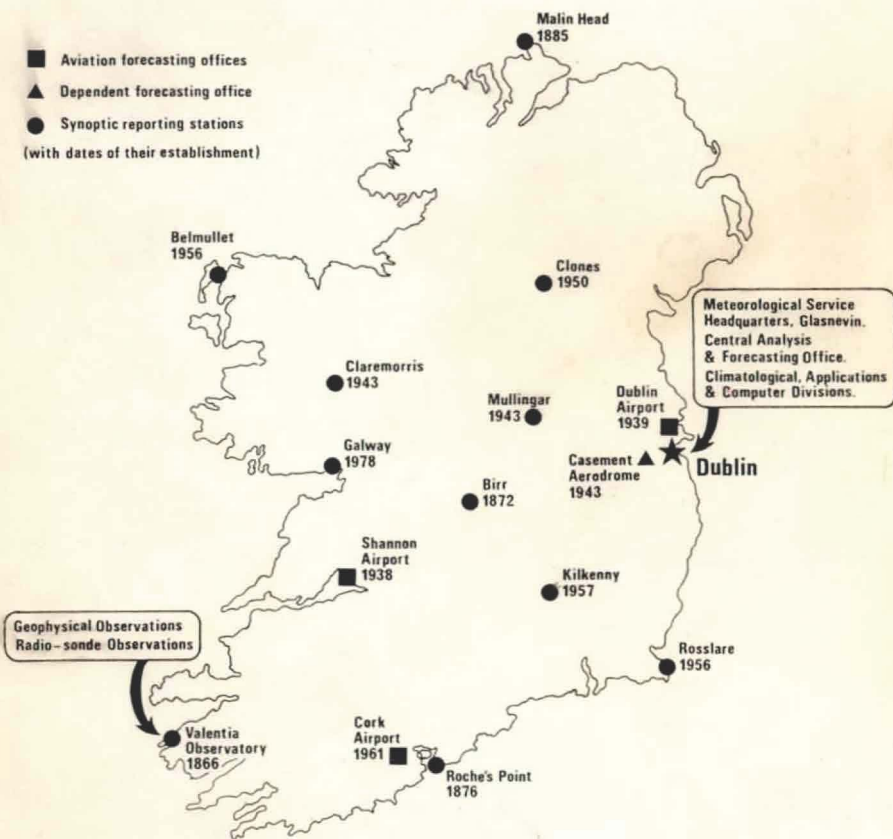


meteorological service ANNUAL REPORT 1983

- Aviation forecasting offices
- ▲ Dependent forecasting office
- Synoptic reporting stations
(with dates of their establishment)



DEPARTMENT OF COMMUNICATIONS

METEOROLOGICAL SERVICE
ANNUAL REPORT
1983

METEOROLOGICAL SERVICE
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FOREWORD

1983 has been another difficult year for the Meteorological Service, but it has nonetheless been possible to maintain the range of services hitherto available to industry and the public. Financial constraints, however, and uncertainty about future staffing structures in the Service, make it difficult to accommodate the technical developments of recent years and to plan for those anticipated in the foreseeable future.

It is encouraging to note the continuing increase in the number of requests for weather forecasts. This greater usage surely reflects an increasing awareness of the usefulness of the forecasts, and is influenced by the extension in recent years of the period for which forecasts are of acceptable accuracy.

In Ireland, possibly due to its generally benign climate, there has been comparatively little debate on the effect of CO₂ and other factors on the world's weather. The possibility of a changing climate, even if the changes are slow, is a very real one, and in response to widespread concern, the World Meteorological Organisation (WMO) has inaugurated an ambitious programme to study the problem. The special topic in this Report (p.1) describes the World Climate Programme of WMO.

D.L. Linehan

Director

Meteorological Service

Dublin

November 1984

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FUNCTIONS OF THE METEOROLOGICAL SERVICE

The functions of the Meteorological Service may be summarised as follows:-

- (i) The collection, analysis and publication of meteorological, geophysical and geochemical data;
- (ii) Research in fundamental and applied meteorology;
- (iii) The supply of weather forecasts, statistical information and scientific advice on meteorological matters to agricultural industrial and public utility undertakings, the press, radio and television, maritime interests, and the general public;
- (iv) The supply of similar information to Government Departments, Semi-State Bodies and the Defence Forces;
- (v) The provision of meteorological facilities for civil airlines and general aviation interests 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) Cooperation with Meteorological Services, and meteorological personnel, in other countries on problems related to meteorology, and the representation of Ireland at international conferences.

THE WORLD CLIMATE PROGRAMME

The impetus for the establishment of the World Climate Programme arose largely from the fears engendered by the droughts in the Sahel of Africa during the 1970s and from anxiety caused by predictions of the future effects of carbon dioxide on world climate. The stage had already been set for the organization of large international programmes in meteorology by the successful planning of the Global Atmospheric Research Programme (GARP). This programme was initiated as a joint venture of the World Meteorological Organisation (WMO) and the International Council of Scientific Unions (ICSU) in 1967 and culminated in the Global Weather Experiment of 1978-79.

As forerunner to the WMO Congress of 1979, a World Climate Conference was convened in Geneva. Experts from the fields of meteorology and climatology reviewed the existing knowledge on the world's climate while economists, agriculturalists and planners assessed the implications of possible future climate changes. Acting on the recommendations of this Conference, the Congress established the World Climate Programme.

It was decided to divide the Programme into four components: The World Climate Research Programme (WCRP), the World Climate Data Programme (WCDP), the World Climate Applications Programme (WCAP) and the World Climate Impact Programme (WCIP). The WCRP was to be conducted, as in the case of GARP, under the joint auspices of WMO and ICSU. Its organization was to be carried out by a Joint Planning Staff based in Geneva and subject to the overall direction of a group of international experts comprising the Joint Scientific Committee. The WCDP and the WCAP were to be organized by a new department set up within WMO. Finally, the WCIP was to be organized by the office of the United Nations Environment Programme (ENEP) in Nairobi, acting in collaboration with WMO.

The WCRP

The work of the WCRP is being organized into three streams of climate research:

1. Research aimed at establishing the physical basis of long range weather forecasting. The objective here is to define the component of weather variability which may be predictable over time periods

of one to two months, in relation to conditions at the ocean or land surfaces or to the development of quasi-stable modes of atmospheric circulation.

2. Research aimed at understanding interannual variability, especially the variability resulting from the coupled variation of the atmospheric and oceanic circulations.
3. Research aimed at understanding the long term variations of climate, whether due to changes in the natural environment or to external influences.

All three streams of WCRP research will involve oceanographers working in close collaboration with meteorologists. It is recognized that one of the main influences generating anomalies in the atmospheric circulation over the past few years has been the El Nino event of 1982-83. El Nino is the name given to the periodic occurrence of warm surface waters in the equatorial eastern Pacific. These events are caused by feedbacks between anomalies in the trade wind regime, which give rise to wind driven ocean currents, and the consequent changes in the ocean surface temperature which result in varying energy inputs into the atmosphere. The El Nino of 1982-83, which involved temperature rises of up to 6°C over large areas of the equatorial Pacific, gave rise to heavy rains and catastrophic flooding in Ecuador and Peru while at the same time causing severe droughts in other areas of the tropics. Some scientists have implicated El Nino in the worldwide anomalous weather of 1983, but the extent to which this theory is valid has yet to be determined.

Modelling the effects of carbon dioxide increase in the atmosphere, which results from the burning of fossil fuels, is also an important focus of WCRP activity. The enhanced greenhouse effect which will result from a doubling of carbon dioxide content is predicted to lead to an increase of about 2°C in global surface temperature, with even greater increases in the polar regions. Much thought is being devoted to the question of how the first effects of the warming can be unambiguously detected. So far, no definite signal has emerged from the noise of natural climate variability.

The aerosol content of the atmosphere, which is increasing due to industrial activity and experiences occasional increases as a result of volcanic activity, is also a subject of interest to the WCRP.

The El Chicon eruption of 1982, which was the largest for the last seventy years, has provided an opportunity to study volcanic effects. It has been found to give rise to a sustained temperature increase of up to 4 C in the stratosphere, but its tropospheric effects are estimated to be minor.

The WCRP is availing of the global satellite network to compile a cloud climatology for a five year period which will provide a basis of comparison for possible future changes in global cloudiness.

The years ahead will see large ocean-atmosphere experiments organised under the auspices of the WCRP. The increasing sophistication of satellite observing technology will enable the ocean surface temperature, the surface wind over the oceans and the geostrophic currents in the oceans to be determined with increasing accuracy. While the predictability of the atmosphere alone is limited to about two weeks, computer models of the combined atmosphere-ocean system may allow predictions of average weather conditions over much longer periods.

The WCDP

The plan for the WCDP emphasises the importance of individual countries upgrading their capabilities in climate data management. Standards and practical manuals for data management are to be published giving guidelines on the digitizing, quality control, storage and retrieval of climatic data. A data source referral system is being developed which will give users information on what data are available, on their location and format and on how they can be assessed.

A project is being developed to promote the transfer and exchange of computing technology in climate data processing. Emphasis is being placed on inexpensive microcomputer systems and easily used computer software packages. Constructive pressure is also being placed on WMO members to make increasing use of existing climate data.

The WCAP

Priority is being given within the WCAP to climate applications in the fields of food, water and energy. Seminars and workshops are being organised to help WMO members make maximum use of climate information

in these areas. Methods and techniques will be developed and made available to member countries. An inventory will be prepared of all available methods to combat desertification. An organized transfer of knowledge and proven methods will be effected with the aid of a climate application referral system.

The WCAP is being organized with the help of the Food and Agricultural Organisation of the UN.

The WCIP

The objective of the WCIP is to study the overall impact of climate and climate variability on society, particularly with regard to socio-economic impacts. The scope of the WCIP is larger than that of the WCAP, both in space and time, but of necessity, some overlap is involved.

In 1980 the Governing Council of UNEP accepted responsibility for the implementation of the WCIP, in close cooperation with WMO. A Scientific Advisory Committee of thirteen scientists was established to advise on the activities that should be carried out under the programme. The Committee has recommended concentration on three main areas:

- 1) studies of the impact of climate on food systems and agriculture;
- 2) assessment of the socio-economic impact of an increase of atmospheric carbon dioxide;
- 3) improvement of the science and methodology to be applied in climate impact studies.

The future work of the WCIP will require the provision of climate change scientists working with general circulation models of the atmosphere. Detailed studies of the impacts of the predicted changes will then be made.

Conclusion

A period of twelve years elapsed between the initial planning of GARP and the completion of the Global Weather Experiment. Similarly it can be expected that a considerable number of years will elapse before the World Climate Programme comes to fruition.

The broadly-based nature of the Programme, involving a number of other UN agencies along with WMO and harnessing the talents of the world academic community through ICSU, will ensure a much stronger effort than anything that could be supported by WMO alone.

If the predicted changes of world climate due to increasing carbon dioxide actually begin to occur, future years will see the World Climate Programme attracting the attention of all mankind.

THE WEATHER OF 1983

The most notable features of 1983 were the warmth and low rainfall experienced during the summer season (June, July and August), when mean air temperatures for the period were up to 2C° above normal, and were the highest this century at Birr and Roche's Point. At Shannon Airport the mean air temperature (18.8C°) for July was the highest monthly mean value ever recorded at any of our stations. July was also the driest on record at some stations, notably Roche's Point, where records commenced in 1867. Roches Point and Malin Head had their driest summer for over 70 years.

Annual rainfall was below normal in Ulster, north Connaught and near the east coast. Elsewhere it was above normal. Amounts ranged from 89% of normal at Malin Head to 115% of normal at Birr. March, May and December were the wettest months. There were some severe but localised thunderstorms in July and an exceptional 15-minute fall of almost 25mm (one inch) at Kilkenny on July 17th.

Annual sunshine varied from 91% of normal at Roche's Point to less than 80% of normal at Belmullet, Birr and Claremorris. It was the duller year since records are available at several stations. However, for the summer season, sunshine was around normal at most stations while at Cork Airport and Roche's Point it was the sunniest summer since 1969.

In late January and early February, gusts in the range 70 to 79 knots were recorded on the north and west coasts. On 4th September, Malin Head had a gust of 85 knots, the highest September gust there since Hurricane Debbie in September 1961.

On 10th May Belmullet registered a pressure of 970.2 millibars (reduced to Mean Sea Level) - the lowest ever recorded in this country for May.

A Climatological Summary of conditions at the Meteorological Service's 15 Synoptic Observing stations during 1983 is given in Table I.

