METEOROLOGICAL SERVICE

SOLAR RADIATION OBSERVATIONS 1981

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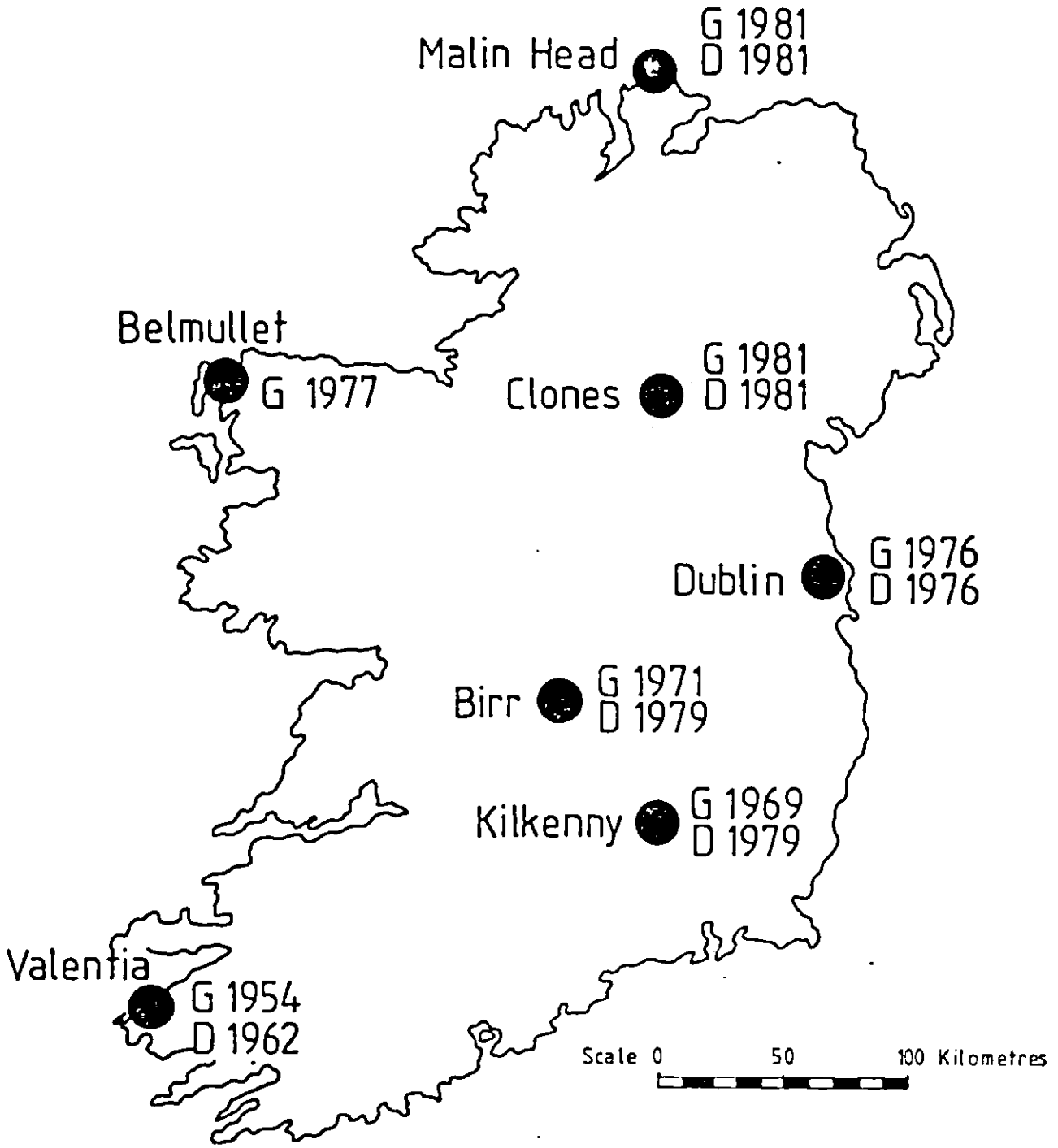
C O N T E N T S (Contd).



IRISH METEOROLOGICAL SERVICE

SOLAR RADIATION STATION NETWORK

SUMMARY

This volume contains a brief description of the site, equipment and observing procedures in use at the seven stations in the Irish network of Solar Radiation measuring stations i.e. Valentia Observatory, Kilkenny, Birr, Dublin Airport, Malin Head, Clones and Belmullet. The network diagram is on the following page.

In previous years hourly values were published but as and from January 1976, only daily totals are published apart from the spot values of Direct Sun at Normal Incidence (Table 4).

The hourly values may be had on request from: The Director, Meteorological Service, Glasnevin Hill, Dublin 9.

In compliance with a World Meteorological Organisation (WMO) recommendation a new radiation scale has been adopted from 1st January 1981. This is the World Radiometric Reference 1981 (WRR 1981) and replaces the International Pyrheliometer Scale, 1956 (IPS 1956) which has been in use for all radiation data published to date by the Irish Meteorological Service. The WRR (1981) scale is 2.2 percent greater than the IPS (1956) scale.

Archived radiation data up to 31st December 1980 will not be increased by the 2.2 percent. However, all radiation values in the following Tables are in the World Radiometric Scale, 1981.

SOLAR RADIATION OBSERVATIONS AT VALENTIA OBSERVATORY

1981

1. Introduction

Solar Radiation observations were begun at Valentia Observatory in September, 1954. At that time a Moll thermopile pyranometer and a recording millivoltmeter were installed, and have, since then, provided a continuous record of Global Solar Radiation. A Linke-Feussner thermoelectric iron-clad Actinometer (Kipp and Zonen) was also brought into use at the same time and a schedule of routine observations on direct sunlight has been maintained when weather conditions permitted. In 1962, a second Moll thermopile pyranometer, fitted with shading ring, was installed to provide a record of Diffuse Solar Radiation.

Measurement of the Radiation Balance with a Funk type Net Pyrradiometer was introduced on a routine basis as from 1st January, 1971.

Measurements of the Direct Sun radiation, using an Eppley Normal Incidence Pyrheliometer, and of Infra-Red radiation, using an Eppley Precision Radiometer (Pyrgeometer), were introduced on a routine basis as and from 1st January 1979.

Data derived from these instruments and the results obtained from the direct sunlight observations for the period 1954 - 1959 have been published in [1]. The data for 1960 and subsequent years have been published in annual volumes. This volume contains the data for 1981.

2. Site of the Observatory

The observatory which is in the extreme south-west of Ireland, (Lat. 51° 56' N; Long. 10° 15'W), is situated on the south-east side of the narrow estuary of Valentia River, which runs from approximately north-east to south-west (Fig. 1). It is about 1.2 Km to the south-west of the town of Cahirciveen. To the north, across the river estuary, is a range of hills 120 to 360 m high. To the north-east, beyond the town of Cahirciveen, the estuary opens out considerably and the terrain is generally an open boggy basin with only a gentle gradient. To the south-east, however, the ground rises rapidly again to a range of hills 270 to 360 m high, the highest peak (Bentee 375 m) being only 1.5 Km from the Observatory. To the south, the country opens out to a distance of nearly 8 Km from the Observatory, where the Kilkeaveragh range of hills runs east west, varying in height from 120 to 390 m. There is an opening to the sea to the south-west between the mainland and Valentia Island. The hills on the Island rise to a height of 270 m. North of the island there is another opening to the sea, and the circle of hills is completed by a range to the north-west, 120 to 270 m high, separated by a narrow gulley from the range to the northward.

3. Measurement of Global Solar Radiation

3.1 Exposure of the Pyranometer

The layout of the Observatory is shown in Fig. 2. The sensor is exposed on the roof of the Radiation House and the recording instruments are installed inside the house. The pyranometer is at a height of 4 metres above ground level and 20 metres above Mean Sea Level. The nature of the exposure can be seen in Fig. 3, in which the outline of all obscuring objects is plotted on an Elevation-Azimuth diagram. Apart from one sector, the obscuring objects have an elevation of less than 5° so that their effect

on the Diffuse Radiation is negligible.

