

**meteorological  
service**

**annual  
report  
1980**

DEPARTMENT OF TRANSPORT

METEOROLOGICAL SERVICE  
ANNUAL REPORT  
1980

METEOROLOGICAL SERVICE  
GLASNEVIN HILL, DUBLIN 9

U.D.C  
551.5 (417)

Price 75p

## FOREWORD

If one word may be used to describe the events of 1980 in the work of the Meteorological Service it should probably be "change". Headquarters staff settled into their new building - first occupied in mid November 1979 - and endeavoured to make the best use of its facilities and equipment. 1980 also saw the retirement of thirteen Meteorological Service staff. This large number was a consequence of the fact that the Service was established and consolidated about forty years previously.

The new building was officially opened on 19th June 1980 by Mr. Albert Reynolds, Minister for Transport. During the year much progress was made in the use of the new computer system. In midyear the preparation of computer produced forecast and analysis charts commenced on a daily basis in the Central Analysis and Forecasting Office (C.A.F.O.). Manual plotting of charts ceased in the C.A.F.O. and was replaced by automatic methods. Considerable advances were also made in the application of computer methods to the communications system. The Introduction to this report gives a short account of computer usage in the Service.

The newly opened Training Centre at Galway also had a very busy year as a result of retirements. The largest number of recruits for many years were given their initial training there.

The delay in publishing this report is regretted; the staff concerned were involved in other difficult and exceptional tasks.

D.L. LINEHAN  
Director

Meteorological Service  
Dublin  
March, 1982

## C O N T E N T S

Page

Foreword	iii
Functions of the Meteorological Service	vi
Introduction	1
The Weather of 1980	5
Staffing	7
Accommodation	11
Observing Programme	13
Forecasting Services	15
Climatology	17
Agricultural Meteorology	18
Marine Meteorology	20
Laboratory Work	22
Instruments and Equipment	24
Computer Developments	26
Research and Investigation	29
Training Courses	32
The Library	32
International Co-operation	33
Appendix - Publications and Lectures	34

## FUNCTIONS OF THE METEOROLOGICAL SERVICE

The functions of the Meteorological Service are summarised as follows:-

- (i) The collection, analysis and publication of meteorological, geophysical and geochemical data;
- (ii) the carrying out of research in fundamental and applied meteorology;
- (iii) the supply of forecasts, statistical information and scientific advice on the application of meteorology in various fields to agricultural, industrial and public utility undertakings, the press, radio and television, maritime interests, individual members of the public, etc.
- (iv) the supply of similar information to Government Departments and the Defence Forces;
- (v) the provision of meteorological facilities for civil airlines operating to and from airports in Ireland and/or flying over Irish territory and the supply of advice on the meteorological aspects of civil aviation problems generally;
- (vi) co-operation with other State Meteorological Services and with meteorological workers in other countries in the development of meteorological science and of the international meteorological organisation; and the representation of Ireland at international meteorological conferences.

## INTRODUCTION

### The use of computers in the Meteorological Service

The use of computers in the Meteorological Service has developed to the stage where almost every activity involves the computer in some way; it covers the whole field of meteorological communications which, by now, is entirely automated, the plotting of data on weather maps, the analysis of upper air charts, the production of numerical forecasts and the processing of climatological data. The computer installation in the Service's Glasnevin Headquarters is, in many ways, the hub of the Service. It compares favourably with the computer system of any similar meteorological service. Yet, the initial steps leading to this satisfactory situation were very modest indeed when, in 1951, punch cards were first introduced for the storage of upper air data from Valentia Observatory and of weather reports from Irish Ships.

In 1961, the use of punched cards was extended to records from synoptic and climatological stations. In the same year, cards were used for the extraction of statistical data, using sorters and tabulators belonging to the Revenue Commissioners. Although the Service later acquired its own sorter and tabulator, this innovation marked the beginning of a long relationship with the Revenue Commissioners' Data Processing Section, a connection which finally ended only in 1980. While the use of cards marked an improvement on previous manual methods, it was still a very tedious procedure, involving many card sortings and consequential damage to cards.

In 1965, great advances were made when computer processing began with the Revenue Commissioners' newly acquired computer. It became possible to produce the monthly climatological bulletins by computer and the extraction of high quality statistical information was greatly facilitated. Compared to modern methods, however, the system was crude since, in the absence of backing storage, every computer run involved the transport of very large quantities of cards from the Meteorological Service's offices in O'Connell Street to the Revenue computer in Cathedral Street, Dublin.

The next significant advance was in 1968 when the Revenue Commissioners acquired two Honeywell computers, known as series 1200, with associated

magnetic tape drives; these were later upgraded to Honeywell series 220C's. This speeded up processing enormously, and also allowed the Meteorological Service to begin the transfer of its climatological archives to magnetic tape, a process that continued to the extent that, by the end of 1980, over 90% of all data was quality controlled and archived on tape.

During these pioneering days in the nineteen-sixties the Service initiated a policy which it still pursues, that of developing computer expertise among its own staff. All analysis and programming (most of it in assembler language) of the climatological data processing system was carried out by Meteorological Service staff who had attended appropriate training courses. As is often the case when computers are introduced, a tremendous degree of enthusiasm and commitment was evident in the personnel engaged in analysis and programming. By 1970, the Honeywell computers were used to produce all of the routine climatological publications, to service climatological enquiries and for various other meteorological projects.

In the early nineteen seventies, considerable attention was given to the feasibility of extending the Service's computer facilities to carry automation into other areas of activity, notably meteorological telecommunications (where fast international computer-to-computer links were tending to replace the slow teleprinter circuits) and numerical weather prediction. Following extensive studies of the possible solutions by representatives of the Government's Central Data Processing Service and the Meteorological Service, meteorological computer installations in the Netherlands, Denmark, Norway, Finland and Sweden were examined and it was concluded that the Meteorological Service needed its own in-house equipment. Subsequently, proposals were invited from computer companies and, in November 1974, sanction was obtained for the purchase of two Digital Equipment Corporation minicomputers, known as PDP 11/40's, to handle communications.