TABLE I : WEATHER SUMMARY FOR YEAR 1983

STATION	RAINFALL (mm)				AIR TEMPERATURE (°C)							SUNSHINE DURATION (hr)			
	Total Fall	Rain-days*	Most in a day		Means of		Annual mean	Extreme Temperature				Annual Total	Daily Mean	Most in a day	
			Amount	Date	Max.	Min.		Highest	Date	Lowest	Date			Amount	Date
Belmullet	990.6	235	32.1	13th Dec	12.9	7.2	10.1	28.3	9th July	-2.0	22nd Nov	1030.2	2.82	15.0	8th July
Birr	935.3	211	39.5	23rd July	13.6	6.6	10.1	30.8	13th July	-4.4	12th Feb	1012.8	2.77	13.8	19th June
Cahirciveen	1432.7	233	52.0	15th Dec	13.8	8.1	11.0	26.6	13th July	-3.5	17th Feb	1069.2	2.92	14.2	27th May
Casement Aerodrome	715.8	185	27.7	9th Dec	13.5	6.3	9.9	29.8	13th July	-4.6	4th Feb	1159.8	3.17	15.0	7th July
Claremorris	1054.1	215	33.2	13th Dec	13.2	6.3	9.8	30.5	13th July	-4.7	22nd Nov	889.9	2.43	14.4	8th July
Clones	663.8	211	21.0	8th Dec	13.1	6.2	9.7	30.5	13th July	-4.0	23 Nov & 4 Feb	1019.1	2.79	14.6	8th July
Cork Airport	1236.1	214	48.4	20th Feb	12.9	7.0	10.0	28.7	14th July	-3.4	12th Feb	1273.7	3.48	14.6	20 June & 4 July
Dublin Airport	702.3	181	30.0	1st May	13.3	7.2	10.3	27.6	15th July	-2.1	3rd Apr	1282.7	3.50	15.1	7th July
Galway	1110.1	225	37.3	8th Dec	13.3	7.4	10.4	28.0	13th July	-2.5	4th Feb	1201.6	3.29	14.5	17 & 19 June
Kilkenny	939.9	198	66.4	17th July	13.8	6.3	10.1	31.4	13 & 14th July	-5.6	4th Feb	1188.9	3.25	14.3	18 June & 8 July
Malin Head	923.5	227	21.9	12th Oct	12.1	7.4	9.8	22.8	14th Aug	-1.6	4th Feb	1065.3	2.92	14.1	19 June & 7 July
Mullingar	1001.9	211	26.0	8th Dec	13.0	6.0	9.5	29.7	13th July	-4.2	29th Oct	1118.8	3.06	14.3	19th June
Roche's Point	913.0	188	40.2	20th Feb	13.3	8.2	10.8	25.5	9th Aug	-1.7	11th Feb	1358.8	3.72	14.5	17 & 20 June
Rosslare	847.0	181	27.2	5th May	12.8	8.1	10.5	26.2	14th July	-0.8	10th Feb	1464.1	4.00	14.5	4th July
Shannon Airport	956.5	207	33.2	8th Dec	14.0	7.7	10.9	30.6	13th July	-2.7	17th Feb	1088.7	2.98	14.5	18th June

* = Days with 0.2 mm or more

OBSERVING PROGRAMME

Surface Observations

The network of surface observing stations continued unchanged throughout 1983. 15 stations operated continuously during the year, each manned throughout the 24 hours by Meteorological Service personnel. Their locations and dates of establishment are shown in Figure 1.

These stations provide hourly reports of wind, temperature, pressure humidity and cloud, and details of the weather currently being experienced at the station. Their reports are distributed both nationally and internationally using a recognised international Synoptic Code, and are used for operational weather forecasting, and for climatological purposes. Many of the stations are also involved in specialised observing programmes, details of which will be found in sections of the Annual Report dealing with particular aspects of Meteorology.

The network of Surface Synoptic Stations was supplemented by returns of climatological data from 90 Climatological Stations and some 750 Rainfall Stations. The locations of the more important elements of this auxiliary network are shown in Figure- 4. Weather data were also received from ships of the Irish Naval Service, from Cross Channel and merchant ships, and from a number of drifting buoys in the Atlantic.

The Service has not yet become involved in the use of Automatic Weather Stations for the acquisition of synoptic reports in real time, but it is hoped to acquire prototypes of such equipment in the next few years with a view to exploring ways in which the existing synoptic network might ultimately be augmented or partially replaced. In common with most other Services however, the Meteorological Service feels that the technology is not yet sufficiently mature to contemplate radical developments in the foreseeable future.

Upper Air Observations

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

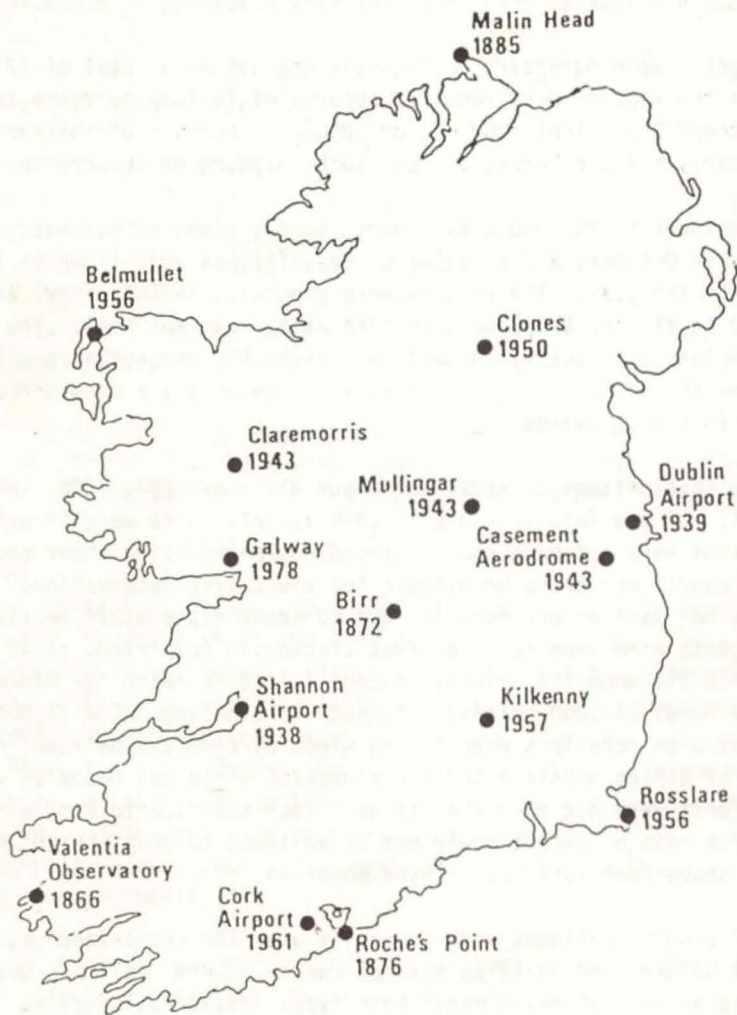


Figure 1. Synoptic Reporting Stations and Dates of their Establishment.

The routine procedure of two ascents per day at 1200 and 2400 G.M.T. was maintained. All ascents were satisfactorily completed to schedule.

Repeat ascents were necessary on 23 occasions out of a total of 730 (3.2%). In general the repeats were required because of failure to reach the minimum acceptable height (200 mb, or 12000 m.) because of instrument failure, early balloon burst, or some such inopportune occurrence.

An "Up-grading kit" to enable the system to fly R/S80 sondes was installed by Vaisala in October, and a number of test flights were flown in the remainder of the year. The results were generally satisfactory, and it is planned to fly the R/S80 on a routine basis from May 1984. The R/S80 sonde, complete with activated battery, weighs 200 grm compared with 700 grm for the R/S21 sonde, and there is consequently a considerable reduction in use of hydrogen.

Upper wind observations by radar were made daily at 0600, 1200, 1800 and 2400 G.M.T. Of the full schedule of 1460 ascents there were 49 occasions where ascents were not made due to ground equipment being under repair and cloud conditions being unsuitable for theodolite observations. An ascent was not made on one occasion due to unavoidable staff shortage. Repeat ascents were necessary, and satisfactorily completed, on 42 occasions (2.9%) when the original ascent failed to reach the minimum acceptable level (13,000 metres). Ascents terminating below 13,000 meters were accepted on occasions when strong winds carried the balloon in the direction of Bente mountain and the elevation angle was below 10° . Repeat ascents were not made when it was clear that due to wind strength a sufficient rate of ascent could not be achieved to keep the angle of elevation above that subtended by the mountain.

Totex TA77 800grm balloons were generally used for radio-sonde ascents, while TA77 800grm and Phillips natural rubber 500grm balloons were used for radar wind observations. Both types proved satisfactory.

The hydrogen generating equipment at Valentia gave satisfactory service during the year, although it continues to require a high level of routine maintenance.

Geophysical Observations at Valentia Observatory

Geomagnetism

No changes were made in observing procedure during the year. Instruments used for base-line data were:

Declination	- Ruska Observatory Magnetometer
Total Force	- Proton Precession Magnetometer
Horizontal Force	- Proton Vector Magnetometer
Vertical Force	- Proton Vector Magnetometer

The two sets of La Cour Variometers with Quick-Run and Standard recorders continued to operate satisfactorily during the year.

Microfilming of the standard magnetograms for Valentia continued at WDC C1, Copenhagen. All the normal magnetograms since the beginning of the IGY in 1957 up to the end of June 1983 have now been microfilmed.

Seismology

Continuous recordings of the components of seismic activity were maintained using the WWSSN short and long period instruments. Regular routine preventive maintenance resulted in satisfactory continuous operations, only minor electric failures in the timing system being encountered. Preliminary report of seismic activity were sent to the U.S. Geological Survey, Denver, Colorado, while original seismograms were sent for microfilming monthly. Data in respect of each earthquake recorded up to 30th June were supplied on punch cards to the International Seismological Centre, Newbury, England, while data from 1st July were supplied on data sheets.

Twenty-one enquiries involving copies of seismograms were serviced during the year compared with seven in 1982.

Solar Radiation

Measurements of Global and Diffuse radiation on a horizontal surface were continued using Kipp and Zonen pyranometers in conjunction with Lintronic Integrators and Print-out Units.

Measurements of Direct Sun Radiation at normal incidence were made using an Eppley Pyrheliometer and Solar Tracker and electronic integrator, while infra-red radiation was monitored using an Eppley Infra-red Radiometer and electronic integrator. Radiation Balance was also continuously recorded using a Funk pattern CSIRO Net Radiometer driving a Honeywell Potentiometric Recorder with off-set zero to accommodate negative net radiation values.

Measurement of total radiation on a south-facing vertical surface, shielded from ground reflected radiation, and measurement of ground reflected radiation were continued.

Thrice daily observations of Direct Sun Radiation were made, when sky conditions permitted, with the Linke-Feussner Actinometer fitted with OG₁, RG₂ and RG₈ filters for spectral band measurements. The measurements with filters facilitated the computation of Angstrom's turbidity co-efficient "B". Routine turbidity measurements were made with the Volz Sun Photometer with transmission bands in the Green, Red and Blue.

All recording equipment was calibrated against the Linke-Feussner Actinometer which in turn was calibrated against the Angstrom Pyrheliometer which is maintained as the National Standard and which is compared regularly with other National Standards.

Global and diffuse Radiation measurements from Dublin Airport, Birr, Kilkenny, Clones and Malin Head and Global measurements from Belmullet were supervised from Valentia.

Details of the Meteorological Service's Solar Radiation Contract with the EEC are given in the Chapter of the Annual Report on International Cooperation.

Other Observations

The aurora, satellite, atmospheric nuclei, weather surveillance radar, and other special observations outlined in previous Annual Reports were continued during the year.

Check readings on the recorder of the tide gauge station at Portmore Pier near Malin Head Synoptic Station were made twice each day by

Meteorological Service Staff on behalf of the Ordnance Survey Office.

Measurements of the chemical constituents of air and rainwater were continued as detailed in the chapter on Laboratory Work, and recordings from the Dines Float Barograph and Jardi Rate-of-Rainfall recorder were maintained at Valentia.

The Sierra-Misco Wet and Dry Automatic Precipitation Collector at Valentia functioned satisfactorily during the year. The collection bucket is covered during dry weather to prevent dry deposition and the system is used only as a wet collector.

FORECASTING SERVICES

The main analysis and forecasting work of the Service was continued at the Central Analysis and Forecast Office (CAFO) during the year, with supplementary analysis for aviation and local forecasting purposes being performed at Dublin, Shannon and Cork Airports. The surface analysis is done manually by the forecaster, while upper air analyses are processed automatically by the computer. Numerical forecasts for 24 hrs. and 36 hrs. at surface and 500 mb. levels produced by the Service's own computer are now available to the forecaster twice daily in real time, as an aid to the preparation of forecasts. In addition ECMWF products, and National Weather Service numerical forecasts from the United States, are received at the forecasting offices. They cover periods up to seven days ahead, and are valuable additional aids to the forecaster.

Charts are produced in CAFO using two off-line Calcomp Plotters. Data may also be called up on the digital GIGI Video Display Unit in CAFO, and hard-copy obtained if desired. Exchange of graphic data throughout the Service is by means of analogue facsimile at present, but it is hoped to introduce computerised methods for this purpose during the coming years. A GIGI unit was installed in Shannon late in 1983 but was not operational on a routine basis by the end of the year.