In the sector 080° to 150°E from north, the elevation of the obscuring objects lies between 8° and 10.5° approximately. The loss of Diffuse Radiation according to Blackwell's formula [2] works out at approximately 1%. This is also very small, so no corrections have been made to the data to allow for this loss. The loss of radiation due to the obscuring of the direct solar beam occurs mainly in the same sector (080° to 150°). During the period from the end of August to mid-April, the initial 30 to 70 minutes of the direct sun is cut off. This affects the hourly values given for the first and occasionally the second hour but the effect on the total for the day is negligible. No attempt has been made to correct the radiation data for this loss of direct sunlight.

.3.2 Pyranometer Used

Details concerning the pyranometer and recording equipment are given in the Appendix.

3.3 Calibration of the Pyranometer

The pyranometer, recorder and integrator were calibrated by means of the Actinometer and Millivoltmeter, described in paragraphs 7.1 and 7.2 below. The calibration was done by comparing the intensity of the direct sunlight as measured by the pyranometer with the corresponding intensity as measured by means of the actinometer.

3.4 Timing Control

To facilitate accurate timing, time marks were made on the chart, automatically, by standard clock, at each hour L.A.T. This clock, which also controlled the print-out unit, was adjusted daily to keep it within ½ minute of true L.A.T.

4. Measurement of Diffuse Solar Radiation

4.1. Exposure of the Pyranometer

The Diffuse Pyranometer is mounted on the same site as the Global Pyranometer, at a distance of 3.1 metres west of the latter. A description of the site is given in 3.1 above.

4.2 Pyranometer Used

See Appendix

4.3 Calibration of the Pyranometer

The shading-ring was displaced below the horizontal position. The pyranometer was then calibrated in exactly the same way as the Global Pyranometer (para 3.3 above). The calibration was checked by comparing the values recorded during the hours when the sky was overcast with the corresponding values as recorded on the Global Pyranometer.

4.4 Shading-Ring Correction

Corrections have been made to increase the values extracted from the charts to compensate the the diffuse energy intercepted by the

ring simultaneously with the eclipse of the sun's disc. Theoretical corrections were computed following the method described by Blackwell [2].

5. Measurement of Direct Sun Radiation

5.1 Exposure of the Pyrheliometer

The Direct Sun Pyrheliometer is mounted on the same site as the Global Pyranometer at a distance of 2.4 metres north-west of the latter. A description of the site is given in 3.1 above.

5.2 Pyrheliometer Used

See Appendix

The Pyrheliometer is mounted on an Eppley Solar Tracker - a power driven equatorial mount with provision for varying the elevation and azimuth settings. The tracker settings are adjusted as necessary to keep the pyrheliometer directed at the sun at all times.

5.3 Calibration of the Pyrheliometer

The pyrheliometer and integrator were calibrated by means of the Actinometer and Millivoltmeter, as described in paragraphs 7.1 and 7.2 below. The calibration was done by comparing the intensity of the radiation as measured by the pyrheliometer with the intensity measured by the actinometer.

6. Measurement of Infra-red Radiation

6.1 Exposure of the Radiometer (Pyrgeometer)

The Infra-red Radiometer is mounted on the same site as the Global Pyranometer at a distance of 1 metre south-west of the latter. A description of the site is given in 3.1 above.

6.2 Radiometer Used

See Appendix

6.3 Calibration of the Radiometer

The radiometer was calibrated in a water-heated hemispherical cavity which provided a source of isotropic black-body radiation. The radiation as measured by the radiometer was compared with the radiation in the cavity as calculated from the Stefan-Boltzmann law.

7. Direct Sun Observations

7.1 A Linke-Feussner thermoelectric iron-clad actinometer (Serial No. 93) by Kipp and Zonen, provided with red and yellow filters, was used for all instantaneous direct sun observations. Sangamo Weston Millivoltmeter No. 56501 was used.

The actinometer body consists of six massive copper rings, which are made to serve as diaphragms. The openings of these diaphragms decrease progressively towards the thermopile, and the chambers formed between them are specially shaped so as to eliminate turbulent air currents within the instrument. Felt lagging around the body shields the instrument thermally.

The detachable filter head consists of a heavy copper core, which is screwed on to the exterior ring and carries a filter disc. Only a small segment of this disc protrudes from the head, so that the filters are kept at actinometer temperature. The Moll thermopile is divided into two equal sections, connected in opposition and each consisting of twenty constantin-manganin couples. One of the sections is screened from radiation and thus acts as a compensating device for the elimination of thermal effects associated with quasi-adiabatic pressure changes, occurring near the thermopile surface.

A thermometer for reading the temperature of the instrument is set inside the copper parts.

7.1.1. Filters Used

Three filters of Schott glass OG_1, RG_2, and RG_8 received from the Radiation Commission of the International Association of Meteorology, were used for all the observations. These filters were tested at Davos Observatory and a certificate with the reduction factor (DR) supplied.

For Filter OG_1, DR = 1.108

For Filter RG_2, DR = 1.132

For Filter RG_8, DR = 1.050

7.2 Calibration of the Actinometer

In 1961, an Angstrom Compensating Pyrheliometer (No. 548) was received, with calibration data, from Stockholm. This instrument is reserved as National Reference Standard. Its calibration has been maintained in agreement with IPS 1956 by participation in the W.M.O. Region VI Comparisons of National Standard Pyrheliometers held at Davos in 1964, in Carpentras, France, in 1969 and at Davos in October, 1975, and also by participation in a comparison organised by the E.E.C. in Carpentras in 1978.

The Actinometer and associated meter were calibrated by reference to the Pyrheliometer.

7.3 Observational Routine

All observations were made at a site about 6 metres south east of the Radiation House (Fig. 2) and at a height of 15.5 metres above M.S.L. Observations were made three times daily, when sky conditions permitted, at approximately 1030, 1230 i.e. at approximately the average time of local noon and at 1430 G.M.T. Each of the observations consisted of a double series of measurements in the order:- Zero - RG_8 - Total - RG_2 - OG_1 - OG_1 - RG_2 - Total - RG_8 - Zero. Observations were made of the time G.M.T. of each of the individual settings, the temperature at the beginning and end of each set of observations, as indicated by the thermometer attached to the Actinometer, the cloud type and amount, visibility and weather.

7.4 Computation of the Sun's Zenith Distance (Z)

The Sun's Zenith Distance for each time of observation was obtained from a special table prepared for Valentia, based on Tables 5, 6 and 11 as given in Linke's "Meteorologisches Taschenbuch" Vol. IV (Leipzig, 1939 edition) and the "Alt Azimuth Tables for Latitude limits 30° to 64°", prepared by P.L.H. Davis and published by H.M. Stationery Office, London (1918 edition). The values are correct to the nearest tenth of a degree.

7.5 Computation of the Optical Air Mass (m)

The Relative Air Mass (m_h) was obtained from the Sun's Zenith Distance (Z) by using Table 137, page 422 of "Smithsonian Meteorological Tables" (1951 edition). This table is based on Bemporad's formula:-

$$m_h = \frac{\text{Atmospheric Refraction in Seconds}}{58.36 \text{ Sin } Z}$$

The Optical Air Mass (m) was computed from the formula:-

$$m = m_h \frac{P}{1000} \qquad \text{where } P = \text{the atmospheric pressure in millibars}$$

8. Radiation Balance

Measurement of the radiation balance commenced on a routine basis in 1971. Details of the instruments used will be found in the Appendix.

The exposure is over a lawn surface adjacent to the Radiation House on the roof of which the other radiation instruments are exposed.

The calibration is checked regularly be reference to the Angstrom Pyrheliometer.