Installed in 1975, the PDP 11/40 system, manufactured at Digital's plant in Galway, has gradually taken over most of the Service's communications functions. Among the Computer links implemented are a low-speed connection with the London centre for the exchange of airport reports and forecasts, a similar link to the aeronautical fixed telecommunications network at Ballygireen, a medium-speed link with the British Meteorological Office at Bracknell, and, more recently, medium-speed links with the European Centre

for Medium-range Weather Forecasts at Reading and with Aer Lingus at Dublin Airport. There exists, as well, a low-speed network for the dissemination of edited bulletins of airport and general meteorological data to the airport forecast offices and for interrogation by the airports of the computer's databanks. The computer is also connected to the public telex system for the collection of reports from the weather observing stations around the country.

The dual computer system acts in such a manner that both computers receive all incoming data and process them but only one sends data out on the circuits. The "standby" computer can take over transmission if necessary without loss of data. The system has proved to be very reliable, surviving even the complicated transfer from 44 Upper O'Connell Street to the new headquarters at Glasnevin in November 1979 without major interruption.

In 1978, approval was obtained for the acquisition of a mainframe computer, another product of the Digital Equipment Corporation, known as a DEC 2050, and this was installed in the Glasnevin headquarters in June 1979. Considerable effort was put into developing programmes for numerical weather analysis and prediction and for the conversion of the climatological data processing system to run on the new computer. In April 1980, two CalComp automatic chart plotters were acquired and, by the end of the year, numerical weather forecasts were being produced routinely using a limited area primitive equation model. The analysis of upper air charts was completely automated and so was almost all plotting of weather charts in the Central Analysis and Forecast Office. In addition, the climatological work was also running on the new computer and the programmes for the production of the monthly publications were almost complete.

The achievements of the last five years were possible only by the allocation of additional staff to computer work; six Meteorological Officers have attained degree qualifications in computers science, one of whom is on leave of absence with the European Centre for Medium-range Weather Forecasts. Of course, automation has resulted in the release of officers in other work areas from tedious and repetitive work.

Development is expected to continue apace in the future, with the expansion of existing computer applications and the investigation of new areas. In



particular it is expected that computer graphical techniques will be more extensively used and that the computer facilities will be more widely used within the Service, for example in such areas as agricultural and industrial meteorology, in meteorological training and in research. A point of particular interest is that expanding links with the European Centre for Medium-range Weather Forecasts will enable the Meteorological Service to make use of that Centre's powerful computer resources, including the CRAY-1, which is one of the most highly developed machines in the world.

The Weather of 1980

January was rather cold in all areas with air frost on several nights, and it was wet in east coast counties.

February was mild; very few days had air frost but it was generally wet, particularly over most of the southern half of the country.

March was rather cold, indeed appreciably colder than February, and it was also a wet month almost everywhere.

April was rather mild with near average sunshine and very dry, the driest in most places for very many years - at Dublin (Phoenix Park), the driest since 1938.

The very dry weather continued in May. The combined April-May rainfall was less than half the normal rainfall for the two months almost everywhere - the lowest this century at Dublin (Phoenix Park), and the lowest since 1912 at Cahirciveen. During May the periods 1st - 9th and 27th - 30th were cold, but mean temperature for the month as a whole was around normal, as was sunshine. However the period from 14th to 18th May was very sunny and warm.

The summer (June, July and August) was exceptionally dull with one very wet period of about four weeks. It was also cool with a notable lack of high afternoon temperatures; values exceeding 22°C did not occur on more than two or three days anywhere. Birr and Cahirciveen both had their dullest summers (with 56% and 61% of normal sunshine respectively) since records began at these stations in the last century. The very wet four weeks from 17th July to 14th August produced more than half of the summer rainfall over much of the country. However the remaining nine weeks of the summer were drier than normal almost everywhere, particularly the period from 15th to 31st August.

During September, mean temperature was slightly above normal, but it continued rather dull in most areas, and rainfall was generally well above normal, especially in Munster and Connaught.

October was cool and it was also wet in the east but sunshine durations were around normal.

During November, mean temperature was about normal except in South Munster where it was rather cold. Rainfall was below normal in the eastern half of the country. In the coastal counties of Connaught and west Munster, it was a wet month, mainly due to very heavy and prolonged rain on 1st and 2nd, when rainfalls of 50 mm or more occurred over most of the area. In these two days, over 100 mm of rain fell over most of south Co. Kerry, and in the Iveragh peninsula, 150 mm was general. At Cahirciveen, the rainfall of 157.1 mm far exceeded the previous two-day record (98.8 mm in 1915). In fact, 154.2 mm out of the 157.1 mm fell in the first 36 hours, an event which might be expected in that area only once in about 500 years, on average. Severe flooding was reported in parts of the southwest and west of the country as a result of this rain on 1st and 2nd November.

December was rather mild, with rainfall well below normal in eastern coastal counties but appreciably above normal in the northwest.

Regarding the year as a whole, the outstanding feature was the deficit in sunshine of around 15% generally, and over 20% in many places. At Birr and Cahirciveen it was the dullest year (78% of normal in each place) since records began a century earlier. Rainfall in Connaught and Munster was well above normal, generally greater than 110%, and reaching about 125% of normal in west Kerry and west Cork. At Cahirciveen, the rainfall total for the year (1775.5 mm) almost equalled the value (1781.2 mm) for 1928 which was the wettest year there since records began in the area in 1866. In Leinster and Ulster, the total for the year was 100-110% of normal. Mean temperature for the whole year was slightly below normal everywhere.

STAFFING

The numbers of staff serving on 31 December 1980 were:-

Director	1
Assistant Director	2
Senior Meteorologist	11
Meteorologist	46
Principal Meteorological Officer	12
Senior Meteorological Officer	42
Meteorological Officer	156
Assistant Meteorological Officer	31
Other grades	<u>41</u>
TOTAL	<u>342</u>

This total represents an increase of 15 on the 1979 figure.