General Forecasts

Efforts to make the forecasts issued by the Service more readily available to the public at large through the Automatic Telephone Weather Service (ATWS) continued during 1983. The success and increasing popularity of this service may be judged by the fact that there was an increase of 18% in the total number of enquiries during 1983 (from 778,525 in 1982 to 915,343 in 1983).

Of the ATWS Systems operated from CAFO the forecast for the province of Leinster and counties Cavan and Monaghan, (01)425555, registered 71,173, calls during the year compared to 46,628 in 1982, while on the Dublin area ATWS, (01)1199, metered calls totalled 520,348. This latter figure is not significantly different from previous years in the recent past.

The Shannon ATWS, (061)62677 which gives a forecast for the North

Munster area, was contacted by 205,295 callers, an increase of 25% on 1982. The Cork ATWS, serving South Munster and contacted by dialling (021)964600, registered 114,576 calls, again a considerable increase over 1982.

All the ATWS forecasts, except 1199, are prepared with the farming community very much in mind and give a forecast for 24 hours with an outlook for the following days. 1199 provides a short term forecast, and in addition to the general public, caters for those interested in sailing in the Dublin Bay area. The whole country, except Connaught and West Ulster is now covered by the ATWS System and it is planned to incorporate a forecast for South Connaught in the Shannon system from 1st May. Figure 2 shows how the number of calls to the ATWS System has been increasing in recent years.

As in previous years the demand for the ATWS facility was found to be strongly weather dependent, and to have a marked seasonal variation. Changeable weather conditions, or weather of unusual severity result in an increase in the number of calls, while fewer demands are made in periods of settled weather. Also demand generally increases during the summer months, mainly due to an increase in farming activity, as is illustrated in Figure 3 which shows the number of calls registered each month during 1983 on the Shannon ATWS.

The ATWS systems are intended to reduce and ultimately to eliminate the demands made on the forecaster by members of the general public for routine weather information. Direct telephone enquiries, additional to ATWS calls, to the various forecasting offices continued at a high rate as shown in Table 2.

Non-aviation enquiries handled directly by the forecaster are rather few at Dublin Airport, because most such calls in the Dublin area are dealt with by CAFO.

During 1983 forecasters from CAFO continued to make a daily personal presentation of the weather forecast on RTE television after the main news bulletin of the day. Four radio broadcasts were also made each day at 0755, 1204, 1802 and 2352 by the Duty Forecaster from the radio studio in CAFO. The daily broadcasts consist of a general forecast, a detailed sea area forecast, weather reports from our coastal stations at

NON-AVIATION REQUESTS FOR FORECASTS BY TELEPHONE (NOT INCLUDING 1199)

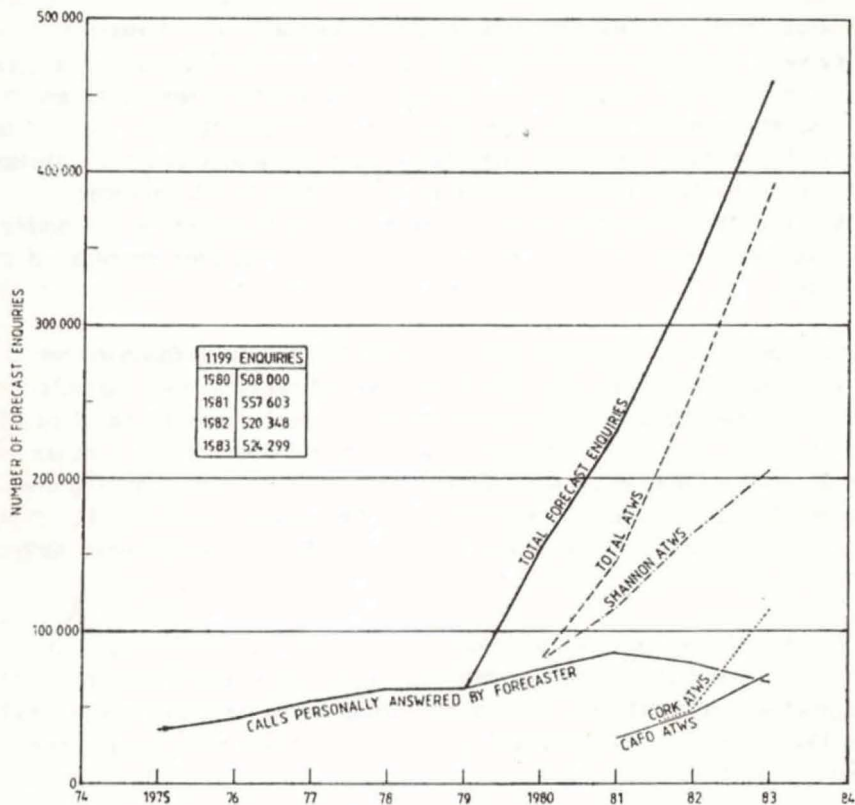


Figure 2

Table 2: Telephone Enquiries to the Forecaster

Interests Originating Enquiries	Telephone calls made to				Totals
	CAFO	Shannon	Cork	Dublin	
Agricultural	21,177	2,653	488	194	24,512
Industrial & Commercial	3,367	961	274	96	4,698
Marine	7,314	1,297	112	110	8,833
Defence Forces	32	18	8	5	63
Other Government Departments	881	420	8	-	1,309
Press	468	1	33	27	529
Sporting	1,336	866	125	77	2,404
Private	6,289	2,869	1,322	323	20,803
Local Radio	-	-	253	-	253
Miscellaneous	-	-	212	31	243
Totals	50,864	9,085	2,835	863	63,647

Malin Head, Rosslare, Roches Point, Valentia and Belmullet, and gale warnings when necessary.

Forecasts were issued to Irish national morning and evening newspapers, to the Sunday papers, and to a number of weekly provincial newspapers. The number of specialised forecasts and warnings issued by special arrangement to individual commercial, industrial, marine, local authority and public utility interests continues to increase. A daily forecast or warning service is supplied to some thirty commercial concerns, as well as 25 local authorities, the Defence Forces, and the major public utilities.

Warnings of weather conditions suitable for the spread of potato blight were added to radio and television forecasts, when appropriate, between May and September. Special frost warnings for the fruit-growing areas of the southeast were also broadcast with the routine forecasts when necessary. A comprehensive forecasting and warning service to agricultural interests was provided during the year as detailed in the Chapter of this Report on "Agricultural Meteorology". 469 gale warnings for coastal waters of Ireland and the Irish Sea were issued by CAFO for broadcast on radio and television during 1983, accounting for a

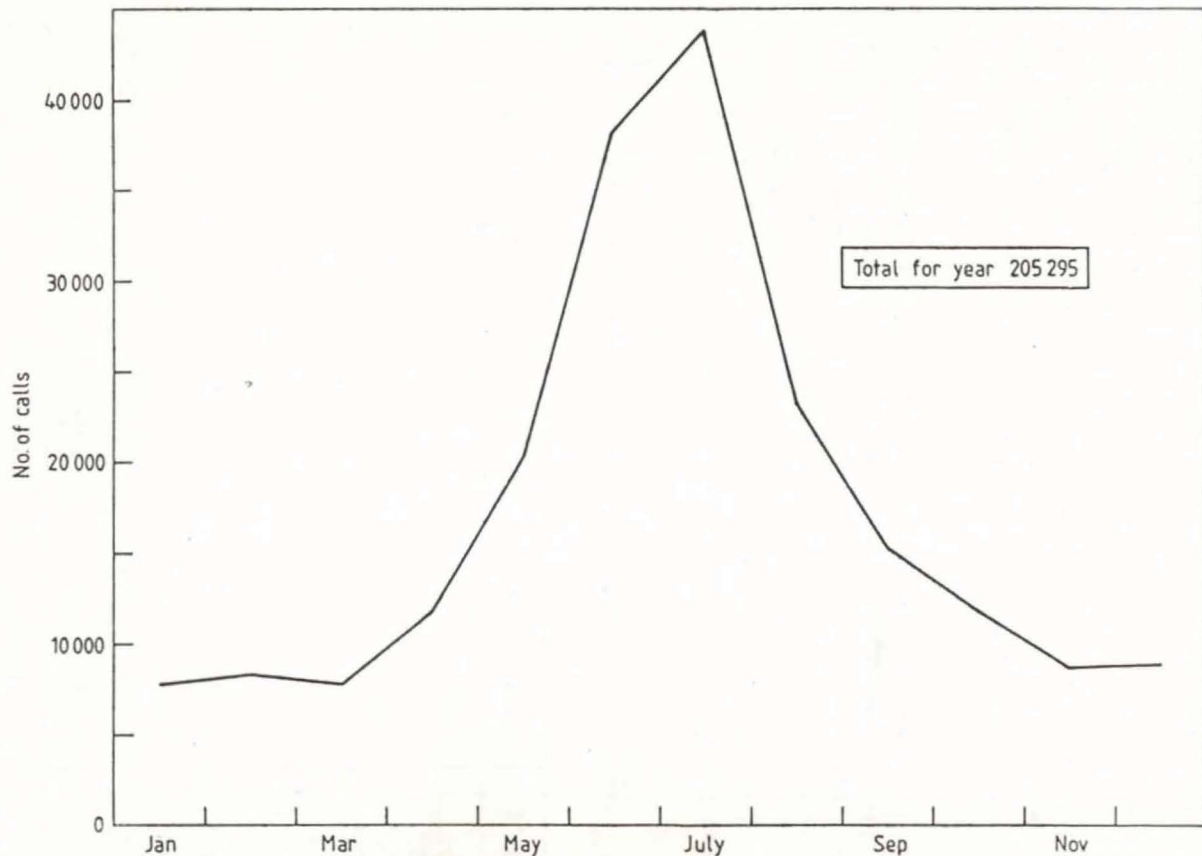


Figure 3: Calls during 1983 on Shannon Airport ATWS.

total of 2574 hours during which the wind was expected to be gale force or stronger. Flood risk warnings were issued to a number of local authorities when appropriate and advance notice of fire hazard conditions was issued to the Forestry Division to assist in anticipating the outbreak of forest fires.

During the Winter-Spring period the scheme for co-operation with the Automobile Association proved very useful. The AA receive special forecasts from the Meteorological Service and transmit them to their clients through their various regional centres. In return the Meteorological Service receives reports on road conditions throughout the country, updated when necessary, which are very useful when dealing with enquiries from the public.

From June until October 1983 the Meteorological Service was an information provider to an experimental Videotex system, coordinated by the Institute for Industrial Research and Standards in association with the Confederation of Irish Industry & ACOT. (Council for the Development of Agriculture). The project was an experimental one, designed to assess the viability of such a facility in Ireland, and also to gain experience in the operation of such a system. The Meteorological Service supplied twenty-four hour and extended forecasts twice daily, and also climatological information, regularly up-dated, mainly for agricultural interests.

An experimental Model Output Statistics (MOS) scheme was introduced in August to assist in the forecasting of daily maximum temperatures in Dublin for up to five days ahead. The programs are based on a software package developed at ECMWF and using correlations between climatological data for Dublin Airport and past ECMWF forecasts, the ECMWF model output is used to produce temperature forecasts which are then employed by the forecasters as an aid. Two sets of correlations are used, one for the summer and one for the winter. Changes in the ECMWF model orography adversely affected the performance of the winter predictions.

Aviation Forecasts

Routine services to civil aviation were maintained at the three airports at Shannon, Dublin and Cork. At Dublin Airport some 30,500 flights were given full meteorological service before departure. Of these 25,159 were commercial aviation flights, while 5,359 were general aviation or military

air traffic. In addition some 9,000 telephone enquiries or requests for briefing were dealt with at the Airport from pilots of light aircraft, Air Traffic Control, Company personnel, etc.

At Shannon Airport some 5,500 flights were supplied with documentation. Apart from the shift in the main helicopter activity from Shannon to Cork due to the lack of oil exploration in the Porcupine area, there was little change in the volume of aviation services provided by Shannon as against 1982. It was still necessary for the Shannon office to provide considerable service for the helicopter operations out of Cork. At Cork Airport 2,828 flights were supplied with documentation. At both these airports the demand for briefing by general aviation interests, and the level of other aviation enquiries was maintained at a level similar to recent years. 255 warnings of hazardous weather conditions for aviation, termed SIGMETS, were issued by the Meteorological Office, Shannon Airport, which acts as the Meteorological Watch Office for the Shannon Flight Information Region. Local aerodrome warnings were also provided as necessary.

The supply of forecast winds and temperatures in grid point form to Aer Lingus for flight planning purposes continued, data being sent twice daily on a routine basis. These data are extracted from the output of the numerical weather prediction models and sent to Aer Lingus at Dublin Airport in digital form over a telephone line.

In addition to the routine needs of aviation, the usual selection of special events in the aviation world, such as gliding and hot-air balloon activities, was catered for by means of detailed special forecasts as necessary. Forecasts were also provided for seven airlines who operated crew training schedules at Shannon during the year.