References

[1] Solar Radiation Observations at Valentia Observatory, 1954-1959 (Meteorological Service, Department of Transport and Power, Dublin, 1961)

[2] Five years Continuous Recording of Total and Diffuse Solar Radiation at Kew Observatory - by M.J. Blackwell. (Meteorological Research committee, Air Ministry, London. M.R.P. No. 895, 1954)

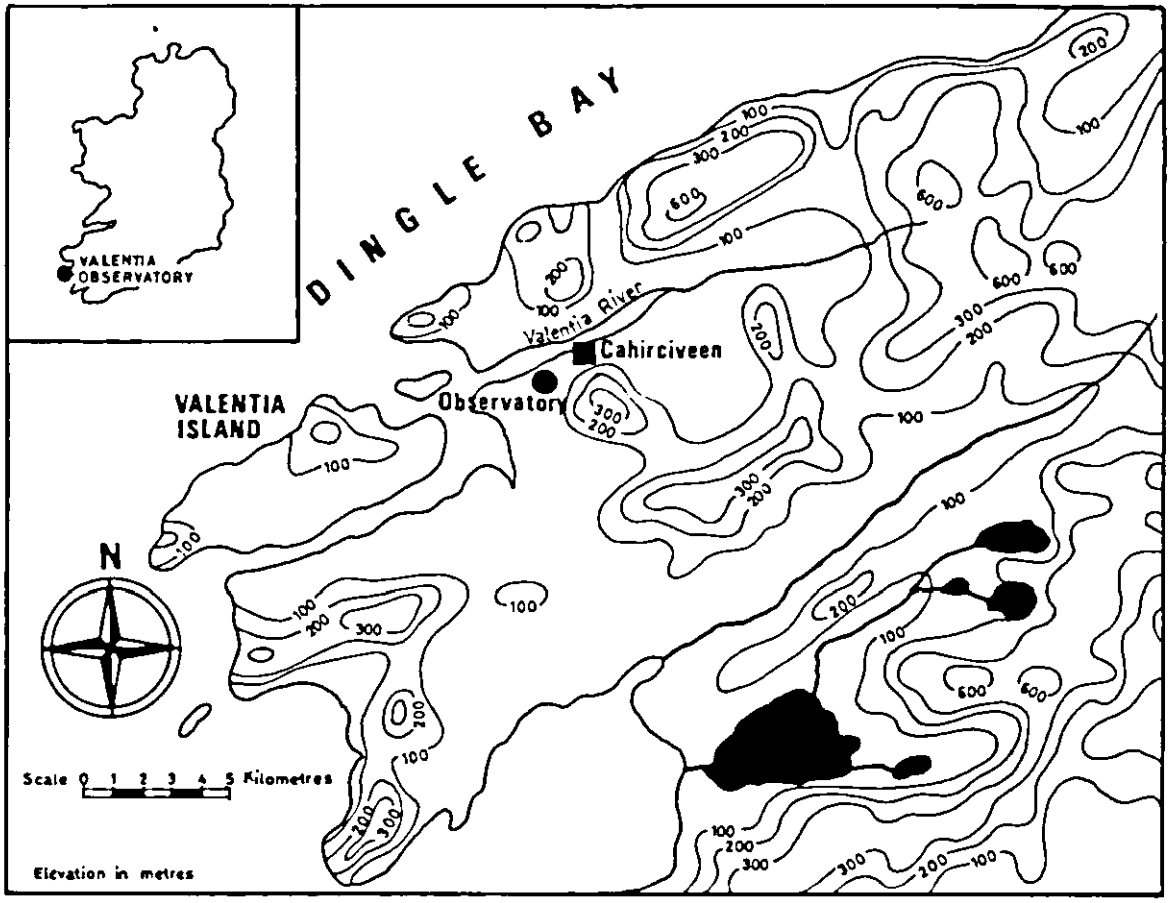


Fig. 1. Map showing the site of Valentia Observatory and its environs.

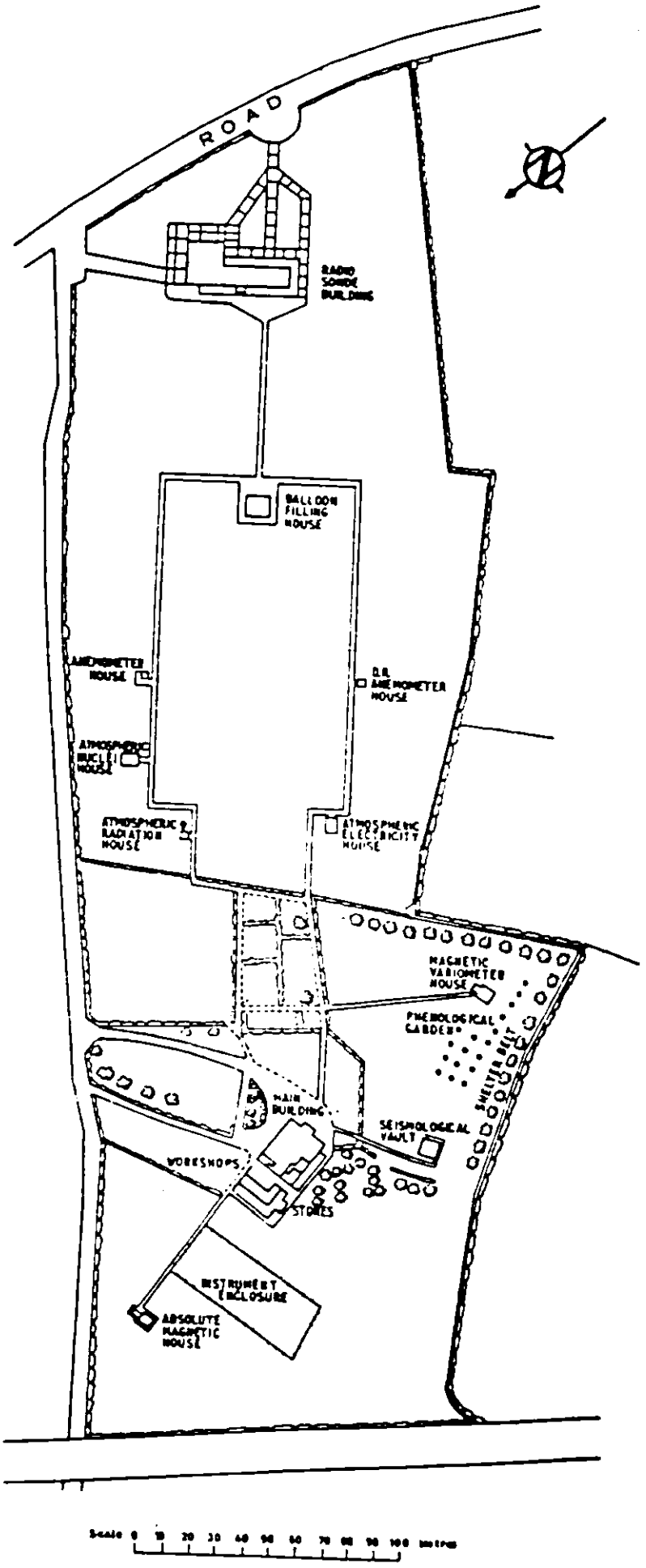


Fig. 2 General layout of Valentia Observatory.