Mr. Jack Murphy, Senior Meteorological Officer, died on 29th May. He joined the Service in 1946 and subsequently served at Valentia Observatory until his transfer to headquarter in 1953. He worked in the Director's Office until 1955 when he was assigned to the instruments and supplies unit. In this capacity he was known throughout the Service for his dedication and helpfulness. In 1979, he received a hard-earned and long overdue promotion to Senior Meteorological Officer and was appointed officer-in-charge of the unit in which he had served with distinction for 24 years. In this capacity he was responsible for the logistics of the formidable task of transferring the whole headquarters organisation from three locations in O'Connell Street to the new building in Glasnevin Hill, a task which he accomplished smoothly and with remarkable energy and patience. He was not to enjoy the fruits of his work for his untimely death took place during the settling-in period, a few months after the transfer. To his wife, Monica, and family sincere sympathy is extended.

Mr. Tom Hunt, Meteorological Officer, died on 15th June. He joined the Service in 1951 as an Assistant Meteorological Officer in which capacity

he served at Clones for 14 years. He was promoted to the grade of Meteorological Officer in 1965 and was transferred to Dublin Airport where he served until his untimely death. Sincere sympathy is extended to his wife, Vera, and family.

There were 13 retirements during the year. Miss Sheila Bambrick, Clerical Assistant, retired in February, Mr. Gearoid Granville, Assistant Director, Mr. Brian Farley, Principal Meteorological Officer and Mr. Michael Keane, Senior Meteorological Officer in March, Mr. Paddy O'Sullivan, Engineman at Valentia Observatory, in April, Mr. Sean McWilliams, Senior Meteorologist, Mr. Bernard Doherty and Mr. Maurice Sheahan, Meteorologists, and Mr. Paddy Howley, Senior Meteorological Officer in June, Mrs. C. McAteer, Cleaner at headquarters, in July, Mr. Paddy Butler, Principal Meteorological Officer and Mr. Jim McNamara, Senior Meteorological Officer in October and Mr. Frank Mooney, Technical Assistant, in December.

Sean McWilliams was one of the first group of Meteorologist Cadets recruited in 1939. He served at Foynes, Dublin Airport and headquarters. He was appointed officer-in-charge of Valentia Observatory in 1944 where he served for the remainder of his career. He was promoted to Senior Meteorologist in 1948. Gearoid Granville and Barney Doherty were in the second group of Cadets recruited in 1940. Gearoid served at Foynes, Shannon Airport, Dublin Airport and headquarters. He was promoted to Senior Meteorologist in 1963 and appointed Assistant Director in 1978. Barney served at Foynes, the Shannon and Dublin airports and headquarters.

Maurice Sheahan, Michael Keane and Paddy Howley were in the first group of Meteorological Officers recruited in 1939. Maurice served at Foynes, Valentia and headquarters before he was promoted to Senior Meteorological Officer in 1948. He was selected in 1950 for a degree course at University College, Cork and graduated with an honours degree in 1953. He was promoted to the grade of Meteorologist in 1955 and served at Dublin Airport from 1956 to the date of his retirement. All of Michael Keane's service was in the Shannon area - at Foynes until the transfer of operations to the new Shannon Airport in 1945; he was promoted in 1947. Paddy Howley served at Foynes, Valentia, headquarters and Shannon Airport; he was promoted in 1949.

Paddy Butler and Jim McNamara were in the second group of Meteorological Officers recruited in 1940. Both served at Foynes and Valentia. Paddy's later service was at Dublin Airport and headquarters; he was promoted to Senior Meteorological Officer in 1953 and to Principal Meteorological Officer in 1978. Jim's later service was at Dublin Airport; he was promoted in 1951.

Brian Farley joined the Service as a Meteorological Officer in 1945 and served at Dublin Airport, Clones and headquarters; he was promoted to Senior Meteorological Officer in 1952 and to Principal Meteorological Officer in 1978.

Frank Mooney, who joined the Service in 1949, was an Instruments Maker and served in the headquarters workshop throughout his career. Frank possessed many additional skills with which he was always forthcoming whenever the Service required them. Sheila Bambrick joined the Service in 1943 and served unobtrusively with distinction in the Climatological Division throughout her career. Paddy O'Sullivan was already serving at Valentia Observatory when it was taken over by the Meteorological Service in 1937; he was a ready source of useful local information to the hundreds of staff who served stints at the observatory during the course of his long career. Mrs. McAteer worked in the Service for 15 years and was always obliging and helpful.

All these retired colleagues carry the best wishes of the staff for many happy years in the future.

Mr. William H. Wann was promoted to the grade of Assistant Director in March and Mr. Declan J. Murphy was promoted to the grade of Senior Meteorologist in the Computer Division in July.

Mr. Michael J. Connaughton, Meteorologist, continued on leave of absence with the World Meteorological Organisation in Geneva, as Chief of the Agricultural Division. Messrs. Paddy O'Sullivan and John Hennessy, Senior Meteorological Officers (Systems Analysts), continued on leave of absence with the European Centre for Medium-range Weather Forecasting (ECMWF).

Mr. Peter Lynch, Meteorologist, continued with his research for a Ph.D degree in the School of Mathematics, Trinity College, Dublin. Messrs. Noel Fitzpatrick and Maurice Murphy, Meteorological Officers, completed the third year of a 4 year BSc course in Computer Science in Trinity College.

Mr. Liam Keegan, Meteorological Officer, passed the second year of the B.A. (mod.) course at Trinity College in October. Mr. Michael J. Kingston, Meteorological Officer, passed the third year of a telecommunications technician's course at Limerick Technical College. Mr. Brendan Flanagan, Meteorological Officer, obtained a B.Sc. degree in Public Administration in June. Mr. K. Commins, Meteorologist, obtained an M.Sc. degree in Experimental Physics in July. Mr. J. Eagleton, Meteorologist, obtained an M.Sc. degree in Applied Mathematics in December.

PRINCIPAL OFFICERS OF THE METEOROLOGICAL SERVICE ON 31ST DECEMBER 1980

DIRECTOR -	P.K. ROHAN, M.A.
ASSISTANT DIRECTORS -	D.L. LINEHAN, B.Sc. B.E. W.H. WANN, B.A. M.Sc.
SENIOR METEOROLOGISTS -	L.S. LEECH, B.Sc. C. O'CONNOR, B.Sc. P.A. LYONS, B.Sc. J.R. BATES, B.Sc., Ph.D. W.G. CALLAGHAN B.A., B.Sc. S.G. MILLER, M.Sc. B.E. McWILLIAMS, B.Sc. D. O'CONNOR, B.A. E.J. MURPHY, B.Sc. S.S. O'LAOGHOG, B.Sc. D.J. MURPHY, M.Sc.