The 24-hour service of forecasts provided to the Air Corps at the Meteorological Office at Casement Aerodrome for training, search and rescue, air-ambulance, sea fisheries patrol, general security and international flights was continued - documentation not available locally being provided by the Meteorological Office at Dublin Airport. The general increase in activity at Casement noticeable in recent years, continued during 1983.

A program for predicting mountain waves, developed at Shannon Airport, was introduced into operational use twice daily in October.

Marine Forecasting

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, although activity on the west coast was considerably lower than in recent years.

Forecasting for offshore oil activities was provided as before from CAFO with forecasts of wind, weather, waves and swell being made available on a routine basis at various times throughout the year for Marathon Petroleum, Burmah Oil Exploration, Total Marine, Elf Aquitaine and Gulf Oil.

Daily forecasts during the sailing season (June to August) were provided to 4 Yacht Clubs in the Dublin/Dun Laoghaire area, while the increasing awareness of the value of meteorological services to marine interests was reflected in the increase in the number of marine enquiries at Shannon from 1,013 in 1982 to 1,297 in 1983.

CLIMATOLOGY

The Climatological Division continued its work of compiling and processing statistical information on the weather, and making it available in a form suitable for use by other branches of the Service and by outside agencies. A large volume of enquiries about past weather was received as usual from legal, commercial, industrial and other interests. Many of the queries from legal and insurance interests entailed attendance in court by Meteorological Service personnel. A total of 5,177 enquiries was dealt with during the year, fees being charged for 661 of them.

Part of the resources of the Climatological Division is directed towards the publication of the Monthly Weather Report (MWR) which provides for each month detailed tabulations of the various parameters available from locations throughout the country. The MWR is published in three separate parts viz,

Part I: "General Weather Report" which gives values of Air and Soil Temperatures, Sunshine, Humidity, Cloud, Pressure, Visibility and Wind at a large number of stations around the country. The locations of these stations are given in Figure 4.

Part II: "Rainfall" which gives the rainfall for the month at some 750 rainfall stations, and

Part III: "Selected Data for Synoptic Stations", which gives detailed hourly values of the more important parameters at the Service's 15 Synoptic Observing Stations.

During 1983 all parts of the Monthly Weather Reports from July 1981 to December 1982 were published, and those for subsequent months completed and presented for printing. Monthly weather summaries, and an Annual Summary for 1982 were supplied to the press.

Conversion of the data archives from Honeywell 7 track tapes to 9 track DEC 2050 tapes continued and by the end of the year only a small amount of data remained to be converted. Current data for the synoptic, climatological and rainfall stations were keyed-in and transferred to the DEC 2050 on a routine basis during the year. Global and diffuse solar radiation data up to the end of 1982 were put on tape, and the keying-in

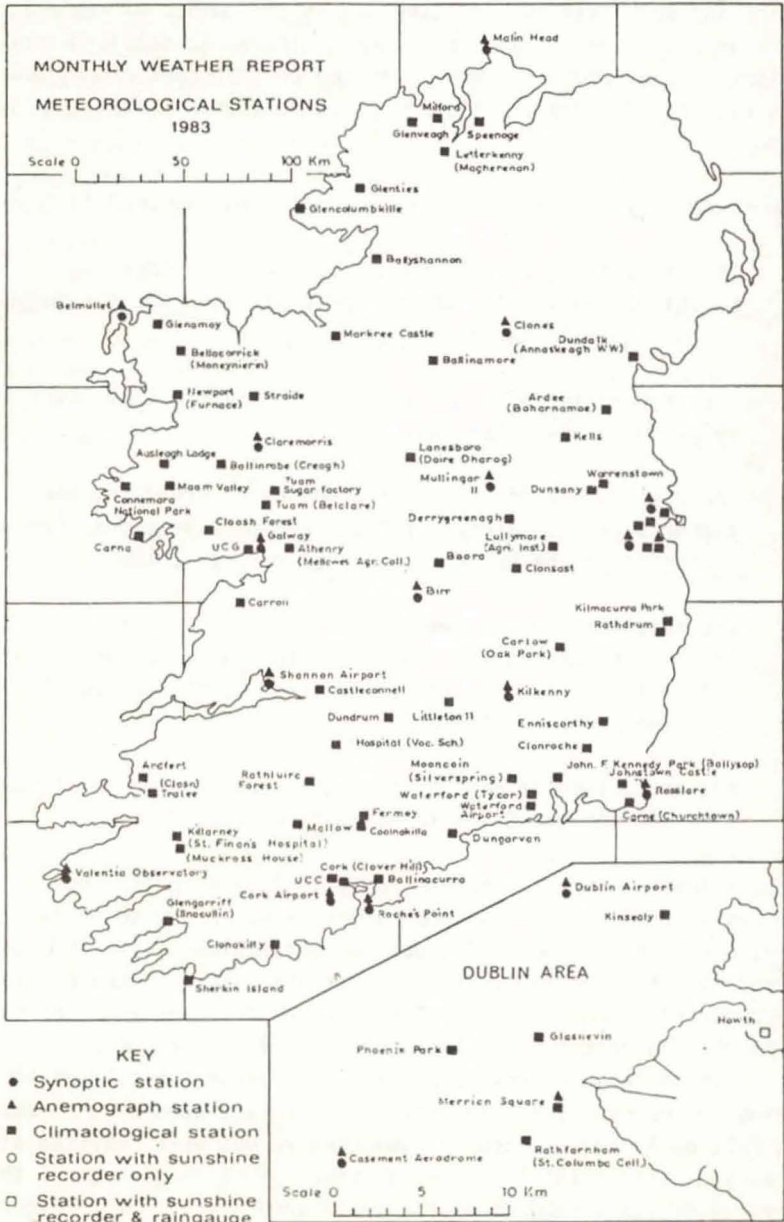


Figure 4. Climatological Stations

of marine and upper-air data continued. As the number of requests for large volumes of data on tape continued to increase, detailed specifications of the tape files were compiled and the Bank of Ireland Data Service was used for the transfer of basic data onto micro-fiche for easy reference.

Other work done by the Climatological Division during 1983 included

- (i) the preparation of 1951-80 averages of air temperature and of sunshine duration for the synoptic stations and for many of the climatological stations;
- (ii) the preparation of monthly and annual rainfall averages for 1951-'80 for 846 stations;
- (iii) the preparation of tables of atmospheric pressure, mean air temperature and rainfall for the synoptic stations, for inclusion in the World Weather Records (1971-1980);
- (iv) the tabulation of extreme values of (1) the monthly sunshine (2) the highest gusts and 10 minute mean wind speeds and (3) rainfall amounts in periods from 15 minutes to 24 hours for the synoptic stations.
- (v) the production of maps of the relative sunshine duration for 1961-'70 for the Climatic Atlas of Europe.

The Meteorological Service operates only 15 Observing Stations. To give comprehensive profiles of the temperature, wind and sunshine over the country, a reliable network of about 100 strategically-located stations is necessary. For rainfall, the most variable element, the requirement is of the order of 1,000 stations. The enormous deficiency in the Service's own network is almost made up by a corps of "Voluntary Observers". The extent to which these observers provide the Meteorological Service with something approaching adequate networks is illustrated by the fact that during 1983 daily temperature and sunshine values were measured at 90 sites and daily rainfall values at some 750 sites throughout the country. A detailed account of the assistance given to the Meteorological Service over the years by our Voluntary Observers is given in the Annual Report for 1977.

Considerable effort is involved on the part of staff of the Climatological Division in supervising this network of rainfall and climatological stations around the country. Many of them are maintained by organisations which cooperate with the Meteorological Service, such as the ESB, An Foras Taluntais, Bord na Mona, the Gardai, etc. A large number is also manned by private individuals who receive a nominal payment for their efforts. It is becoming increasingly difficult in recent years to recruit suitable voluntary observers, since the level of remuneration which it is possible to offer is extremely low, and also because the level of dedication and dependability required of good observers becomes less and less compatible with present day lifestyles. Routine inspections were carried out during the year on 553 of these rainfall and climatological stations. Thirteen new rain-gauge stations were opened, and thirty-two were closed, while six climatological stations were opened and two closed.

During the year, the Climatological Division was represented at meetings of the Irish Committee of the International Hydrological Programme, and of the Solar Energy Society of Ireland.

COMPUTER DEVELOPMENTS

Equipment

The Meteorological Service's computer system consists of two PDP 11/40 mini-computers, used mainly for communications, a DEC-2050 mainframe computer, used for numerical weather prediction, graphics, climatological data processing and research projects, and two CalComp 960 offline pen plotters. The system was enhanced during the year by the acquisition of the following equipment:-

- additional 512K words of core memory for the DEC-2050 computer in March, thereby doubling the main memory and significantly improving response time for users and reducing the runtime of large programs such as the numerical prediction model
- a RPO6 disk drive for the DEC-2050 in November, bringing the total number of disks on the system to four, with a total capacity of 710 Megabytes; the new disk is to be used for more online storage of climatological data.
- three DEC GIGI graphics terminals, together with three DEC KA34-VA graphics printers in January; these are intended for use in the Airport offices and will provide access to the databank of graphics products similar to that available to the Central Analysis and Forecast Office.

In addition a Comart Communicator CP200 microcomputer was acquired in February from Lendac Data systems, Dublin, for use in Valentia Observatory as an aid in the radiosonde ascent and pilot balloon communications and in the processing of solar radiation and other data. After a period of testing and familiarisation in Headquarters the microcomputer was transferred to Valentia in July.

In general the performance of all equipment was satisfactory, although some problems were encountered in the updates to the DEC-2050 system.

Communications Applications

One of the most significant improvements during the year was the fact that from January onwards Irish hourly data were routed to the airport offices by the computer directly after compilation of the bulletins

rather than after return transmission from the Bracknell Regional Telecommunications Hub. This resulted in a faster and more reliable service to the airports.

The interrogation procedures for use of the Irish Meteorological Data Bank were improved and new facilities added, notably 27 new lists of airports whose forecasts could be obtained by a single request, thus making the preparation of flight documentation at the airports more efficient, and also the ability to request individual ship reports.

Considerable attention was given to planning for future communications with the airports, especially in the area of exchanging charts by computer graphics rather than the present analogue facsimile methods. Trial transmission were made to Dublin and Shannon airports and new data lines were ordered. The lines for the transmission of EMTN data were upgraded to 75 bauds during the year, and as a result it was possible to receive all our EMTN data on one line. The second will be discontinued shortly. It is hoped to go to 100 bauds during the coming year. EMTN (European Meteorological Telecommunications Network) is a computer-based system for the international exchange of basic synoptic weather data.

The dial-up terminal to the HQ mainframe computer acquired in the Meteorological Service Training Centre in Galway in 1982, has been operating successfully. It makes available a wide range of up-to-date computer-predicted weather charts and enables programs for training and research purposes to be run directly on the computer.

Automatic Plotting and Numerical Weather Prediction

The twice daily runs of the numerical analysis and prediction programs continued, as did the automatic plotting of maps of weather reports, surface and upper air analyses and forecasts, tephigrams etc. The Automatic Data Extraction module of the numerical weather prediction suite, which deals with the processing of the International reports, was expanded in February to include SATOB (satellite-derived wind data) reports.

From September onwards preprinted forms were used in the plotting of tephigrams leading to a major speeding-up.

The ECMWF Connection

In March the Service took over from CHACO Computer Consultants Ltd. the maintenance of the software for the ECMWF communications link. Considerable attention was given to the removal of software bugs which had become more apparent when the communications system at ECMWF became more strained. Significant improvement was effected. In order to ensure that the numerical analysis and forecast programs would have the necessary ECMWF data for the "first guess" fields and boundary conditions, an arrangement was made from October onwards whereby part of the ECMWF data-set is transferred to the DEC-2050 computer earlier in the morning.

Data from an experimental run of the ECMWF model based on 0000Z data (in addition to the main run based on 1200Z data) were received for a period early in the year.

AGRICULTURAL METEOROLOGY

The importance of agriculture to the Irish economy, and the increasing need to improve productivity and avoid losses, are reflected in an increasing awareness of the meteorological services supplied to agriculture. In recent years it has been possible to improve these services by the development of computerised methods for data storage and extraction, and also by the increasing use of automated methods in the dissemination of meteorological information.

During 1983, the publication of the monthly "Agrometeorological Bulletin" was continued. Three hundred copies were printed each month and dispatched by post to a wide range of agricultural interests. Scientists engaged in agricultural research and also local agricultural advisory personnel use the Bulletin in their investigations and as a basis for informed comment on the effects of weather on crops. The Bulletin was improved by the addition of monthly values of Penman evaporation, and the deviations from average of degree day accumulations. From October onwards an additional Table has been included in the Bulletin giving data on the temperature and moisture climate of two soil patches at Mullingar synoptic Weather Station.