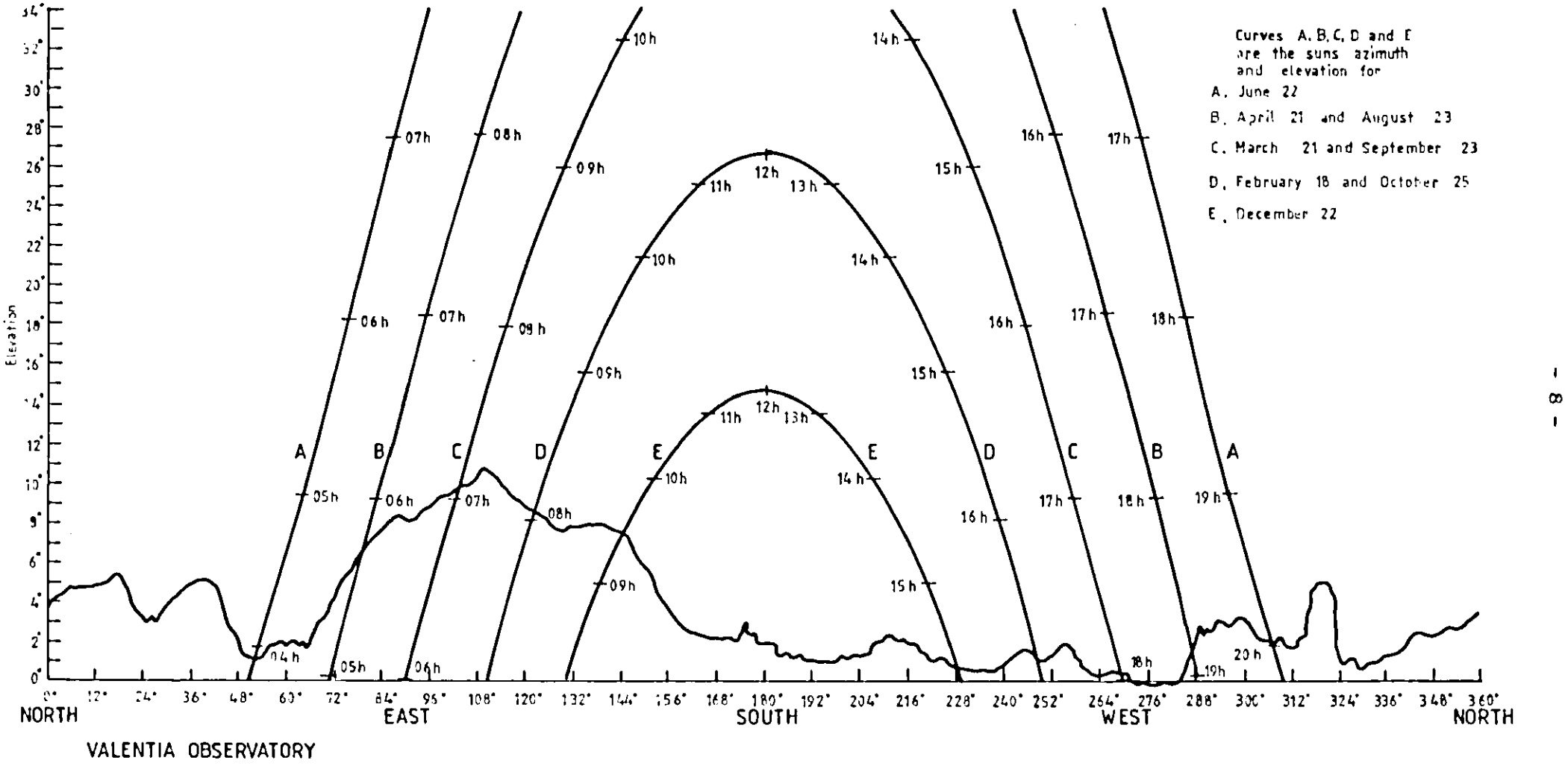


Fig. 3. Exposure diagram showing Azimuth and Elevation of all objects which obscure the pyranometer, together with Elevation and Azimuth of the sun at different times of the year.

SOLAR RADIATION OBSERVATIONS AT KILKENNY METEOROLOGICAL STATION

1981

1. Introduction

Measurements of Global Solar Radiation were begun at Kilkenny towards the end of 1968 while measurement of Diffuse Solar Radiation commenced in May 1979. Data given in this volume represent the results for 1981.

2. Site of the Observations

The Meteorological Station is situated 2 Km north-west of the centre of Kilkenny at Latitude 52° 40' N; Longitude 07° 16' W. Kilkenny is mainly a marketing town of population 10,000, in which there are no major industries or sources of atmospheric pollution. The countryside immediately surrounding the station is flat open grassland. Low hills beyond this area are sufficiently distant to avoid causing obstruction.

3. Measurement of Global Solar Radiation

3.1 Exposure of the Pyranometer

The global pyranometer is installed on a stand at the southern edge of the flat roof of the station building 5 metres above ground level (Fig. 5) and 67 metres above sea level.

The exposure is good, all effective obstruction being below 2° elevation except between 57° and 59° azimuth where an anemometer mast obstructs to 65° elevation (See Fig. 6)

3.2 Pyranometer Used

See Appendix

3.3 Observing Procedure

Time marking of the records and control of print-out is by means of an electric clock, reset each night to maintain timing within ½ minute of time L.A.T. The method of tabulation of the records is the same as that already described for Valentia Observatory.

3.4 Calibration of the Pyranometer

The instrument in use is similar to that in use at Valentia Observatory and was calibrated, before installation, against the Valentia Standard.

4. Measurement of Diffuse Solar Radiation

4.1 Exposure of the Pyranometer

The diffuse pyranometer is mounted on the same site as the global pyranometer, at a distance of 9 metres north-east of the latter. A description of the site is given in Section 2 above.

4.2 Pyranometer Used

See Appendix

4.3 Calibration of the Pyranometer

The shading-ring was displaced below the horizontal position and the calibration was done in exactly the same way as for the Global pyranometer. The calibration was checked by comparing the values recorded during the hours when the sky was overcase with the corresponding values as recorded by the global pyranometer.

4.4 Shading-Ring Correction

Corrections have been made to increase the values extracted from the charts to compensate for the diffuse energy intercepted by the ring simultaneously with the eclipse of the sun's disc. Theoretical corrections were computed following the method described by Blackwell [2].

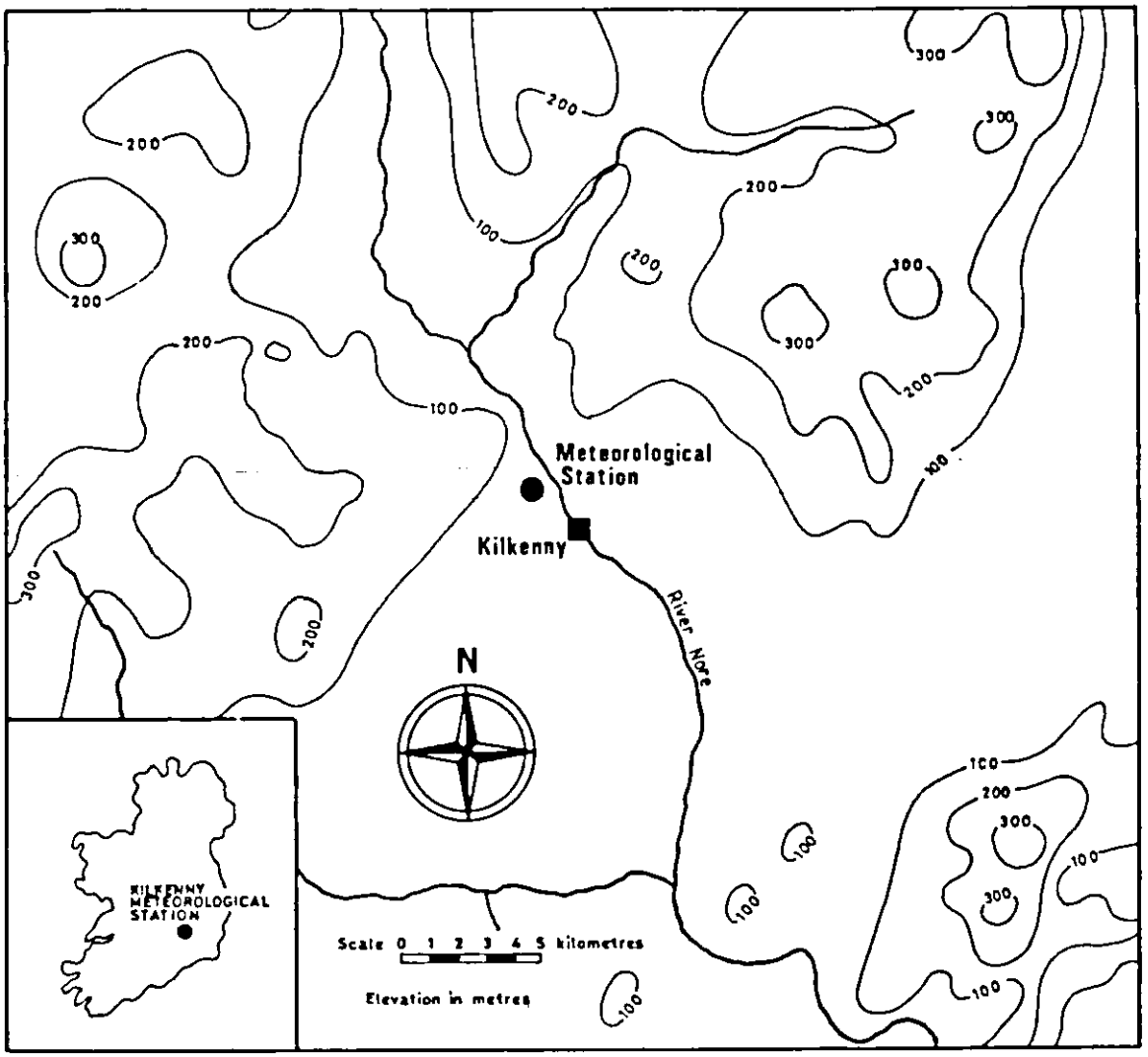


Fig. 4. Map showing site of Kilkenny Meteorological Station.