ACCOMMODATION

The new headquarters building was officially opened by the Minister for Transport, Mr. Albert Reynolds, T.D. on 19 June. Overseas guests at the opening ceremony included Mr. Austen H. Nagle, the first Director of the Service who, at the age of 77, travelled specially from Washington for the occasion, Professor A.C. Wiin-Nielsen, Secretary-General of the World Meteorological Organisation, Mr. J. Labrousse, Director of the European Centre for Medium-range Weather Forecasts and Mr. F. Bushby, Deputy Director of the British Meteorological Office. Mr. E. Cayhill of the Meteorological Office, Belfast was also a welcome guest.

Local guests at the ceremony included Mr. Noel McMahon, Secretary of the Department, Mr. Tom Nally, the Assistant Secretary responsible for the Meteorological Service and other officers of the Department; Mr. J. McCarthy, Chairman, Mr. M.D. Burke, Principal Architect, Miss June Thompson and other officers of the Office of Public Works; representatives of the Departments of Finance, the Public Service, Posts and Telegraphs, Social Welfare, the Revenue Commissioners, the Gardai, the Electricity Supply Board, Bord na Mona, An Foras Taluntais, the Ordnance Survey Office, Comhlucht Siucire Eireann, Irish Shipping, the Air Corps, the Naval Service, Aer Lingus, Trinity College and University College, Dublin. The Minister acknowledged the indebtedness of the Meteorological Service to all these organisations which co-operate with the Service in one way or another, most of them by providing vital basic information.

The Minister's guests also included the Architect, representatives of the Structural Engineers, of the Mechanical and Electrical Consultants and of the Quantity Surveyors as well as a representative number of the staff of the Meteorological Service, present and past; regrettably the latter did not include Dr. P.M.A. Bourke, Mr. Rohan's predecessor as Director, under whose aegis the new building was planned and commenced and who was unavoidably absent.

It was stated in the 1979 Annual Report that it was questionable whether expenditure on a new synoptic station at Johnstown Castle was still justifiable. It is now accepted that present-day requirements can be met by the installation of an automatic station there.



The very extensive building programme carried out by the Office of Public Works on behalf of the Meteorological Service, over a period of 35 years and involving, as it did, every synoptic station in the country with the exception of the airports, is now complete.

OBSERVING PROGRAMME

Surface Observations

The following 15 surface synoptic observing stations operated continuously on a 24-hour basis throughout the year:

Malin Head	Birr
Belmullet	Shannon Airport
Clones	Kilkenny
Claremorris	Rosslare
Mullingar	Valentia Observatory
Dublin Airport	Cork Airport
Casement Aerodrome	Roches Point
Galway	

The positions and dates of establishment of these stations are as shown on Figure 1.

The network of surface synoptic stations was supplemented by four lighthouses and by the following network which sent regular returns to the Climatological Division during the year:

- 64 climatological stations;
- 37 rain recorder stations; and
- 623 rain-guage stations

Upper Air Observations

At Valentia Observatory, upper air observations of pressure, temperature and humidity by radio-sonde and upper wind observations by radar were continued during the year.

Other Observations

The aurora, solar radiation, satellite, atmospheric nuclei, geomagnetic, seismological, weather surveillance radar, tidal and other special observations outlined in previous annual reports were continued during the year.



Irish weather stations and dates of their establishment

FORECASTING SERVICES

The analysis and forecasting work of the Service was continued at the Central Analysis and Forecasting Office (CAFO) during the year. The forecasting offices at the airports continued their assistance to the CAFO by dealing with enquiries from local agricultural, industrial, commercial and other non-aviation interests as well as the general public. A number of the synoptic stations also continued their assistance by relaying the CAFO forecasts to local enquirers.

508,000 calls were made on the automatic telephone weather service (Dublin 1199) during the year. The format of the forecast information was changed to include the time of issue and the duration was extended to 18 hours.

At Shannon Airport the automatic telephone answering service was very much in demand. The existing system of three ansafones was replaced in November by a robophone communicator system servicing 5 telephone lines. It is estimated that 80,000 callers availed of the service during the year. The numbers of direct telephone calls for weather information made to the forecasting offices during the year were as follows:

Interests Originating Enquiries	Telephone calls made to				Totals
	CAFO	Shannon	Cork	Dublin	
Agricultural	20,759	8,808	6,157	190	35,914
Industrial & Commercial	2,459	887	1,869	14	5,229
Marine	7,207	1,205	587	86	9,085
Defence Forces	7	15	12	-	34
Other Government Departments	722	208	28	21	979
Press	350	9	78	5	442
Sporting	1,016	472	752	47	2,287
Private	12,869	4,162	3,390	380	20,801
Miscellaneous	-	-	33	-	33
Totals	45,389	15,766	12,906	743	74,804

In addition, over 1,400 requests for forecasts were dealt with by the synoptic stations.

The 24-hour service of forecasts provided to the Air Corps by the Meteorological Office, Dublin Airport (direct or through the Meteorological Office at Casement Aerodrome) was continued. Again, there was considerable activity at Casement.

The routine services to civil aviation were maintained. The numbers of civil flights serviced were 20,600 at Dublin, 4,750 at Shannon and 2,700 at Cork - total 28,050. In addition, 560 briefings were given to airline training crews and pilots of light aircraft were provided with 9,530 briefings. 84 warnings of hazardous conditions in the Shannon Flight Information Region were issued. During the summer months, the Shannon and Cork forecast offices provided briefings and forecasts for helicopters servicing the oil-exploration installations operating in Irish coastal waters.

Forecasting for offshore oil exploration operations was resumed in mid-June and continued to late September. Wind, weather and wave forecasts were provided to rigs drilling in the seas around the Irish coast during this period and were continued into late December for southern coastal areas in connection with maintenance work on the Marathon platform.