Conditions favourable to the spread of potato blight were monitored during the active season, May 1 to September 30. Blight Warnings were issued as necessary, the first warning being issued early in June and the fifth and last towards the end of August. Accumulations of effective blight hours during the year were below average except in the northwest and parts of the south-midlands. The latter condition was mainly due to frequent Blight Spells in that area in the season, especially after August 20 and in the second half of September. Information on Blight Spells was also made available on the Automatic Telephone Weather Service (ATWS) during periods when favourable conditions were expected in a particular region. A new Blight Advisory Service was instituted to a small number of interested parties. This service provides a weekly summary of the current meteorological situation in relation to the spread of potato blight, as well as a forecast of conditions, including spraying conditions, for the following week.

The processing of reports from the Irish Phenological Gardens was continued and the results were transmitted to the international directorate of the Phenological Gardens Programme. Since this project

has now been in progress since 1964, a review of the present state of the four participating gardens (Johnstown Castle, John F. Kennedy Park, Valentia Observatory and the National Botanic Gardens) was initiated by the Meteorological Services Agricultural Meteorology Unit during the year. Of a total of 84 specimens planted at Valentia Observatory in 1964, only 20 are now considered as growing well. 1983 was not a favourable year for growth at Valentia, since some rotting of blossoms occurred in May, the Spring was cold and wet, drought conditions prevailed over the Summer, and there were gales in the first week of September.

Cooperation was continued with the Department of Agriculture in a programme aimed at reducing the incidence of liver fluke. The Department uses weather information in conjunction with field observations and also faecal and liver examinations, in the preparation of dosing recommendations to farmers. The weather of 1983 suggests a lower incidence of disease, and the degree of infection has been halved in the last decade. This is attributed to the efforts of the National Advisory Group on Fascioliasis, in which the Meteorological Service participates, as well as to advertising of flukicides, better husbandry generally and more vigilant treatment of animals.

A seminar on measures to be taken in the event of a Foot and Mouth Disease outbreak was held for Veterinary Officers in May by the Department of Agriculture at Bandon Co. Cork. The Meteorological Service participated. The exercise confirmed that, in the event of an outbreak, very close liaison between the Meteorological Service and the Department of Agriculture would be necessary from the earliest possible moment.

A pilot scheme of Fire Danger Warnings (meteorological conditions indicating the existence of fire hazard) to the Limerick Division of the Forestry and Wildlife Service was instituted in March. The general usefulness of the information in combating fires is being evaluated with the Division. The warning service, which was provided by the Central Analysis and Forecast Office, continued to the end of August.

An assessment 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 May and July, for use in the ACOT cereal disease weekly Bulletin. The ACOT Bulletin is circulated to all Advisory service Offices and to the farming media throughout the country.

The Meteorological Service also participated in an agricultural Videotex pilot trial service implemented by ACOT and supported by the EEC. Daily forecasts and five-day outlooks were provided from the Central Analysis and Forecast Office together with regularly updated climatological information from the Agricultural Meteorology Unit. The pilot trial ended in October and the service is expected to recommence early in 1985.

Cooperation with An Foras Taluntais (The Agricultural Institute) was continued, and increased collaboration with individual researchers of the Institute occurred. A weekly forecast of certain weather parameters was provided to Johnstown Castle Research Centre for their computer grass production simulation model and the results were published in the farm management section of the "Farmer's Journal". The meteorological data provided was for Johnstown Castle only, but it is hoped to add other stations in 1984 which will be representative of much of the country.

There is an increasing interest in Ireland in upland climatology. A hill climatological station (height 210 m) was opened by the Agricultural Institute at Coolnakilla, Fermoy, in 1982 and data from the station have been published in the "Agrometeorological Bulletin" since January 1983. A climatological survey of the Slieve Bloom Mountains was provided for the Midland Regional Development Programme for Slieve Bloom Mountains, in May, in connection with the Agricultural Institute. A report on the climatology of the Coolnakilla hill was also prepared and a similar report on the Wicklow Mountains is in progress.

Medium range forecasts for farming interests are published weekly in certain farming papers in cooperation with the Central Analysis and Forecast Office. These forecasts have been found to be generally accurate and provide useful guidance over the first five days. A weekly service, comprising statistical data and a summary of the previous week's weather together with a forecast for the following week, was provided to Bord Baine and Ballyclough Cooperative Creamery Limited, and also to Nitrigin Eireann Teo, to help with short term forecasts of milk intake and to assess the utilization and uptake of fertilizer respectively. A weekly weather forecast for farming was given on RTE Radio throughout the year as part of a special weekly programme "Agriview". An additional weekly forecast was instituted on "Farm Diary" in June.

The number of direct enquiries for personal forecasts to the Meteorological Service has largely stabilised at about 80,000 calls per annum, many of them for very specific needs. The expansion of the Automatic Telephone Weather Service (ATWS) has enabled the growth in forecast requirements to be catered for. Detailed recorded forecasts, which are made with farmers' interests specially in mind, are available on a regional basis. While not all calls are from the agricultural sector, the response from farmers suggests that the forecasts on the system are well suited to their needs. The telephone numbers from which these forecasts may be obtained are given in the chapter of the Annual Report on "Forecasting Services".

MARINE METEOROLOGY

Offshore Operations

Activity in offshore drilling operations has tended to fluctuate considerably since the Meteorological Service began providing forecasts in 1977. Receipts for forecasts in the various years have varied from IR£46,000 in 1978 to a low of IR£13,000 in 1980. Total income to the Meteorological Service from these sources in 1983 was slightly above the average at about IR£30,000.

In conjunction with maintenance work on the Marathon Kinsale Platform, special 3-day forecasts of weather and wave conditions were issued by CAFO this year from mid April to the end of August. Similar forecasts were supplied by CAFO to four oil companies (Burmah Oil Exploration, Total Marine, Elf Aquitaine and Gulf Oil) during the oil-drilling season. One of these, Gulf Oil continued drilling into 1984. Routine reports of weather and wave conditions were received from the rigs of the four companies involved.

Major changes were made to the spectral wave model during the year. Since March the sea model has run twice a day using as input the surface winds from the Numerical Weather Prediction Model. Later, the swell model was included. This Hybrid model provides an analysis and a series of forecasts every 12 hours up to 36 hours ahead. The wind and wave parameters reported every 12 hours at three North Atlantic Ocean stations ("Charlie" "Lima" and "Romeo") have been compared with the model actual and forecast parameters. The model output is available in the form of (a) maps of sea-wave heights and directions on a VDU and (b) printouts at individual grid points of wave parameters and spectral wave energies of the local sea, the local swell and the local combination of sea and swell.

Automatic Weather Station on the Marathon Gas Platform:

A new microprocessor, designed and manufactured by an Irish company, was installed in May. It was intended to transmit the data in real-time to the CAFO computer, via the meteorological station at Roche's Point. In addition the data were to be recorded on magnetic tape on the platform for subsequent processing ashore. This system is not yet fully operational, although the manual logging of the meteorological elements was resumed in October. Regular valid wave measurements have not yet

been obtained.

Buoy Project

The Irish Meteorological Service joined with the British Meteorological Office in purchasing pressure sensors which were subsequently installed on drifting buoys owned by Kiel University. These buoys were released in mid-Atlantic in September, reports from them were transmitted by the Argos system and received in CAFO.

Enquiries:

The vast majority of marine-orientated enquiries came from yachtsmen and professional mariners, who required weather forecasts which were supplied by CAFO. However, a considerable number of marine climatological enquiries and reports on conditions during accidents at sea were dealt with by the marine unit.

Marine Observations

The following marine interests cooperated with the Service by making observations of weather during the year:

Irish Shipping: (5 deep-sea vessels)

- Irish Cedar,
Irish Maple, Irish Spruce,
Irish Pine, Irish Rowan

Cross Channel and Continental: (7 vessels)

- Leinster, Connacht,
Kilkenny, Innisfallen,
Wicklow, St. Killian and
St. Patrick II.

Naval Service

- The fishery protection vessels Emer, Deirdre, Aoife and Aisling continued to send weather reports during the year.

Others

- The sail training vessel Asgard II also returned observations as did the trawler "Girona" and the M.V. "River Moy"

With the assistance of the Climatological Division 1,951 ships' Observations were processed and despatched to the appropriate areas of responsibility. The computer programs facilitating the quality control, extraction of data, and sorting of these observations into areas of responsibility became fully operational in 1983. The data, processed in this way to meet the standards required for International Maritime Meteorological Punch Cards, are now also archived on magnetic tape.

The Service operated as a collection centre for a total of 3,265 real-time reports from ships in the seas around Ireland, received through the Coastal Radio Stations at Valentia and Malin Head through British Radio Stations.

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

Dublin	45 visits
Rosslare	8 visits
Cork	5 visits

INDUSTRIAL METEOROLOGY

Wind Energy Atlas Project

A two-year project, set up by the European Economic Community (EEC) to produce a Wind Energy Atlas for the Community came formally to an end in June 1983. Under a contract to the EEC the Meteorological Service received IR£7,000 during this two year period. The project is continuing as an interim programme, and it is expected that a further 4½ year contract will be offered to this Service. Overall modelling of the winds in the EEC study is carried out by the Risø National Laboratory of Denmark. Preliminary results for Ireland were checked by the Meteorological Service.

Wind Energy Survey

Work continued during 1983 on a contract from the Department of Energy to produce material for incorporation in a Wind Energy Survey of Ireland.

The Statistics and Operational Research Laboratory of TCD supplied the Meteorological Service with a package in the form of a suite of computer programs, to calculate an enhanced estimate of the mean annual wind speed and wind power at any site in uncomplicated terrain in Ireland, based on a short run of wind measurements at the site. Mr. C. J. Gillman, formerly of the Meteorological Service, and now a sub-contractor in this project continued his statistical investigations into the Irish wind regime and its variability. The choice of theoretical distributions to be fitted to actual measurements of wind speed, and especially wind power, was considered in detail. The processing of historical wind measurements and observations continued at various outstations.

METEOROLOGICAL SERVICE LIBRARY

The library continued to fulfil its dual function; firstly its national role as the principal repository of meteorological material in Ireland and secondly its internal role of technical library serving the needs of Meteorological Service staff at HQ and around the country.

The Library tries to keep abreast of modern research by subscribing to a wide range of scientific journals and by purchasing the best modern textbooks and monographs on subjects of meteorological interest. At the same time full use is made of the resources of other libraries through "current awareness schemes" and inter-library loans. Many interesting books have also been acquired through the British National Meteorological Library's excellent Gift/Exchange Scheme.

Much time and thought has been given during 1983 to the new computerised cataloguing and retrieval system being developed jointly by the Computer Division and the Library. The new system allows for instant on-line retrieval of library records through subject, author, organisation and keywords, and enables the library stocks to be sorted under any of 22 different headings. The system, still under development, is now in use in the Library, and will shortly be put on general access to all HQ staff.

The repair and binding of early registers of weather data continues with the assistance of the Stationery Office. Arrangements are at present being made for the binding of registers (1869-1968) from Markree Castle, Co. Sligo.

INSTRUMENTS & EQUIPMENT

Satellite Receiving Stations

In Shannon Airport and CAFO, pictures were received from the METEOSAT and GOES EAST geostationary satellites, and from the American polar orbiting satellites. Pictures from the Russian satellites were no longer copied as sufficient coverage was already available. Alden parabolic dish aerials, 1.9 metres in diameter, were used for reception of Meteosat. Reception of the polar-orbiting satellites was by means of a crossed yagi aerial in Shannon and an Alden omni-directional aerial in CAFO.

Satellite signals received in CAFO were routinely relayed to Dublin Airport and Casement Aerodrome; those received at Shannon were relayed to Cork Airport. In practice, the pictures from the American polar-orbiting satellites were the most frequently used as these provided a better coverage of the areas of most concern to the forecaster.

Meteosat pictures, as received on the 18 inch facsimile recorders used in the Service, contain a white space between each line of signal. A digital repeater was designed and constructed by the Instruments' Unit to store each line of signal and repeat it in the following blank line. This repeater is installed in CAFO and the resulting picture, although not containing any additional information was more visually acceptable to the forecaster.

Pictures received in CAFO, mainly those from the American polar-orbiting satellites continued to be used nightly on Radio Telefis Eireann as part of the television weather presentation.

Facsimile and Communications Networks

The transmission and reception of facsimile pictures and charts over the dedicated-line network, while generally good, gave cause for concern at times. Efforts continued to effect improvements where necessary.

Three Muirhead radio receivers were purchased in November for use at CAFO, Cork and Shannon for the reception of Bracknell & Frankfurt Area Forecast Centre products for aviation use. These are intended to augment the present land-line network and to act as standby equipment in the case of line failures. They were not fully commissioned at the end of the year as delivery of modules tuned to specified frequencies was awaited. Two

facsimile transmitters were also acquired to replace existing obsolescent equipment for which spares are no longer available.

The facsimile overhaul programme continued and five recorders were re-built in addition to routine maintenance of the CAFO machines. A Tectronics 466 Memory Oscilloscope for the servicing of recently acquired digitised facsimile equipment was acquired in November.