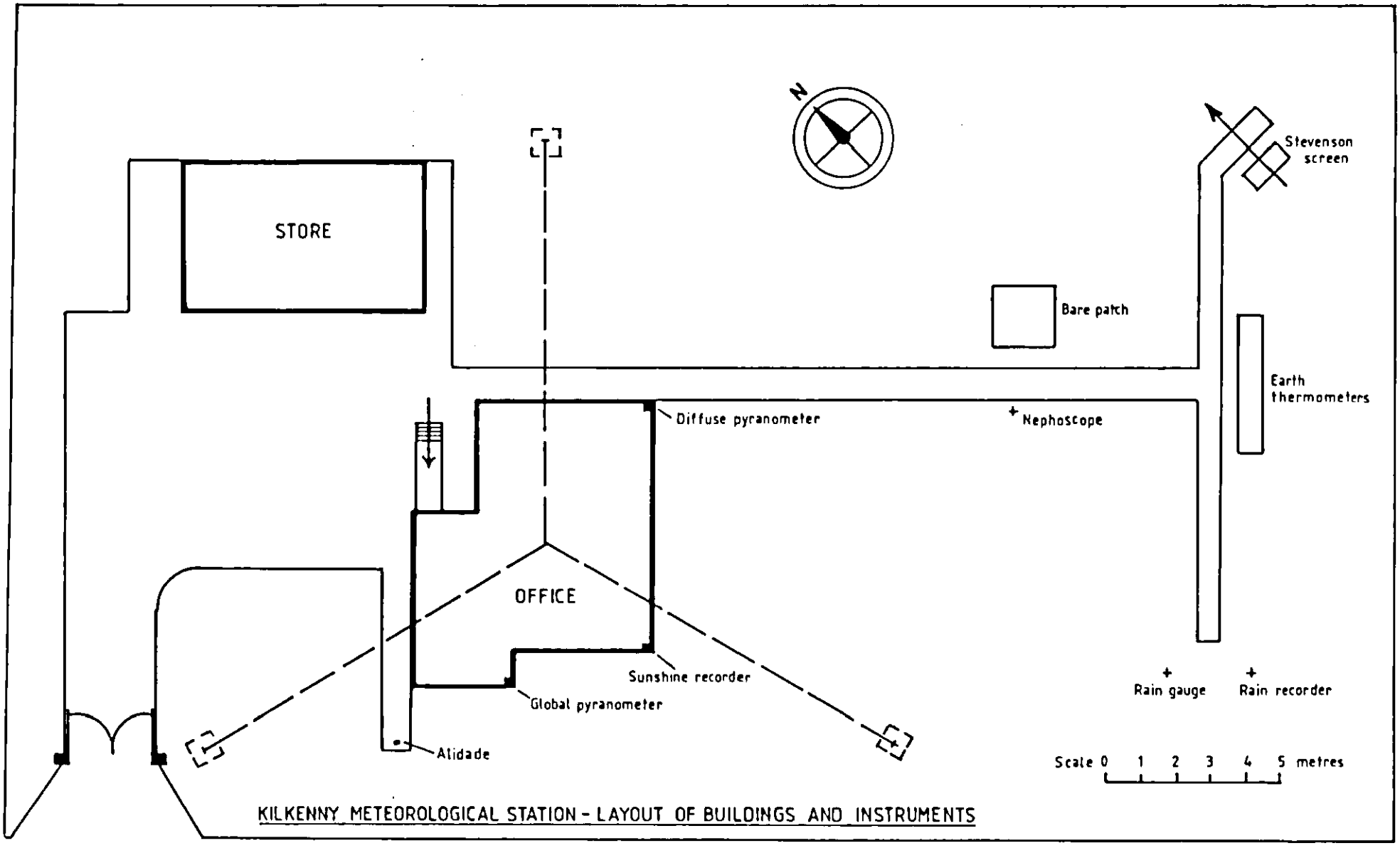
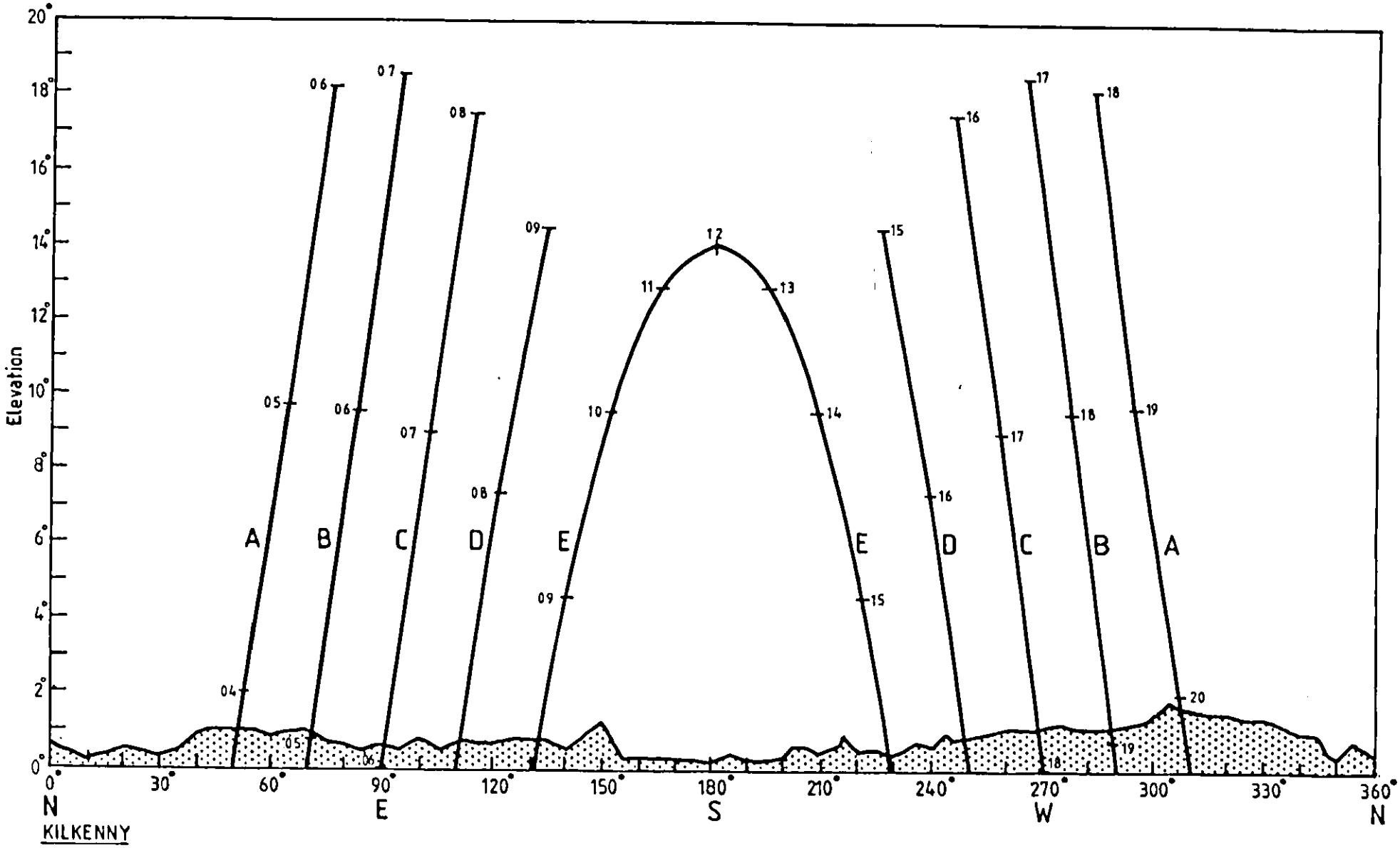

N
STORE
Stevenson screen
Bare patch
Earth thermometers
Diffuse pyranometer
Nephoscope
OFFICE
Sunshine recorder
Global pyranometer
Alidade
Rain gauge
Rain recorder
Scale 0 1 2 3 4 5 metres
KILKENNY METEOROLOGICAL STATION - LAYOUT OF BUILDINGS AND INSTRUMENTS

Fig. 5.



g. 6. Exposure diagram showing (1) azimuth and elevation of all objects which obscure pyranometer.
(2) azimuth and elevation of sun at various times of year as follows: (A) June 22, (B) April 21, August 23
(C) March 21, September 23, (D) February 18, October 25, (E) December 22.