CLIMATOLOGY

The processing of punch card weather data by the Revenue computer ceased at the end of February, the initial recording of the synoptic station data thereafter being by direct input to the DEC 2050 computer at headquarters. By September, the quality controlled versions of the monthly data for synoptic stations were becoming available within a fortnight of the end of the month. The new computer programmes for data from the climatological and rainfall stations were assigned a somewhat lower priority but, by the end of the year, it appeared that the quality-controlled archived data from all stations would soon be coming to hand very punctually.

The archiving on magnetic tape of data from the older synoptic stations was completed. This includes the data for the former stations at Fynes (October 1939 to June 1946) and Middleton (October 1946 to December 1955). Some 16 years of Valentia upper air reports back to the mid 1940's remain to be similarly archived.

The Monthly Weather Reports for January 1979 to December 1979 and the Annual Summary for 1979 were issued. Monthly Weather Summaries and an annual summary for 1980 were issued to the newspapers.

The staff of most outstations continued to help in processing climatological data for Birr, Malin Head and Roche's Point, for years previous to the introduction of hourly observations at these stations in the mid-1950's. Some 445 station months were so processed.

The number of enquiries dealt with was 5,103. One major job was an analysis of visibility and/or low cloud, with associated winds, for new runway planning at Dublin Airport. New lists of extreme conditions in one or more elements at various stations were produced, also new annual and monthly mean values of sunshine (1961-1980) for the World Climatic Atlas published by the World Meteorological Organisation.

Routine inspections of 412 rainfall and climatological stations were carried out. Five new raingauge stations were opened and nine closed. One new climatological station was opened and one closed.

### AGRICULTURAL METEOROLOGY

Publication of the monthly agrometeorological bulletin was continued. The climatological station at Lisdara, Tralee, from which reports were included in the bulletin since it was first published in 1971, closed at the end of 1979, leaving a gap in the network of stations in the southwest. A replacement station, newly opened at Liscahane, Ardfert, late in 1980, shows considerable promise and may be suitable for inclusion in the bulletin later.

Six warnings of weather conditions conducive to the spread of potato blight were broadcast on RTE during the June - September period. This number was twice the annual average issued over the past decade. The onset of a warm and humid airflow on 22nd July heralded a series of three major spells of blight weather, which caused a rapid accumulation of blight conditions in the period up to 7th August. Severe blight damage was caused during this period, particularly in the south and east. Three potato blight bulletins on the accumulation of blight weather and detailing the progress of the disease were issued. Taken as a whole the percentage of effective blight weather in 1980 was above average in western, southern and extreme eastern regions.

Co-operation was continued with the Department of Agriculture in a programme to reduce the incidence of liver fluke. That Department uses weather information in the preparation of dosing recommendations issued to farmers. Liver fluke conditions were unusually prevalent in the summer months of 1980 because of the poor drying, frequent rain, heavy in the west and south, and an exceptional lack of sunshine. The area west of a line from Limerick to Clones was expected to be particularly affected by the disease during the 1980/81 winter.

A foot and mouth disease scare occurred in August. As some weather elements, e.g. wind, precipitation, can be a major factor in the spread of the disease, the Agricultural Meteorology Unit began "dry run" routines to be in readiness to provide assistance to the Department of Agriculture if called upon. Later, the Minister for Agriculture, expressing his thanks to those who helped during the scare, included the Meteorological Service in his list of credits.

The processing of reports for the four Irish phenological gardens was continued during the year and the results were transmitted to the international directorate of the phenological gardens programme.

Assessments of the effect of the previous week's weather on the level of cereal disease together with forecasts for the coming week was issued every Monday between mid-May and the end of July, for use in the Department of Agriculture's cereal disease weekly bulletin.

Some 120 enquiries for specialist information were answered; most came from research workers. In co-operation with the Central Analysis and Forecasting Office, weekly forecasts especially for farming interests were published in the farming press. An evaluation of these forecasts suggests that their accuracy is reasonably good and that the service is worthwhile. A weekly weather forecast for farming was also given on RTE radio from March to October in connection with a special weekly programme, "Agriview".

The notification of fine spells during the harvesting season was continued. Due to exceptionally bad weather over much of the Summer, only five fine spells were notified by the Central Forecasting Office, i.e. about half the number issued in 1979. Undoubtedly, the bad weather was also responsible, to a large extent, for an increase in direct telephone enquiries from farmers for forecasts which were up 75% on the number of such calls in 1979.

The Meteorological Service was represented at the Irish Ploughing Championships held at Rockwell, Cashel, Co. Tipperary on the 7th and 8th of October 1980. The presentation, which was sponsored by the Irish Farmers' Journal, included a weather reporting and forecasting pavilion as well as briefings on the weather services available to farmers. About six thousand people visited the pavilion during the two days.



MARINE METEOROLOGY

The following ships co-operated with the Service by making observations of weather during the year:

Irish Shipping (6) - Irish Cedar, Irish Larch, Irish Maple,  
Irish Oak, Irish Pine, Irish Rowan

B & I (6) - Munster, Leinster, Connacht, Kilkenny,  
Innisfallen, Wicklow

Irish Continental Line (1) - Saint Patrick

The Innisfallen was sold in January and the meteorological equipment was transferred to the Wicklow. The Leinster was transferred to the Cork-Swansea route in November, re-named Innisfallen, and replaced on the Dublin-Liverpool route by the Connacht.

The Naval Service's fishery protection vessels Emer, Deirdre and Aoife continued to provide weather reports. In May, an additional vessel, the Aishling, was fitted with weather observing equipment. The Captain, Cdr. McIlvenna, officers and cadets, eleven in all, visited Meteorological Service headquarters on 11 August and were shown over the building.

Port Meteorological Officers visited ships in port to check and replace equipment during the year as follows:

Dublin: 19 visits; Rosslare: 5 visits; Cork: 5 visits.

With the assistance of the Climatological Division, 9006 ships' observations were processed and furnished to the appropriate international collecting centres.

Weather reports continued to be provided four times daily by Tory Island, Loop Head, Fastnet and Kish lighthouses. Reports from the latter two were included in the early morning and late night sea area forecasts broadcast on RTE Radio.

The automatic weather station on the Kinsale Head Gas Platform had a number of outages during the year. However, usable amounts of data were received for all months except January, February, May and August; in these months, the data recovered were less than one-third of the total amount possible.

Three oil prospecting companies operated in Irish waters during the year - B.P., Elf and Phillips - and were provided with special forecasts by the Central Forecasting Office.

