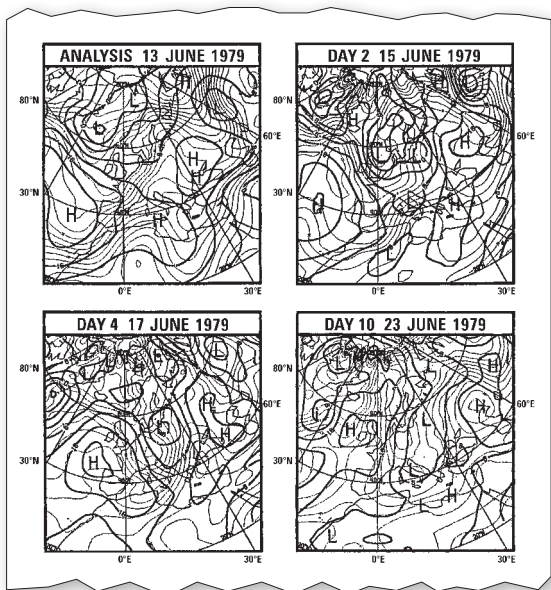
Over the years, ECMWF had developed a capability for operational ocean wave prediction, seasonal forecasting and ensemble prediction. The Centre is a major user of satellite data.

The computer system is connected to the computers in the National Meteorological Services of its supporting States by high-speed telecommunication links. Forecasts are disseminated to the NMSs, and researchers in these Member States can access the Centre's computers and archives freely for their own research.

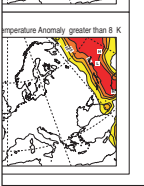
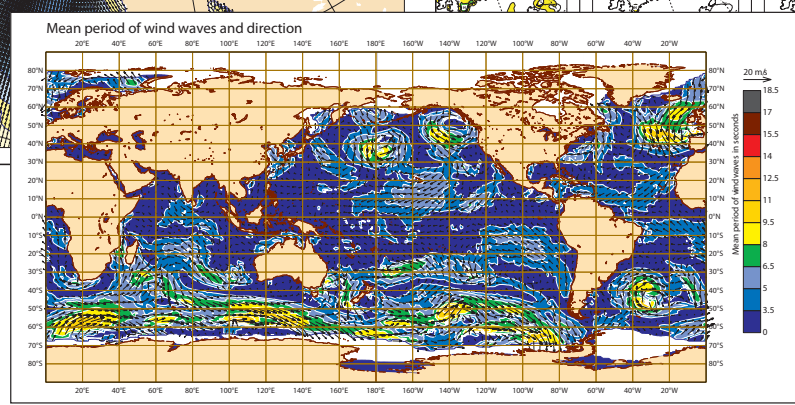
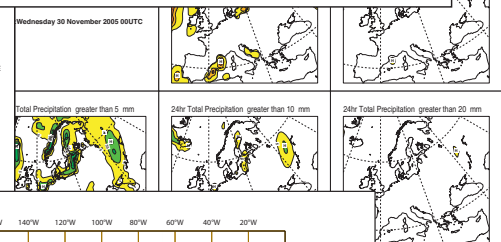
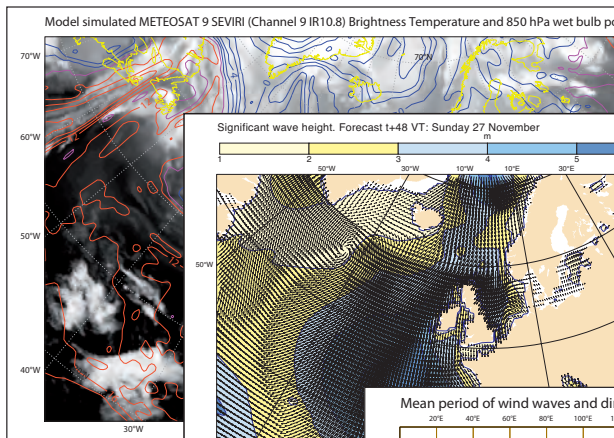
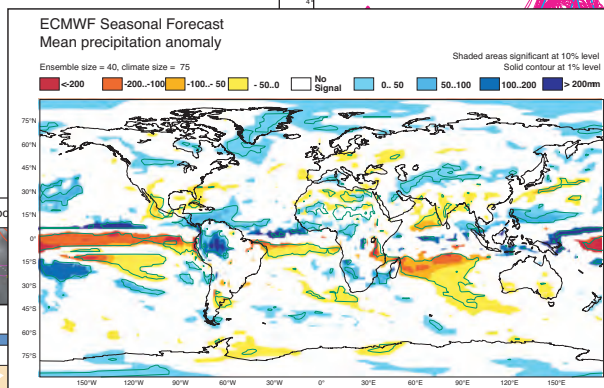
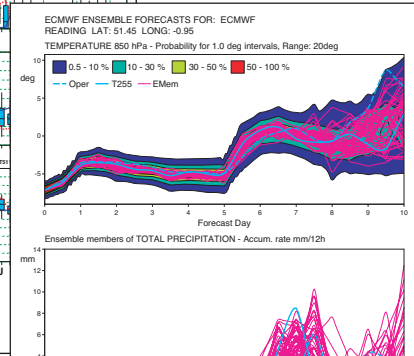
The Centre's archives contain copies of all the observational data received from the beginning of the Centre's work. In fact, the archive has been extended back to the mid-1950s. Copies of the forecasts are also archived. The data have been re-analysed to provide a continuous sequence of the global atmosphere covering decades – a resource invaluable for research into the climate of the earth.



Forecast for 15 June 1979. Analysis, 12 UTC 13 June 1979, and forecast days 2, 4 and 10. Real-time forecasts prepared for the official opening of the headquarters building on 15 June 1979 . . .



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ECMWF is an intergovernmental organisation supported by more than 30 States. It provides weather services with medium-range forecasts of global weather to 15 days ahead as well as with monthly and seasonal forecasts. ECMWF's computer system at its headquarters in Reading, United Kingdom, is one of the largest for meteorology worldwide and contains the world's largest archive of numerical weather prediction data. It runs a sophisticated medium-range prediction model of the global atmosphere and oceans. The National Meteorological Services of Member States and Co-operating States use ECMWF's products for their own national duties, in particular to give early warning of potentially damaging severe weather.

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