SOLAR RADIATION OBSERVATIONS AT BIRR METEOROLOGICAL STATION

1981

1. Introduction

Measurements of Global Solar Radiation were begun at Birr towards the end of 1970, while measurements of Diffuse Solar Radiation commenced in May 1979. Data given in this volume represent the results for the year 1981.

2. Site of the Observations

The Meteorological Station is situated in flat pasture land, fairly well wooded, about 1½ Km east of the town of Birr at Latitude 53° 05' N; Longitude 07° 54' W. The surrounding country is gently undulating. About 16 Km to the east lie the Slieve Bloom mountains, the main axis of which runs north east - south west. The highest peak of this range is 518 metres. About 10 Km to the north of the station, there is an extensive area of bog (see Fig. 7).

3. Measurement of Global Solar Radiation

3.1 Exposure of the Pyranometer

The global pyranometer is installed on a stand at the southern edge of the flat roof of the station building 5 metres above ground level (Fig. 8) and 75 metres above sea level.

The exposure is generally good, all effective obstruction being below 2° elevation, except for a few isolated buildings which obstruct the horizonabove 2° and between 37° and 39° azimuth where an anemometer mast obstructs to 64° elevation (See Fig. 9).

3.2 Pyranometer Used

See Appendix

3.3 Observing Procedure

Time marking of the records and control of print-out is by means of an electrical clock reset each night to maintain timing within ½ minute of true L.A.T. The method of tabulation of the records is the same as that already described for Valentia Observatory.

3.4 Calibration of the Pyranometer

The instrument in use is similar to that in use at Valentia Observatory and was calibrated, before installation, against the Valentia Standard.

4. Measurement of Diffuse Solar Radiation

4.1 Exposure of the Pyranometer

The diffuse pyranometer is mounted on the same site as the global pyranometer, at a distance of 7 metres north-east of the latter. A description of the site is given in Section 2 above.

4.2 Pyranometer Used

See Appendix

4.3 Calibration of the Pyranometer

The shading-ring was displaced below the horizontal position and the calibration was done in exactly the same way as for the global pyranometer. The calibration was checked by comparing the values recorded during the hours when the sky was overcast with the corresponding values as recorded by the global pyranometer.

4.4 Shading-Ring Correction

Corrections have been made to increase the values extracted from the charts to compensate for the diffuse energy intercepted by the ring simultaneously with the eclipse of the sun's disc. Theoretical corrections were computed following the method described by Blackwell [2].

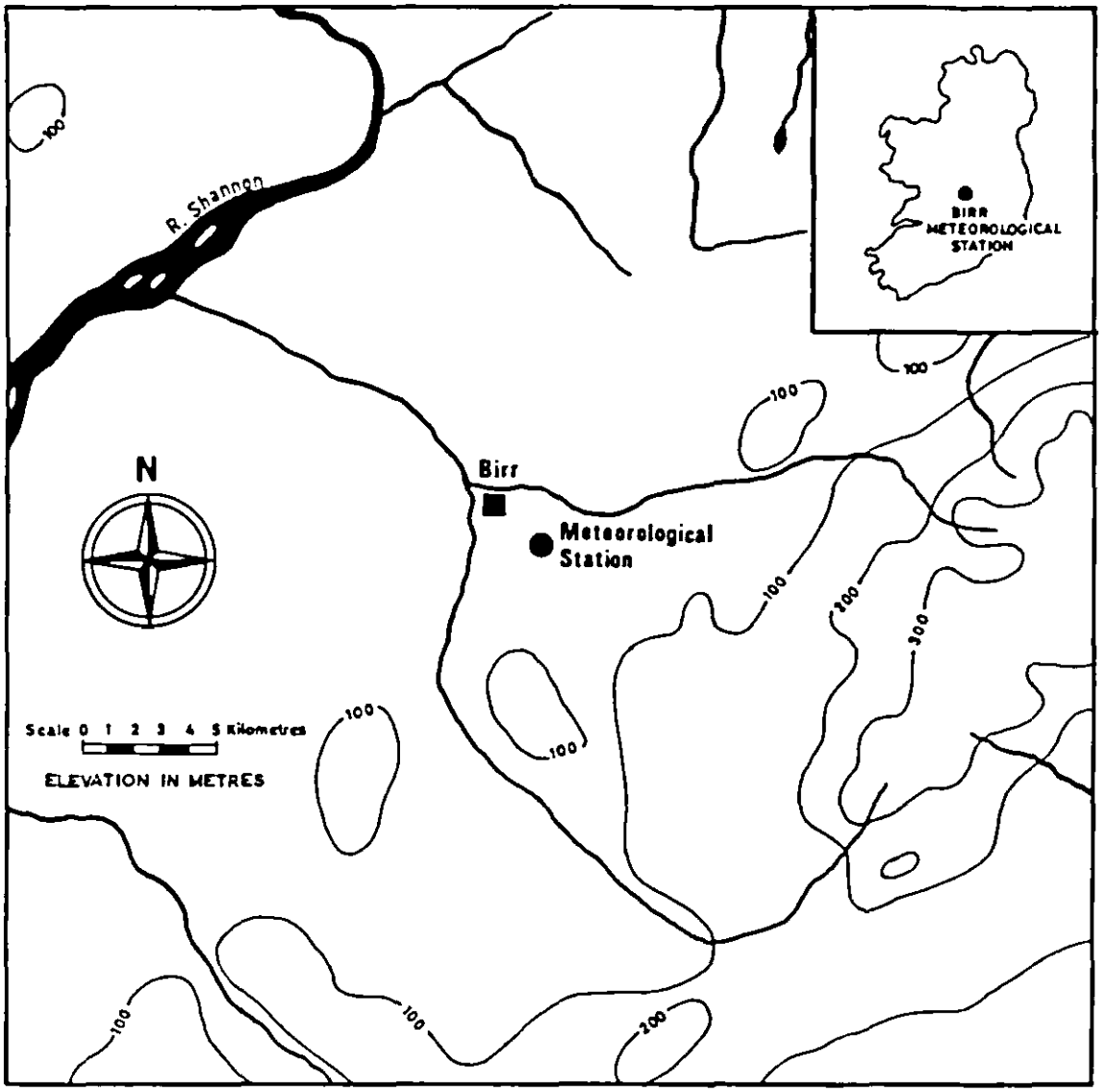
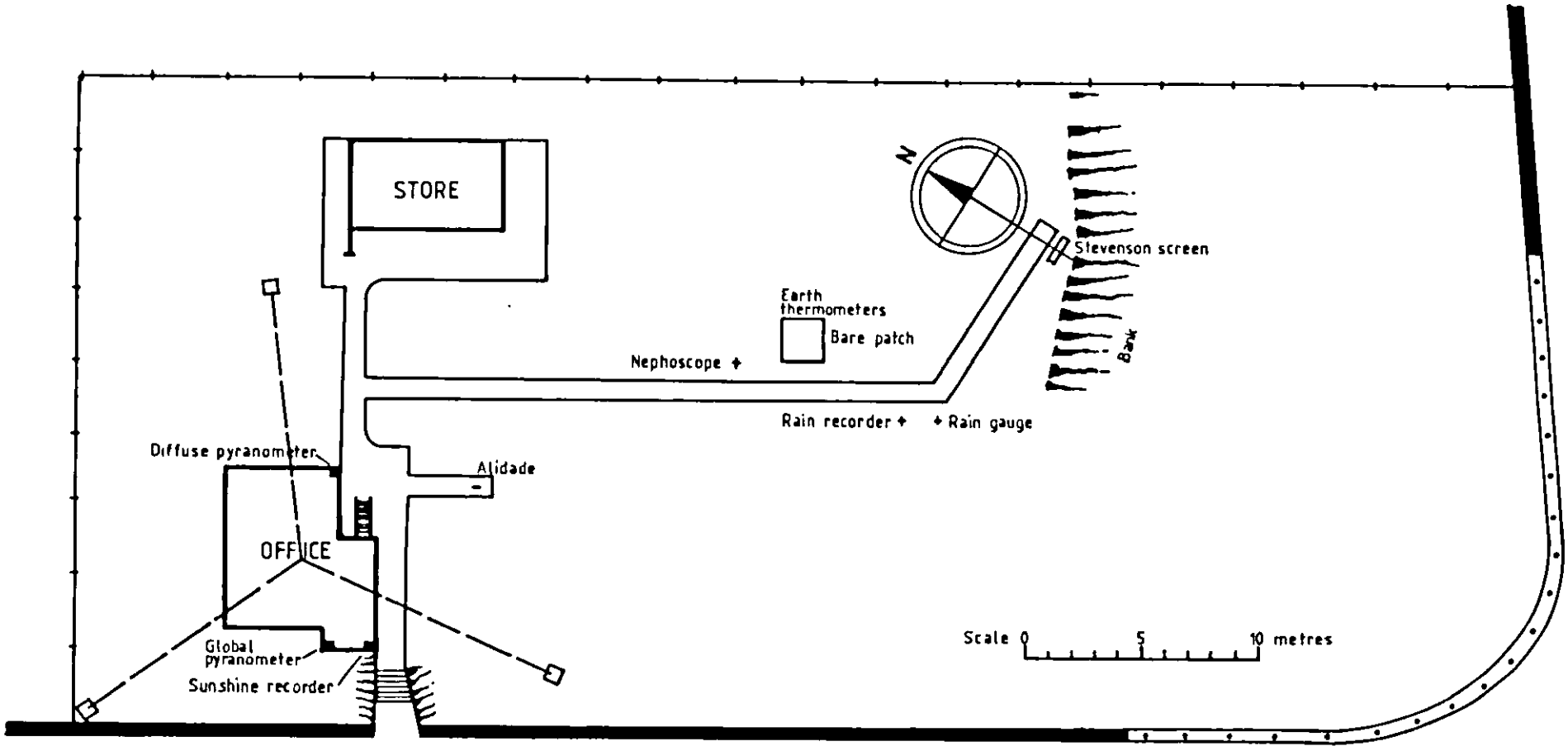