The design of a facsimile switchboard for use in CAFO was undertaken to eliminate incorrect switching which could easily pass unnoticed with the present complicated jack plug system. A prototype push-button solid state switchboard to control two lines was designed and built by the Instruments Unit. Its facilities include electronic switching with buffered amplifier outputs allowing versatility in matching line levels for individual requirements. This limited capacity experimental prototype was put into operation in CAFO and proved very reliable. Its simplicity of operation was especially welcomed by the operators. This equipment was paralleled with the existing jackfield as it could not be officially put into operation until it had been "type approved" by the Department of Communications.

The success of this switchboard prompted the design of a full scale micro-processor controlled switchboard, this project being started near the end of the year. Concurrently with these projects a line power level meter was built and used regularly to monitor data line power levels. Preliminary work was done on the design and construction of a replacement for the D-900 satellite converter. The early indications were promising.

Automatic Weather Station (AWS)

A Didcot Automatic Weather Station, installed on a radio mast belonging to the Electricity Supply Board (ESB) near Gweedore, Co. Donegal continued to operate satisfactorily, apart from an intermittent fault in recording the Wet Bulb Depression. Among the elements measured are the windspeed measured at 100 ft, speed and direction at 55 ft, and air temperature, wet-bulb depression and solar radiation from sensors installed at the 30 ft level. The system does not report in real-time, data being recorded on a cartridge which is changed every few months.

Personnel from the Instruments Unit made six maintenance visits to the site during 1983. The data were transferred from cartridge to 9 track

magnetic tape by the ESB. There are basic differences between the quality control required for data from automatic systems and from manual systems, as traditionally operated by the Service. Because of this a computer program was developed to carry out detailed quality control on these wind data and on similar data from other automatic systems (e.g. those installed on sites of experimental windmill systems set up as part of the Department of Energy's Wind Energy Survey).

Weather Surveillance Radar

Work began in mid April on the extension to the radar penthouse on the new terminal building in which the computer and associated equipment related to the Shannon/Malvern Weather Surveillance Radar (WSR) Project will be housed. The accommodation was ready by early summer apart from some minor electrical work which has since been completed.

The 2,400 baud synchronous data line to connect the equipment to the BMO Radar Research Laboratory in Malvern, U.K., has been provided and a 26" television monitor for use in the operations room. A Jasmin store for use in connection with maintenance work in the penthouse was also delivered during the year. Two Jasmin stores and two monitors (26" and 14") are now available. A set of "PROMS" programmed to give a coastline map for the Jasmin Store were also received and tested during the year. This Project is described in more detail in the chapter of the Report on International Cooperation.

The Selenia WSR at Dublin Airport continues to operate satisfactorily, although its increasing age (it was installed in 1966) makes spare parts increasingly difficult to come by, and some have to be specially manufactured. The Decca Radar is still awaiting installation at Cork, where work is held up due to an industrial dispute.

Anemometers

The programme of overhaul and calibration of the Dines Anemometers at the airports and synoptic stations was accelerated during 1983. Overhauls were carried out at Mullingar, Roches Point, Cork Airport, Birr, Galway Rosslare and Dublin Airport.

The Dansk Impulsfysik anemometer at Shannon Airport was put into service again in February after a lengthy period out of official use and trouble

was again experienced with the direction potentiometers. A set of Malling sensors was purchased during the year as replacements for use with these anemometers as the present sensors have a disappointing reliability record.

Other Activities

In January the installation of soil moisture measuring equipment was completed at Mullingar Synoptic Reporting Station.

At a seminar in St. Patrick's Training College in Drumcondra, Dublin a display of the reception of facsimile weather charts was set up using a telephone line connection to the Dublin Airport Meteorological Office. A series of charts of acceptable quality was obtained and Meteorological Service Staff were present to supply any information requested and to demonstrate the equipment.

LABORATORY WORK

The collection of air, precipitation, tap-water and total fallout samples for radioactivity measurement continued to be done by the Meteorological Service. While the processing of the samples was carried out by the Meteorological Service Laboratories at Headquarters in Dublin and at Valentia, the measurement of radio activity levels as well as the computation and publication of the results are now done by the Nuclear Energy Board.

The established programme for the chemical analysis of monthly and daily air precipitation samples outlined in the 1980 Annual Report continued during the year. The Sierra Misco automatic precipitation collector purchased in 1982 by the Department of the Environment to assist the European Monitoring and Evaluation Programme (EMEP) was modified by Valentia, after testing, to improve its efficiency. It was used from June onwards for the daily collection of precipitation samples at Valentia. The daily collection of precipitation samples at Dublin Airport for pH measurements, which began in October 1982, continued until October 1983 when it was replaced, temporarily, by a weekly collection of samples. A comparison between daily and weekly pH values at Dublin Airport may give some information on the effects of dry deposition, which appears to have an alkaline effect on pH values at this site.

There was a marked increase in the number of enquiries seeking information on acid rain. An examination of the results of monthly and daily precipitation samples for changes in the acidity of precipitation, and the updating of already published data on the same subject were continued. Arrangements were also made at Casement and Dublin Airport for the collection of daily samples of precipitation for an Foras Forbartha by Meteorological Service staff, in connection with a short term project on acid deposition in the Dublin area, funded by the EEC. Meteorological Service representatives attended a meeting in the Institute for Industrial Research and Standards in October to discuss the possible implications to Ireland of an expected EEC directive to combat the effects of acid deposition by reducing emissions of sulphur dioxide and nitrogen oxides.

A few enquiries were received seeking information on radioactivity levels and wind patterns around the time of the Windscale accident in October 1957.

RESEARCH AND INVESTIGATION

The main thrust of the activities of the Research Division during 1983 was directed towards the continued development and improvement of the operational numerical forecasting system. A brief description of the automatic analysis and forecasting system used by the Service is presented in Table 3.

Computer analyses and forecasts are produced every 12 hours on an operational basis. Several improvements were introduced during the year. SATOB data (wind speeds derived from series of geostationary satellite photographs) are now used in the analysis. Also the 12-hour ECMWF forecasts from midnight GMT were used in the midday analysis during the short time they were available. It is hoped that they will be available operationally in the near future. The division of the analysis into two sub-jobs has resulted in more timely availability of charts.

The mass and wind fields are initialized by a calculus of variations technique using as constraints the equations of motion with forecast tendencies, a method which has no impact on the skill scores but reduces noise in the initial hours of the forecast. However, to make best use of the semi-Lagrangian technique in the model it is felt that a better initialization is needed. A new method, using a modified inverse Laplace transform, is being developed, and preliminary results are very encouraging. The method has now been applied to a one-level model, also with good results. It is planned to extend the method for use in the operational system.

The main features of the forecast model are shown in Table 3, and forecasts out to 36 hours are made twice daily. The time integration is split explicit; a semi-Lagrangian advection scheme is used and the adjustment terms are integrated by a forward-backward treatment of the gravity-wave terms. The semi-Lagrangian method has been proved to be efficient and accurate. An Alternating Direction Implicit (ADI) method is under development, and should be applicable to the integration of the adjustment terms of the model equations, with further saving of computer time and increased accuracy. Tests with fast semi-implicit methods are also being made.

TABLE 3:

Irish Meteorological Service
Numerical Analysis and Forecasting System

ANALYSIS		
FORECAST		
ANALYSIS		
<p><i>Method</i> <i>Analysed variables</i> <i>Grid</i> <i>Levels</i> <i>Observation types</i> <i>First guess</i> <i>Data cycle</i></p>	<p>3-D univariate optimal interpolation Sea-level pressure, geopotential, temperature, wind components Arakawa D-grid on polar stereographic projection; $d=300\text{km}$ at 60°N 1000, 850, 700, 500, 400, 300, 250 and 200 mb SYNOP, TEMP, PILOT, AIREP, SATOB ECMWF 12 or 24 hour forecasts of geopotential and wind 12 hours</p>	
INITIALIZATION		
<i>Method</i>	<p>Variational fitting of mass and wind fields using the equations of motion with forecast tendencies as constraints</p>	
PREDICTION		
<p><i>Formulation</i> <i>Independent variables</i> <i>Dependent variables</i> <i>Diagnostic variables</i> <i>Grid</i></p>	<p>Primitive equations λ, ϕ, σ, t T, u, v, p_s Φ, δ Arakawa E-grid, transformed lat/long, $d=1.4^\circ$ (see figure); five levels in vertical Europe, North Atlantic, Eastern Canada Second order accuracy Advection: semi-Lagrangian scheme ($\Delta t=30\text{min}$) Adjustment: forward-backward for gravity wave terms; trapezoidal implicit for Coriolis terms ($\Delta t=7.5\text{min}$)</p>	
<p><i>Integration domain</i> <i>Finite difference scheme</i> <i>Time-integration</i></p>		
<i>Parameterization</i>	<p>Orography: smooth Surface friction (Ekman) Vertical eddy momentum transport Horizontal diffusion: near boundaries Dry convective adjustment (applied every hour) Moisture: not included Radiation: not included Upwind differencing scheme. Values from ECMWF forecasts updated every 6 hours.</p>	
<i>Boundaries</i>		

Other activities of the Research Division are given below:

- i) The extension and refinement of the verification programs. The analysis is checked against that of ECMWF and 24 and 36 hour forecasts are verified against both analyses. A study of the impact of the numerical products on the accuracy of forecasts produced by CAFO has been undertaken, and results will appear in a Memorandum.
- ii) The graphics software was further refined. New features include better annotation, extended range of products, and background shading for rainfall maps.
- iii) Assistance in the development of graphics systems was given to University College, Dublin, and also to the Icelandic Meteorological Service.
- iv) The range of products supplied to Aer Lingus was extended, and the programs for preparation of this data were made more efficient.

In addition to the work of the Research Division, the following research work was in hand or was completed by other members of the staff of the Service:

- CAMPBELL, W.J. (Computer Division)
Regression equations have been derived which allow the Maximum Temperature at Dublin Airport to be forecast for up to 5 days ahead. The predicted values are based on a Model Output Statistics (MOS) interpretation of the ECMWF forecast products.
- FITZPATRICK, L.N. Work continued on the implementation of communications Protocols on the DEC 2050 Computer, and was submitted as a thesis for the award of a MSc Degree in Computer Science from Trinity College Dublin.
- GLEESON, S. (Meteorological Office, Shannon Airport)
An investigation into "the accuracy of rainfall measurement at Shannon as opposed to its measurement in a turf wall shelter". This project is now to be extended to the synoptic stations at Mullingar and Belmullet.

- HEUSSAF, P.A. (Meteorological Office, Dublin Airport)
"A survey of References to Weather in Historical Records in Ireland 1200 - 1840 AD".
- McGRATH, R.T. (Central Analysis & Forecast Office)
The development of an evaluation system for CAFO Radio Forecasts.
- SHERIDAN, T. (Meteorological Office, Shannón Airport)
The development of a computer program for output of Mountain Wave information from the IMS computer using radio-sonde ascents. This program has been run operationally twice a day since December 1983 on data for 0000 and 1200 for both Valentia and Long Kesh.
- SHIELDS, L. (Meteorological Service Library)
i) Early sources of Irish Climatological and weather data.
ii) Weather-lore in Irish folk tradition.

INTERNATIONAL COOPERATION

European Centre for Medium Range Weather Forecasts (ECMWF)

ECMWF is a cooperative venture by 17 European countries in an effort to improve the quality of weather forecasts in the period 3 to 10 days ahead. The financial resources necessary to provide the very large computer power necessary to tackle forecasting of this type is beyond the afford-limits of any one nation. The cooperative project has resulted in the ECMWF Centre in Reading, which has been supplied with the necessary computers, and employs scientists of a high calibre. Progress to date has been encouraging. The products of the Centre are available to all member states, including Ireland, by direct computer to computer link, and are now used on a routine daily basis at the forecasting offices of the Irish Meteorological Service.

Mr D.L. Linehan, Director, represented Ireland at meetings of the ECMWF Council in April and November. Mr W.H. Wann, Assistant Director, was elected Chairman of the ECMWF Technical Advisory Committee (TAC) in January and in this capacity attended meetings of the Council, TAC, the Scientific Advisory Committee and the Finance Committee during the year.

Mr D.J. Murphy, Head of the Computer Division, attended a meeting of ECMWF Computer Representatives in May, while Dr. J.R. Bates, Assistant Director, and Dr. A. McDonald of the Research Division attended an ECMWF Seminar on Numerical Weather Prediction. Dr. J.E.M. Hamilton of the Research Division served as a consultant in computer graphics to the Centre from June to August 1983.

ECMWF forecasts from one to seven days ahead at both surface and 500 mb. levels were used operationally in the forecasting offices of the Service throughout the year. By means of a Graphics Display Unit an extensive range of ECMWF products was readily available to the forecaster, while a Graphics Printer linked to the system, gave a hard copy option.

Data from an experimental run of the ECMWF model based on midnight GMT (in addition to the main run based on 1200 GMT data) were received for a limited period early in the year.