The B & I Steampacket Company commenced hydrofoil operations on the Dublin-Liverpool route. Wind and wave forecasts for these operations were provided by the Central Forecasting Office from mid-February to early November.

The studies and discussions aimed at setting up a data buoy in the Porcupine area west of Ireland continued during the year but progress was slow.

### LABORATORY WORK

The planned transfer of the measurements (counting) of radioactivity samples from the Meteorological Service laboratories to the Nuclear Energy Board was effected during 1980. The collection and processing of samples was continued by the Meteorological Service; at headquarters, and, to a lesser degree, at Valentia, the frequency of sampling was reduced by agreement with the N.E.B. A number of samples from other locations were prepared in the headquarters laboratory for the N.E.B. during the year. Some items of equipment were also issued on loan to the N.E.B. to assist in setting up their measurements.

The computation and publication of results of the radioactivity measurements for 1980 is being undertaken by the Meteorological Service; from 1981 onwards this also will be taken over by the N.E.B.

Co-operation by the Valentia and headquarters laboratories in international atmospheric chemistry programmes continued throughout the year, air and precipitation samples being collected at nine stations. Air samples were analysed for the concentrations of Calcium, Chloride, Potassium, Sodium, Ammonia and Sulphur. Precipitation samples were analysed in addition, for Magnesium, Nitrate-Nitrogen, Hydrogen Ion (pH), acidity/alkalinity and electrical conductivity. The results were sent regularly to the European Air Chemistry network co-ordinated by the University of Stockholm. The results of the monthly precipitation analysis for Valentia Observatory as well as the turbidity measurements made there, were sent to the World Meteorological Organisation's data centre for the Background Air Pollution Monitoring Network, in which Valentia is a Regional Station.

In addition to these established programmes, daily sampling of precipitation and air commenced at Valentia during 1980, as a joint undertaking by the Department of the Environment and the Meteorological Service in a co-operative programme of the Economic Commission for Europe for monitoring long-range transport of air pollutants (known as the EMEP programme). Temporary sampling procedures were devised which, while adequate for the present, will need to be upgraded. Samples were sent weekly from Valentia to the headquarters laboratory, where pH, sulphate and sodium values were measured in the precipitation samples, and sulphate and sulphur dioxide content were measured

in the air samples. The values up to December 1980 were sent to the Norwegian Institute for Air Research, which co-ordinates the EMEP programme, for processing and publication in their bi-annual data reports.

The headquarters laboratory took part in June 1980 in the fifth intercomparison of analytical methods within the EMEP. The results, communicated in a preliminary report issued in October 1980, indicated the methods used for analysis of these low-level concentrations are satisfactory.

An article "Acid Rain in Ireland" was prepared by the laboratory staff for publication in the "Irish Journal of Environmental Science" published by An Foras Forbartha; it will appear early in 1981.

A new all-glass still to provide an adequate supply of high-quality distilled water for the laboratory work at headquarters was acquired in August 1980.

### INSTRUMENTS AND EQUIPMENT

A satellite receiving station was set up on the roof of the headquarters building during the year. The station is capable of direct reception and recording of pictures from orbiting satellites and to a lesser extent from the European satellite (METEOSAT) which is geostationary over the Equator and the Greenwich meridian. Using special aerials a VHF receiver and a tape recorder, together with existing facsimile equipment suitably modified, good quality daylight and infrared pictures are obtained on standard facsimile recorders. A new buffer amplifier with self-contained power supply was designed and built by Meteorological Service staff to enable the Central Forecasting Office to transmit to three separate receiving stations on balanced impedances. This facilitated the transmission of taped satellite pictures of good quality to the three airports, using existing lines. From June, recorded satellite pictures were presented as a routine in the nightly RTE weather forecasts.

Reconditioning of old facsimile receivers continued throughout the year as time permitted. Reconditioned automatic machines were sent to Cork and Shannon Airports. Four new automatic receivers were purchased; two were allocated to the Meteorological Office at Shannon Airport and one each to Casement Aerodrome and the Central Forecasting Office. This helped alleviate a dangerous shortage of dependable automatic machines. There are still difficulties with poor transmission lines and the Department of Posts and Telegraphs are endeavouring to improve these.

The installation of digital anemometers for the measurement and recording of wind speed and direction was completed at the Dublin and Shannon Airports and they were checked out in April by a design engineer from the suppliers. There were serious faults both before and after that date. The main causes of trouble were the sensors. Both the direction and speed sensors proved unsatisfactory due to defective design. All three direction sensors were replaced under warranty and two of the original speed sensors were found to disagree significantly with each other. This caused further delays in commissioning the Shannon Airport system. The Dublin Airport system was brought into operational service on 1st September and has been very satisfactory since. No work was done on a digital anemometer system which has been acquired for Cork Airport; the hold-up was due to a continuing industrial dispute there. Six members of the staff

attended a two-week course on the maintenance of digital anemometers given at Dublin Airport in April by the manufacturers' engineer.

At Valentia Observatory, work continued on the design of a more satisfactory sensor for an automatic rain sampler. A new design was in the mock-up stage and appeared promising.

It had been intended to install solarimeters for the measurement of solar radiation at the Malin Head and Clones synoptic stations during the year. Because of staffing difficulties, this work had to be postponed.

The annual check of Aer Lingus pressure-measuring instruments was carried out in October.

The Department of Energy placed an order for an automatic weather station in December. The station will have logging for wind, temperature and humidity and is intended for use in connection with that Department's research on alternative energy possibilities. The Unit will be checked out by the Meteorological Service at Dublin Airport; later, the Service will install and commission it at a site in the west of Ireland.

### COMPUTER DEVELOPMENTS

One of the main developments was the implementation of an automatic system for plotting weather charts and for producing automatic analyses and forecast maps. When this system was introduced in October it signified the end of much of the manual plotting of weather charts, particularly in the Central Analysis and Forecast Office. Another major development was the takeover by the Service's own DEC 2050 computer of the processing of the Irish climatological data and the phasing out of the use of the Revenue Commissioners' Honeywell 2200 computer, thus ending sixteen years of fruitful association with the Revenue Commissioners. On the communications side, a major advance was the introduction of a telex dial-in facility whereby the airports and synoptic stations could enter their climatological data directly into the communications computer by means of a telex call.