Fig. 7 Map showing site of Birr Meteorological Station.



BIRR METEOROLOGICAL STATION - LAYOUT OF BUILDINGS AND INSTRUMENTS

Fig. 8.

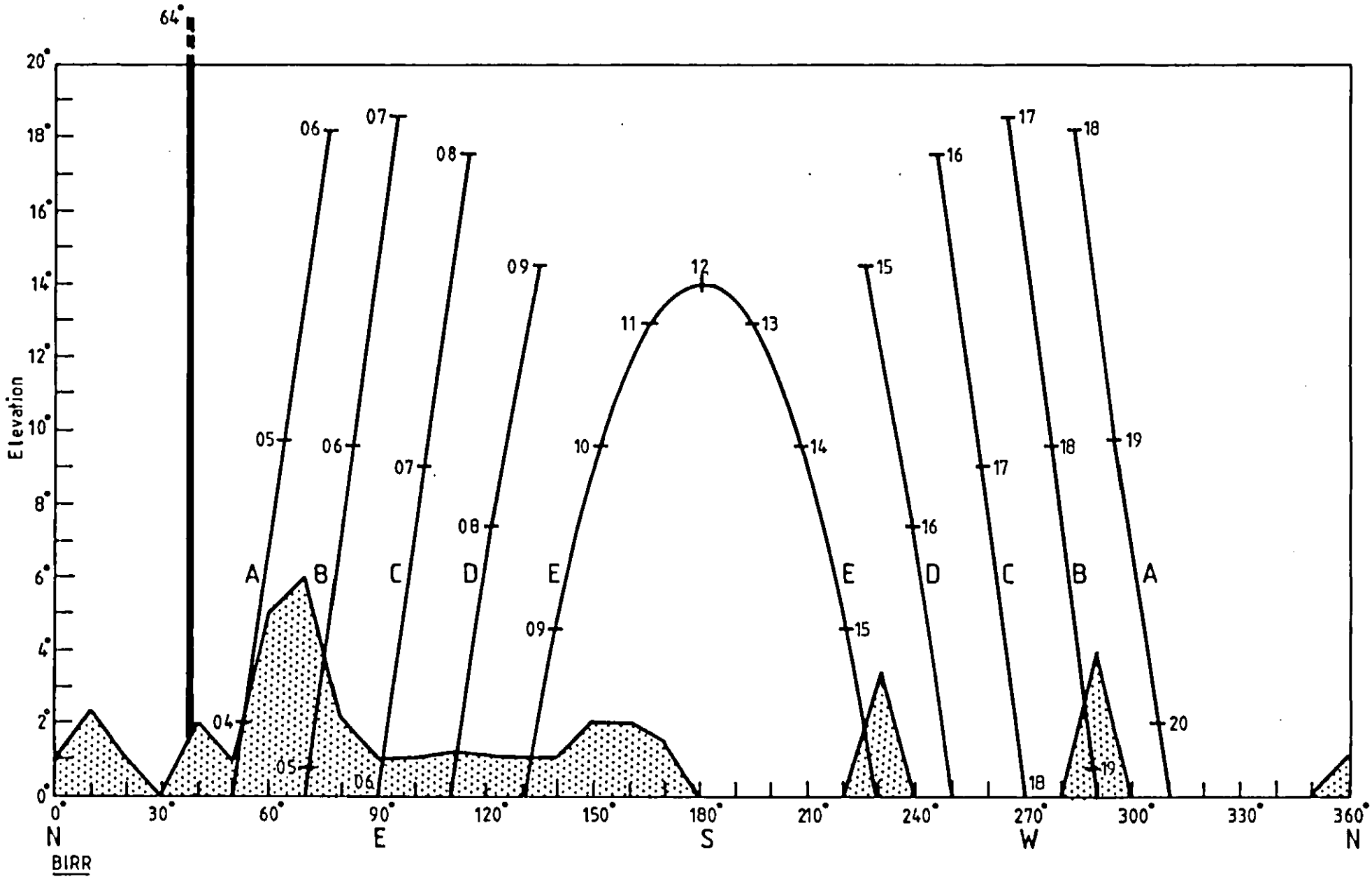


Fig. 9. Exposure diagram showing (1) azimuth and elevation of all objects which obscure pyranometer.
(2) azimuth and elevation of sun at various times of year as follows (A) June 22 (B) April 21, August 23
(C) March 21, September 23 (D) February 18, October 25 (E) December 22

SOLAR RADIATION OBSERVATIONS AT DUBLIN AIRPORT

1981

1. Introduction

Measurements of Global Solar Radiation were begun at Dublin Airport in September, 1975 and of Diffuse Solar Radiation in May 1976. Data given in this volume represent the results for 1981.

2. Site of the Observations

Dublin Airport, Latitude 53° 26'N; Longitude 06° 14'W, is situated on a low hill 8 Km north of Dublin City and 9 Km from the sea to the east (Fig. 10). The surrounding country is flat, the nearest mountains lying about 20 Km to the south.

3. Measurement of Global Solar Radiation

3.1 Exposure of the Pyranometer

The pyranometer is installed on the third storey balcony of the Terminal Building 13 metres above ground level and 82 metres above sea level. (Fig. 11).

As the prevailing winds are westerly and the sources of pollution from the city lie to the south the site is relatively pollution free.

There is some obstruction from surrounding buildings (Fig. 12) but as the vertical component of radiation lost is less than 0.5% no attempt has been made to allow for it.

3.2 Pyranometer Used

See Appendix

3.3 Observing Procedure

Time marking of records and control of print-out is by means of an electric clock, which is maintained within ½ minute of L.A.T. The general procedure for maintaining the instruments and tabulating the records is the same as that already described for Valentia.