International Civil Aviation Organisation (ICAO)

Mr. P.A. Lyons, Officer-in-Charge of the Meteorological Office at Shannon Airport, attended the Eighth meeting of the Meteorological Advisory Group (METAG) of the European Air Navigation Planning Group (EANPG) at the European headquarters of ICAO in Paris from 31st October 1983 to 4th November 1983. METAG concerns itself with the meteorological content of the regulatory material which governs the operation of Civil Aviation throughout Europe. The work of the group during 1983 was concerned to a large extent with the Meteorological part of the new European Air Navigation Plan, which is reaching its final stages. It also considered in detail the implementation of the new World Area Forecast System (WAFS), which is an arrangement whereby forecasts of en route conditions for civil aviation are prepared centrally at two World Area Forecast Centres in Bracknell and Washington, and disseminated as necessary, rather than forecasts being prepared individually at local aviation forecasting offices.

Mr. D.J. Murphy, Head of the Computer Division, attended the 15th Meeting of the MOTNE Regional Planning Group at the ICAO Office in Paris in September. MOTNE (Meteorological Operational Telecommunications Network for Europe) is an international telecommunications system for the exchange of meteorological information for aviation purposes.

World Meteorological Organisation (WMO)

WMO is the international body responsible for coordinating the activities of national meteorological services throughout the world. Ireland was represented at the Ninth Congress of WMO in Geneva in May by Mr. D.L. Linehan, Director and Mr. B.E. McWilliams, Head of the Services Division. Congress is the supreme policy-making body of WMO on which all Member States are represented and meets every four years to review the activities of the Organisation, and to decide on future actions.

Mr. T. Keane of the Agricultural Meteorology Unit attended the Eighth Session of the Commission for Agricultural Meteorology held in Geneva from February 21 - March 4. The Service participated in an exhibition held during the Session, with a display entitled "Weather and Animal Health - the use of Meteorological Data in Liver Fluke Control in Ireland". Mr. Keane was invited by the Commission to act as joint rapporteur with experts from Sweden and from the Federal Republic of

Germany on the Economic Benefit of Agrometeorological Services.

Mr. L. Burke of the Marine Meteorology Unit attended a meeting at the World Meteorological Organisation Headquarters in Geneva in September in connection with the formulation of a WMO Wave Programme.

Ireland was also represented at the Eighth Session of the WMO Commission for Basic Systems in Geneva in February by Mr. W.H. Wann, Assistant Director.

World Meteorological Day, organised by the WMO to promote interest in the science of meteorology, was celebrated as usual on March 23rd. The theme for 1983 was "The Weather Observer". A Press Release was issued on behalf of the Meteorological Service to draw attention to the occasion.

Shannon Weather Surveillance Radar

During 1982 the Service had entered into an agreement with the British Meteorological Office, aimed at providing a quantitative estimate of the rate of rainfall within the field of view of the radar at Shannon and incorporating this in the existing U.K. weather radar network. Preparatory work on this project continued in 1983, with the construction at Shannon of premises to house the necessary computer equipment, at present being assembled in the United Kingdom. An additional Jasmin Display Unit was purchased for eventual use in CAFO, when the system becomes operational in mid 1984.

COST-43 Agreement

This Agreement (project 43 of European Cooperation in Science & Technology), which is aimed at setting up an experimental network of ocean stations in the waters around Europe to report environmental data in real-time, expired in June 1983. The agreement provided a focal point framework within which several bi-national or multinational buoy projects were set up. Considerable work remains to be done to consolidate these achievements and for this reason a new agreement was drawn up during 1983. An official decision on the participation of Ireland has not yet been made.

During the autumn of 1983 the University of Kiel released a number of small drifting buoys in mid Atlantic to measure ocean currents. The

University permitted the Irish Meteorological Service and the U.K. Meteorological Office to install pressure sensors on a number of these buoys. Two sensors were provided by Ireland and three by the U.K. Buoy positions and air pressure values were transmitted through the Argos System and provided valuable information to CAFO during the succeeding months.

Agreement for Joint Financing of the North Atlantic Ocean Stations (NAOS)

Mr W.G. Callaghan, Head of the Applications Division, attended the eighth session of the NAOS Board in Geneva from 28 June to 1 July 1983. It was generally agreed there that the present network of four stations could be maintained until the end of 1985 but that after that date financial restrictions would compel a reduction in this number. To compensate for the resulting loss of data, especially in the upper-air, it would be necessary to increase the quantity of information available from other sources, such as aircraft, voluntary observing ships and data buoys. The NAOS Board felt that WMO should give priority to a study to determine the most cost-effective distribution of such observing systems in the North Atlantic.

EUMETSAT

EUMETSAT is an organisation of European states, set up for the purpose of implementing an operational meteorological satellite programme for Europe. The initial programme covering the period up to 1995, envisages the continued operation of the present satellites and the procurement of three new satellites which will be launched in 1987, 1988 and 1990. In May 1983 the Director attended a Plenipotentiary Conference in Geneva to adopt the text of a Convention for the establishment of EUMETSAT. This Convention is now open for signature and ratification by States and it is hoped the necessary procedures will be completed by Ireland during 1984.

World Communications Year

The year 1983 was designated by the United Nations as World Communications Year (WCY). In common with other countries, a special effort was made in Ireland to highlight the role of communications in modern life. A National Committee was established to coordinate activities, and the Meteorological Service was represented on this Committee by the Director. His participation reflected the importance of communications to the

science of meteorology.

The Meteorological Service contributed material to a stand organised by the National Committee for WCY at a Telecom Exhibition in the Royal Dublin Society premises in March. Mr. D.J. Murphy, Head of the Computer Division contributed an article on "Communications in Meteorology" to an Advertisement Feature in the national newspapers in July, and also delivered a public lecture on the same subject to the Irish Meteorological Society in December.

Other International Activities

The Director attended the Conference of Directors of Western European Meteorological Services in Helsinki in April, and the 18th Assembly of the International Union for Geodesy and Geophysics in Hamburg in August. He was also present as an observer at the Conference of Directors of Commonwealth Meteorological Services in Bracknell, United Kingdom, in June.

Dr. P. Lynch of the Research Division attended a meeting of the European Working Group on Limited Area Modelling in De Bilt, Holland in October, while Mr. L. Burke of the Marine Meteorology Unit represented the Service on the Windpower Steering Committee of the Department of Energy and attended three EEC Wind Energy Meetings abroad during the year.

Under a contract negotiated with the European Economic Community in the context of the Commission's Solar Energy research programme, a statistical analysis of the components of solar radiation on a Vertical South-facing surface at Valentia Observatory, mainly with respect to relative duration of sunshine and solar elevation, was completed. The final report was submitted to the EEC in September.

STAFF TRAINING

The Government restrictions on recruitment continued to have an effect on the level of activity at the Meteorological Service Training Centre in Galway. The courses given at the School of Meteorology during 1983 are detailed below:

<u>Began</u>		<u>Ended</u>	<u>Course</u>	<u>Number completing</u>
March 1	-	Oct 28	Meteorologist	1
March 2	-	May 6	Assistant Meteorological Officer	1
June 8	-	June 22	Meteorological Officer	1
June 20	-	Sept 30	Meteorological Officer	1
Aug 15	-		Meteorologist	1
Nov 2	-		Meteorologist	1
Nov 8			Meteorological Officer	1

It is notable that, although the number of trainees was much reduced the number of courses given was well up to the levels of previous years.

Negotiations are at an advanced stage between the Service and University College, Galway about possible collaboration in the provision of an MSc course on Meteorology, which would be available both to trainee meteorologists and to post graduate students of the University. A curriculum for the course has been accepted by both parties.

Since October 1983 the Meteorological Service has also been a member of DEVCO, the State Agencies Development Cooperation Organisation, the object being to utilise spare capacity in the Training Centre by providing courses in meteorology for overseas students.

The following Training Courses in meteorology were provided for Air Corps personnel at Casement Aerodrome, Baldonnel.

- i) 16th Young Officers Class to Commercial Pilots Licence level with final examination in March 1983.
- ii) 17th Young Officers Class, as above, with final examination in December.

- iii) 19th Air Traffic Controllers Class, with final examination in July.
- iv) Beech King Air pilots conversion course - 4 lectures, October and November.

A comprehensive training programme for computer operations staff was devised and implemented during the year and incorporates both initial and refresher training. New Operations Manuals were written on all major applications systems in the Computer area. Two courses for CAFO computer operations staff were held in April, attended by Meteorological Officers and 2 Senior Meteorological Officers, while three refresher seminars for operators were held in December, catering for 29 Meteorological Officers and 3 Senior Meteorological Officers. A course for users of the DEC-2050 computer was held in November and was attended by 14 people.

The involvement of some individual staff members in educational or training activities is given below.

1. Mr. F. O'Murchadha, Senior Meteorological Officer at the Meteorological Office, Shannon Airport attended a training course on the ASEA ceilometer Type QL1211 in Vasteras, Sweden in March, and also a one-day course given by PACE Electronics on repair systems for Printed Circuit Boards in Limerick on 21st January.
2. Mr. D. Lynch, Meteorological Officer, Shannon Airport obtained a B.Sc. degree in Experimental Physics, Mathematics and Chemistry from University College, Cork.
3. Mr. T. Sheridan, Meteorologist, Shannon Airport is currently attending a course at the Limerick School of Engineering, leading to Membership of the British Computer Society.
4. Messrs B. Barry, J. Bourke and J. O'Brien of CAFO attended a distant education Course in Computer Basics organised by the National Institute for Higher Education.
5. Messrs S. Walsh, A Nulty and J Scully, and Miss E. Murphy attended RTE training courses on the presentation of weather forecasts on radio or television.

6. Mr. M. Hopkins continued his studies leading to a BSc degree from the New University of Ulster.

ADMINISTRATION

Staffing

Government restrictions on recruitment and promotion continued to affect the Service during 1983, causing considerable difficulties in areas of the Service where redeployment is not possible. The Meteorological Office at Dublin Airport, and the Research Division, both continue to operate without a permanent Officer-in-Charge, while at many of the Service's stations, shortage of staff at the supervisory level has led to difficulties in maintaining the required levels of service. The number of staff assigned to the Meteorological Service in April 1984 is 26 fewer than the sanctioned complement in April 1981, a reduction of some 7.6%.

The restrictions on payable overtime imposed by the Government in 1982 continued during 1983, and in some cases minor curtailments of services were necessary in order to stay within the prescribed allocation.

Proposals for the re-organisation of the grading structure in certain areas of the Service, which were submitted to the Department of the Public Service in 1982, were still under consideration by that Department at the end of 1983. A Working Group of Senior Meteorologists, set up in November 1982 to recommend methods by which the aviation sector could be serviced more efficiently, submitted its Report to the Director in July. The Report is now the subject of discussions with staff interests, and decisions on the future organisation of services to aviation will be taken when these are completed.

The numbers of staff servicing in the Meteorological Service on 31st December 1983 were:

Director	1
Assistant Director	2
Senior Meteorologist	9
Meteorologist	45
Principal Meteorological Officer	10
Senior Meteorological Officer	38
Meteorological Officer	152
Assistant Meteorological Officer	31
Other grades	<u>38</u>
Total	326

Mr. S.G. Miller, Senior Meteorologist died after a short illness on 28th April. Seamus Miller was a graduate of University college Galway and joined the Meteorological Service in 1952. After serving at Dublin and Shannon Airports he was assigned to the Central Analysis and Forecast Office in March 1961. He became well known to millions of viewers and listeners for his regular presentation of the weather forecast on television and radio, and gave frequent interviews to the media on matters of meteorological interest. In October 1978 he was promoted Senior Meteorologist and appointed Head of the Central Analysis & Forecast Office, but continued to combine his administrative duties with frequent radio and television appearances. To his wife Joan, and family, sincere sympathy is extended.

Mr. D. O'Connor, Senior Meteorological Officer retired from the Service in May. Des O'Connor joined the Meteorological Service as a Meteorological Officer in July 1940, and was one of the few remaining members of the Service to have served at the Meteorological Office at Foynes, the flagship of the Service in its early years and the predecessor of our Office at Shannon Airport. After leaving Foynes, he served at various times in Headquarters, Dublin Airport, Birr and Shannon, before spending the last fourteen years of his career at Dublin Airport. He was promoted Senior Meteorological Officer in July 1959.

Miss Mary Moore also retired from the Service in 1983. Mary joined the Meteorological Service in October 1963, and her helpful, efficient and cheerful manner in her capacity as telephonist have been greatly missed since her retirement in July.

Mr. P. MacHugh was promoted Senior Meteorologist and appointed Head of the Central Analysis and Forecast Office in July, while Mr. W.P. Keegan was promoted to the Meteorologist grade in September.

Mr. M.J. Connaughton continued on leave of absence as Director of Administration with the World Meteorological Organisation in Geneva.