In January two Mohawk Data Systems "key to diskette" data entry stations were installed and successfully linked to the PDP 11/40 communications computer. This equipment, which replaced the punched card systems, is located in the Climatological Division and enables programmes and tabulated data to be entered on visual display units in prescribed formats and subsequently to be transmitted to the communications computer.

The facility for transmitting data directly into the communications system by means of a telex call initiated by the sending station was implemented early in the year, allowing the use of this method for transmission of all climatological data from the synoptic stations from 1st March. Although some loss of data occurred in the initial stages the situation improved significantly with time. The system was later extended to include the automatic collection of the Shannon Airport aeronautical weather reports. Good progress was made also on the development of a "dial-out" facility by which the computer could initiate telex calls. This is intended for use in the collection of surface, upper-air and other reports from the synoptic stations which is due to be introduced by the end of 1981.

The software for the computer link with the European Centre for Medium-range Weather Forecasts (E.C.M.W.F.) in Reading is being developed by a team of consultants from Trinity College, Dublin, and good progress was made on this although the original implementation date of July 1980

was put back to early 1981 due to the complexity of the project and to some delays in installing necessary items of hardware. The medium-speed data line to the E.C.M.W.F. was connected in October 1980.

Work continued on the development by the computer company of an on-line link between the communications and mainframe computers, but a link suitable for operational use was still not available by the end of the year. In connection with this a new version of the PDP 11/40 operating system was installed. Transfer of data between communications and mainframe systems was achieved using magnetic tapes.

An additional disk drive on each PDP 11/40 system and a manually operated switch for switching the magnetic tape units from one processor to another were installed. No major changes in existing communications systems occurred. During the year the software developed by the Service for linking to the European Meteorological Telecommunications Network was sold to the Siemens Company, Germany.

Initial "teething" troubles with the DEC 2050 mainframe computer were largely solved by the latter half of the year and an acceptable level of performance achieved. Additional local terminals were connected to the system in May, so that a total of seven visual display units and two printer terminals were linked to the mainframe. Near the end of the year an order was placed for an additional disk drive and controller and an extra drive, to enhance the capacity and reliability of the system.

Two CALCOMP vertical bed pen plotters and controllers were delivered in April. Following installation and subsequent intensive software development by the Research Division, a system for the plotting of surface and upper level weather charts was brought into operational use in October. The plotters operate off-line using magnetic tapes prepared on the DEC 2050 mainframe computer or on the PDP 11/40 communications processors.

From early in 1980 data sets from the automatic data extraction scheme were made available for testing the Research Division's objective analysis and numerical forecast programmes. The data covered material in most of the commonly used codes. Some useful data were rejected by the extraction system and efforts continued to reduce the rejection rate. An operational



scheme for automatic plotting and analysis of surface and upper-level charts and for producing numerical forecasts was introduced on 1st October. The system involves preparation of a magnetic tape containing the reports on the PDP 11/40 computers, and then the processing, analysis and forecasting on the mainframe system, all initiated by a single instruction from the operator. The plotting stage involves the operator running a programme to produce a magnetic tape which is loaded on the CALCOMP plotter.

With the withdrawal of the Revenue Commission's Honeywell 2200 computer in September all the climatological data from March onwards had to be handled on the Service's mainframe computer. Much effort was devoted to developing and implementing programmes (all written in FORTRAN) to deal with this. From 1st March, all climatological data from the synoptic stations were collected on-line by telex and the climate station and rainfall data entered on the new data entry equipment. By July it was possible to produce tabulated statistics for the synoptic stations for a particular month within two weeks of the month's end. By the end of the year the programmes to deal with climate station and rainfall data were almost completed. The problem of converting the many 7-track Honeywell magnetic tapes to 9-track tapes for use on the mainframe computer ran into difficulties and progress in this area was slow.

An arrangement was worked out with Aer Lingus to provide grid-point forecasts for flight planning from mid-1981. A communications link with the Aer Lingus computer was set up and tested satisfactorily.

RESEARCH AND INVESTIGATION

An important milestone in the work of the Research Division was reached in the Summer of 1980 when daily computer analyses and forecasts using real data began to be produced. The first guess fields for the analyses were provided by a coarse mesh Swedish quasi-geostrophic model and this will continue until routine forecasts become available from the European Centre for Medium-range Weather Forecasts (E.C.M.W.F.). The boundary values on the forecast area were held fixed at their starting values and this again will continue until the advent of the E.C.M.W.F. forecast fields allows variable boundary values to be introduced.

Work continued on varying the analysis and forecast model parameters with a view to achieving maximum efficiency and accuracy.

Research also continued on the use of an initialization method using the calculus of variations which incorporates the use of tendencies from the previous forecast. The method was found to reduce forecast noise but its impact on forecast accuracy has not yet been fully assessed.

Development of the computer graphics system continued and the switchover from manual to automatic plotting took place in October.

Verification statistics on model performance were being accumulated to provide a basis of comparison against which to judge the influence of changes in the system. In particular, statistics of mean square errors at each point were being computed.

In October the Research Division hosted the second meeting of the European Working Group on Limited Area Modelling. The meeting was attended by twenty participants representing nine countries.

During the year, Dr. J.R. Bates was re-elected chairman of the Scientific Advisory Committee of the E.C.M.W.F.

Details of investigational and research work being carried out or completed by members of the staff of the Research Division are as follows:

- (1) J.R. Bates
  - [a] Initialization of primitive equation model using calculus of variations.
  - [b] Dynamics of Blocking.
- (2) P. Lynch
  - Baroclinic Instability of ultra-long waves in the atmosphere (for Ph.D. at Trinity College Dublin).
- (3) A. McDonald
  - Effect of varying the parameters (time step, grid size, boundaries) of the Mesinger model with a view to improving efficiency and forecast accuracy.
- (4) J. Hamilton
  - [a] Finished research for Ph.D. degree: "Computer Simulation of the Geomagnetic Current sheet".
  - [b] Forecast verification.

Research in hand or completed by other members of the Service staff:

- (1) T.S. Kelly
  - Development of a method of simultaneous printing of infra-red and visible pictures from polar-orbiting satellites
- (2) T. Sheridan
  - A study of airflow over mountains
- (3) P.S. Ryan
  - The distribution of rainfall in the Limerick-Clare area
- (4) P. Flynn
  - An examination of the sunshine regime at Shannon Airport from 1957 to 1966
- (5) K.L. Breivik
  - Air and sea temperatures and winds at the old Kish Lightship - Jan. 1951 to Oct. 1965

- (6) D.L. Fitzgerald  
The formulation of a theoretical wind frequency distribution to summarise synoptic wind data for input into estimates of wind power energy potential
- (7) L.S. Leech  
An assessment of the quality of summer weather for tourism and outdoor recreation
- (8) L. Burke  
The effect of tidal streams on wave heights in the Irish Sea
- (9) R. McGrath  
Wave generation in the Irish Sea - a model

### TRAINING COURSES

1980 was an extremely busy year at the Training Centre in Galway. Recruitment was stepped up considerably and, as a result, eight courses were conducted, as follows:-

- 2 courses for meteorologists
- 4 courses for meteorological officers
- 1 course for meteorological officers promoted by confined competition from the assistant meteorological officer grade
- 1 course for assistant meteorological officers

The following courses were provided for Air Corps personnel at Casement Aerodrome:-

- a course for air traffic controllers
- a course for trainee pilots
- a course for helicopter pilots

### LIBRARY

The first consignment of the Royal Irish Academy's collection of meteorological and seismological publications (offered on permanent loan in 1977) were received during the year.

The work involved in the discovery and investigation of Irish meteorological data relating to periods before official measurements were carried out, continued during the year. These data, especially manuscript and little known printed material, weather diaries and meteorological registers are scattered throughout libraries at home and abroad or in private collections. It is hoped to produce a register of all such material which should prove invaluable for future studies on the climate of Ireland.

The library has taken responsibility for the storage and handling of the audiovisual material held by the Service and is developing the use of microforms where appropriate.

INTERNATIONAL CO-OPERATION

The Council of the European Centre for Medium-range Weather Forecasts met three times during the year - twice under the Presidency of Mr. Rohan. Mr. Linehan attended the three meetings. Mr. W.H. Wann attended a meeting of the Centre's Technical Advisory Committee and Mr. S. Miller attended a forecasters' meeting.

Mr. Rohan attended two meetings of Directors of European Meteorological Services, a preparatory meeting in London and a full meeting in Athens.

The Service was represented at meetings of two Commissions of the World Meteorological Organisation - the Commission for Hydrology which met in Madrid in April-May and the Commission for Basic Systems which met in Geneva in December.

The Service was also represented at meetings of a meteorological panel for the North Sea and adjacent waters (Paris, April) and of the North Atlantic Ocean Stations Board (Geneva, July); at two meetings concerned with the European Network of Ocean Stations (Bergen, September and Brussels, December); at a meeting concerned with the buoy project in the Porcupine area (Bracknell, July); at a meeting of the British Universities Global Modelling Group (Reading, June); at a meteorological working group of the European Air Navigation Commission (Paris, September) and at a meeting of a panel concerned with the exchange of aeronautical meteorological information in Europe, known as the MOTNE Panel (Paris, March).

A contract was negotiated with the EEC in relation to the Commission's Solar Energy research programme. Under the contract the following work is being undertaken:

- (a) extension of solar radiation network to include Clones and Malin Head.
- (b) installation of equipment to measure the components of solar radiation on a vertical surface at Valentia
- (c) Statistical analysis of the components as measured in (b) mainly with respect to relative duration of sunshine and solar elevation.

The Service was represented at a meeting of contractors in Dusseldorf in May.

APPENDIX

PUBLICATIONS BY MEMBERS OF THE STAFF

(a) Meteorological Service Publications

- (1) Internal Memorandum No. 91/80 - Checking of Forecasts in the Meteorological Service, 1980 -  
A. Hodson, S. Dyas and P. Carrigan
- (2) Internal Memorandum No. 92/80 - Cork Harbour and its associated catchment areas - C. O'Connor
- (3) Internal Memorandum No. 93/80 - The Red Dust Fallout of November, 1979 - C. O'Connor
- (4) A look at some aspects of the weather at Cork Airport - F. Fitzgerald

(b) Other Publications

- (1) On the interaction between a radiatively damped planetary wave and the zonally averaged circulation in the middle atmosphere - J.R. Bates - Pageoph 118, 266-283, 1980
- (2) The Summer of 1980 in perspective - T. Keane - Irish Farmer's Journal, 6, December, 1980.

A SELECTION OF LECTURES GIVEN BY MEMBERS OF THE STAFF

J.R. Bates

- Irish Maritime Institute: New Outlooks on Weather Forecasting
- UCD Astronomical Society: The Atmospheric Ozone Layer and the Earth's Climate
- UCG Physics Department: Weather Forecasting as a problem in Physics.
- European Space Agency Conference: Dynamical Mechanism through which Variations in Solar Ultraviolet Radiation can Influence Climate.
- Irish Astronomical Society: Solar Influences on Weather

C.M. Byrne

- St Enda's Community School, Limerick: A Series of four lectures on the Royal Yachting Association's courses for coastal skippers and yachtmasters

W.G. Callaghan

- National Fisheries School, Greencastle: Interpreting Weather Forecasts

W.J. Campbell

- Kevin Street College of Technology: Modern Weather Forecasting

C.J. Gillman

- Dublin Institute for Advanced Studies: Multivariate Analysis

J.E.M. Hamilton

- Bolton Street College of Technology: A series of six lectures on General Meteorology.

J. McCurtin

- St Enda's Community School, Limerick: A series of eight lectures on Private Pilot Studies



G.A. McDonald

Comprehensive School, Ballymun:

Two series of ten lectures on Basic  
Meteorology

S.G. Miller

Engineering & Scientific Society  
of Ireland:

Modern Weather Forecasting

D.J. Murphy

U.C.D. Electrical Engineering  
Society:

Computers in the Meteorological Service.

P. McHugh

Fingal Sailing School:

Lectures on meteorology at Malahide,  
Bray and Dundalk.