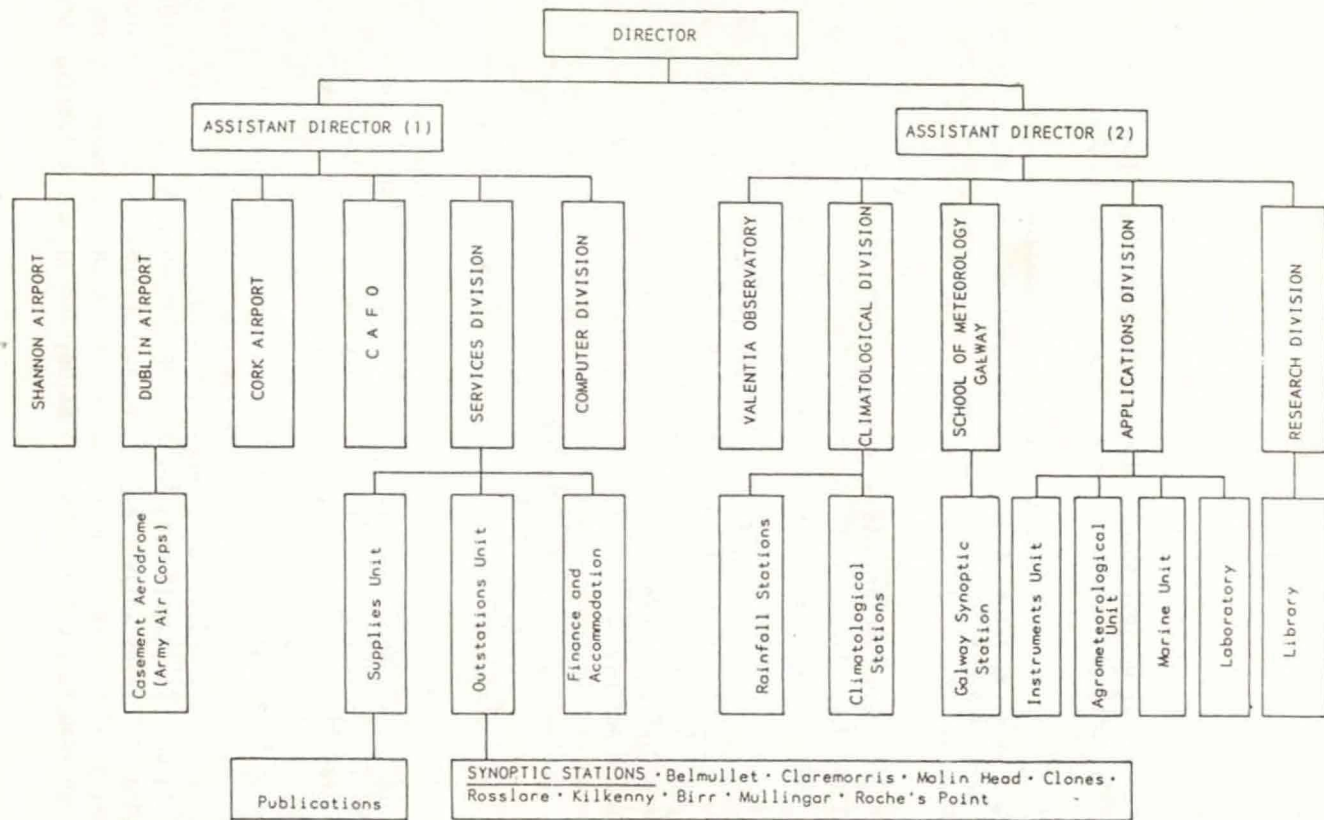


Figure 5. Organisation of the Meteorological Service

PRINCIPAL OFFICERS OF THE METEOROLOGICAL SERVICE ON 31st DECEMBER 1983

DIRECTOR

D.L. Linehan B.E.B.Sc

ASSISTANT DIRECTORS -

W.H. Wann B.A. MSc

J.R. Bates BSc.PhD

SENIOR METEOROLOGISTS -

C O'Connor B.Sc.

Meteorological Office, Cork Airport

P.A. Lyons B.Sc.

Meteorological Office, Shannon Airport

W.G. Callaghan B.Sc.

Applications & Instruments Division

B.E. McWilliams B.Sc

Services Division

E.J. Murphy B.Sc

Valentia Observatory

S.S. O Laoghog B.Sc.

Training Division

D.J. Murphy M.Sc.

Computer Division

D.L. Fitzgerald B.Sc

Climatological Division

P. MacHugh B.Sc.

Central Analysis & Forecasting Office

Vacant

Research Division

Vacant

Meteorological Office , Dublin Airport

SUPPLIES AND STORES

The supply of approximately 400 different items of consumable stores to all stations throughout the country was maintained during the year. These items consisted mainly of charts and forms covering the areas of Administration, Climatology, Forecasting, Accounting and Operations; also, such diverse items as specialised inked ribbons, inked rollers and pens, computer paper, telex and teleprinter paper, about 20 different types of roll charts and sensitised facsimile paper. An annual issue of forms and charts in daily and weekly use is made to 15 Meteorological Offices and some 110 Climatological and Rainfall stations. Arrangements were also made for the purchase and supply of Upper Air consumables, viz. Radio-sondes, Radar Targets and Balloons.

Rotadex stock cards are kept for the receipt and issue of all consumables and a file exists for the transfer of this information to the computer when this becomes practicable.

PRINTING

The Publications listed in Appendix 1 (a) were printed during 1983

and distributed both at home and abroad. The circulation lists for issue of all published material are computerised and these computerised lists were critically examined and reduced where possible in 1983 to effect economies in postal and printing costs. Printing on both page sides is now standard in all cases using an Eskofot 1324 reduction-camera platemaker (which takes paper plates) and an AB Dick M350 Offset Duplicator. The reduction to plate-making dimensions of rainfall maps and other material of A3 size and larger was carried out using RPS 2024 Mark II Repromaster camera.

Other in-house printing during the year included the annual stock of approximately 120 of the different forms used throughout the Service. A Climatological calendar was also produced and issued to all official stations and some 130 voluntary and paid observers.

APPENDIX 1

PUBLICATIONS DURING 1983

(a) Meteorological Service Publications

1. Solar Radiation Observations, 1980.
2. Solar Radiation Observations, 1981.
3. Magnetic Observations at Valentia Observatory, 1979.
4. Magnetic Observations at Valentia Observatory, 1980.
5. Magnetic Observations at Valentia Observatory, 1981.
6. "The Climate of Dublin" by P.K. Rohan, M.A.
7. "The Design of an Interactive Graphics System for the Display of Meteorological Tables". I.M. 100/83 by J. Hamilton, Ph.D.
8. Checking of Forecasts in the Meteorological Service, 1982. I.M. 101/83 by M. Hogan, G. Murphy, D. Cahalane BSc.
9. "Waterford Aerodrome - A Meteorological Note" by C. O'Connor BSc.
10. Monthly Weather Report, Parts I, II and III, February 1982 to December 1982.
11. Annual Weather Report, Parts I, II and III, 1982.
12. Monthly Weather Summary, December 1982 to November 1983.

(b) Other Publications

- Bates, J.R. - "Semi-Lagrangian Advection Schemes and their use in Meteorological Modelling". Lectures to the Applied Mathematical Society.

- "Analysis and Implementation of the semi-Lagrangian Technique", ECMWF Seminar Proceedings 1983.
- Lynch, P. - "A rapidly travelling planetary-scale instability in the atmosphere".
Geophysical Research Letters, 10, 12, 1176-1179.
- Lyons, P.A. "Meteorological Services for Aviation" for Air Traffic Services Training Manual.
- Murphy, D.J. - "Telecommunications in Meteorology" Irish Independent, 20 July.
- Shields, L. - "The Beginnings of Scientific Weather Observations in Ireland (1684 - 1708). Weather (Royal Meteorological Society),
Vol. 38 No. 10 (October 1983), pp 304 - 311.

A SELECTION OF LECTURES GIVEN BY MEMBERS OF THE STAFF

- Bates, J.R. - "An Alternating Asymmetric Scheme for Solving Hyperbolic Equations" TCD Mathematics Dept.,
14 January.
- "Weather Forecasting by Computer"
NIHE, Limerick, 23 February.
- "Semi-Lagrangian Advective Schemes and their use in Meteorological Modelling". Scripps Institution of Oceanography, La Jolla, California,
5 July.
- "Analysis and Implementation of the semi-Lagrangian Technique", ECMWF, 8 September.
- Byrne, C.M. - "The Interpretation of Weather Maps and Forecasts for Lough Derg", Lough Derg Branch of Waterways Association.
- Two lectures in meteorology to yachtsmen preparing for the Yachtsmasters Certificate of

the Royal Yachting Association.

- Campbell, L.
- "General Weather Forecasting" Irish Underwater Council, 18 January.
 - "Weather and Diving" Irish Underwater Council, 25 January.
 - "Weather and Mountain Safety" An Oige Mountaineering Group, 8 February.
 - "Impact of ECMWF on Forecasting in the Irish Meteorological Service" Irish Met. Society Seminar, 24 September.
- Cunningham, T.
- Talk on meteorology to the Galway Insurance Institute, 16 November.
- Dalton, W.G.
- "Computers in the Meteorological Service", Holy Faith Convent, Glasnevin, 12 May.
- Doyle, J.
- "Weather", at the Irish Science Week, Royal Dublin Society, 7 July.
- Fitzgerald, D.L.
- Lecture to architectural students on the services and data available from the Climatological Division.
 - Talk to Water Engineers on climatological services.
 - Contribution to a Wind Energy Seminar in Galway.
- Hamilton, J.E.M.
- Talk to Kevin St. College of Technology. Computer Society, February.
 - Invited lecture at ECMWF on "Interactive Graphics", March.

- Kavanagh, R. - "Careers in Computing" Chanel College, Dublin, 15 October.
- Keane, T. - "Weather Services to Agriculture" - a lecture as part of a 100-hour Basic EEC Course in Agriculture and Horticulture, held at the Agricultural Education Centre, Lusk, Co. Dublin.
- "Some Possible Uses for Degree Days and Thermal Time in Agriculture" - a lecture given at Johnstown Castle Research Centre, Co. Wexford.
- Lyons, P.A. - Talk to the mid-western region of SKAL "Development of Meteorological Services for the Public over the last 30 years", 20 September.
- McDonald, G. - "The Weather Map", Aircraft Owners & Pilots Association 29 January.
- MacHugh, P. - "Winds on Dublin Bay" Irish Meteorological Society, 24 September.
- Murphy, D.J. - "Computers in the Meteorological Service", UCD Computer Science Society, 17 January.
- "Telecommunications in Meteorology" Irish Meteorological Society, 2 December.
- O'Connor, C. - Series of four lectures in Geography Department, University College Cork, February.
- "The Climate near the Ground" Zoology Department, UCC. 3 February.
- "Science and Weather", a public lecture at the request of Cork Scientific Council, 26 October.

Walsh, M.R. - Lecture on meteorology to Fingal Sailing School,
18 November.

A SELECTION OF RADIO AND T.V. INTERVIEWS BY MEMBERS OF THE STAFF

Cleary, M. - Interview on Holiday Weather
RTE Radio 1, 29 July.

Cunningham, T. - Interview in Irish for Radio na Gaeltachta on
current weather, 18 July.

Cusack, E. - Current Weather, RTE Radio 1,
5 July.

McAuliffe, M. - Interview for an Nuacht on Radio na Gaeltachta,
13 July.

Mac Hugh, P. - Discussion on weather on the Pat Kenny show,
RTE Radio 1, 15 July.

- Discussion on Ballymun Community Radio,
9 November.

Walsh, M.R. - TV Interview on current spell of good weather,
16 July.

- Interview on 1.30 news, RTE Radio 1,
16 August.

- Interview on 6.30 news, RTE Radio 1,
19 August.

APPENDIX 2

SPECIAL TOPICS IN PREVIOUS ANNUAL REPORTS

- 1975 Development of the Meteorological Service
- 1976 Valentia Observatory
- 1977 Our Voluntary Observers
- 1978 The Meteorological Office at Foynes
- 1979 The New Headquarters Building
- 1980 The use of Computers in the Meteorological Service
- 1981 The Use of Satellites in the Meteorological Service
- 1982 Telecommunications in the Meteorological Service

APPENDIX 3

ABBREVIATIONS

ACOT	Council for the Development of Agriculture
AFTN	Aeronautical Fixed Telecommunications Network
AMCS	Aviation & Marine Communications Service
ATWS	Automatic Telephone Weather Service
AWS	Automatic Weather Station
BMO	British Meteorological Office
CAFO	Central Analysis & Forecast Office
CSIRO	Commonwealth Scientific & Industrial Research Organisation
EANPG	European Air Navigation Group
ECMWF	European Centre for Medium Range Weather Forecasts
EMEP	European Monitoring & Evaluation Programme
EMTN	European Meteorological Telecommunications Network
ESB	Electricity Supply Board
IAEA	International Atomic Energy Agency
ICAO	International Civil Aviation Organisation
IGY	International Geophysical Year
METAG	Meteorological Advisory Group
MOTNE	Meteorological Operational Telecommunications Network for Europe
MWR	Monthly Weather Report
NAOS	North Atlantic Ocean Stations
RTE	Radio Telefis Eireann
WMO	World Meteorological Organisation

12/15/53