3.4 Calibration of the Pyranometer

The instrument in use is similar to that in use at Valentia Observatory and was calibrated, before installation, against the Valentia Standard.

4. Measurement of Diffuse Radiation

4.1 Exposure of the Pyranometer

The diffuse pyranometer is mounted on the same site as the global pyranometer, at a distance of approximately 14 metres to the north of the latter. A description of the site is given in 2 above.

4.2 Pyranometer Used

See Appendix

4.3 Calibration of the Pyranometer

The shading-ring was displaced below the horizontal position and the calibration was done in exactly the same way as for the global pyranometer. The calibration was checked by comparing the values recorded during the hours when the sky was overcast with the corresponding values as recorded by the global pyranometer.

4.4 Shading-Ring Correction

Corrections have been made to increase the values extracted from the charts to compensate for the diffuse energy intercepted by the ring simultaneously with the eclipse of the sun's disc. Theoretical corrections were computed following the method described by Blackwell [2].

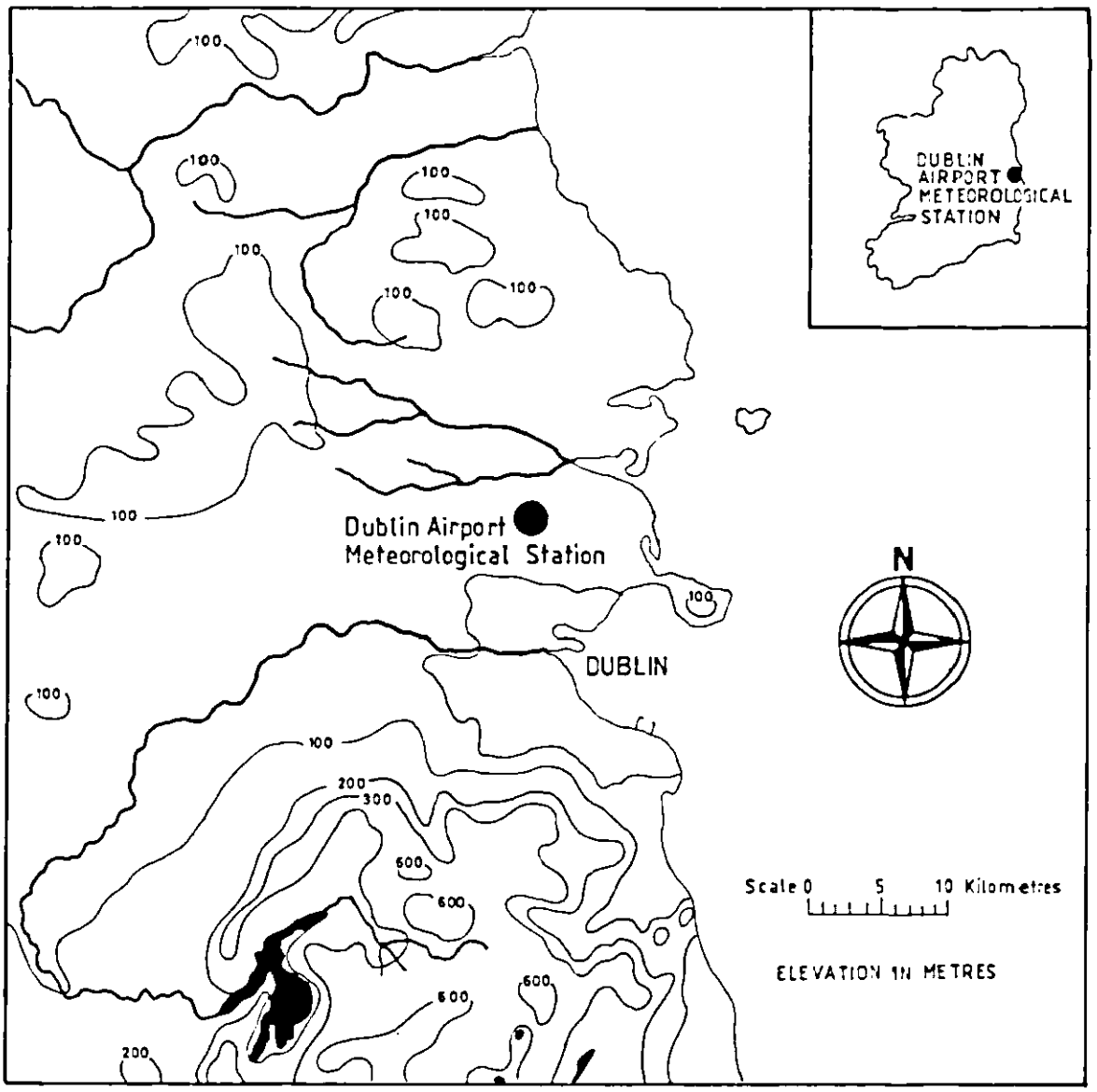
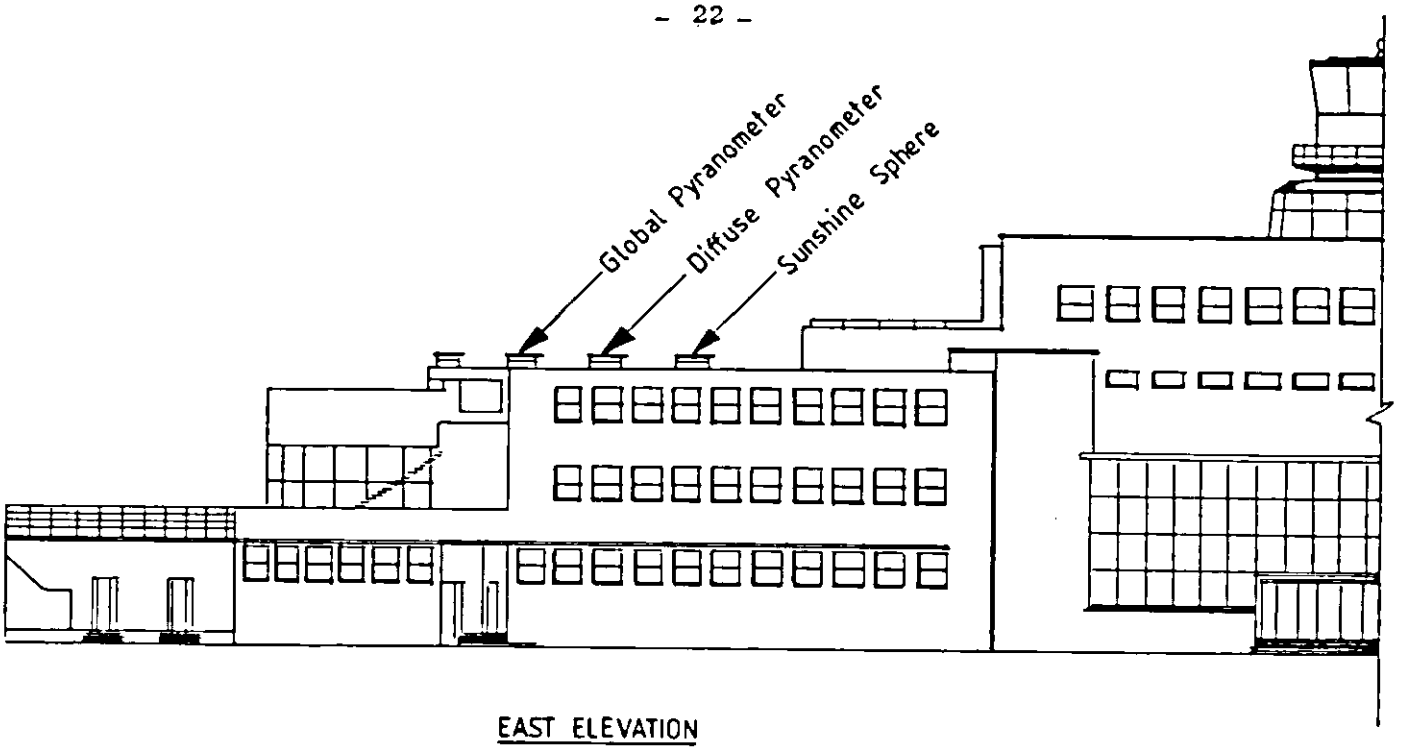
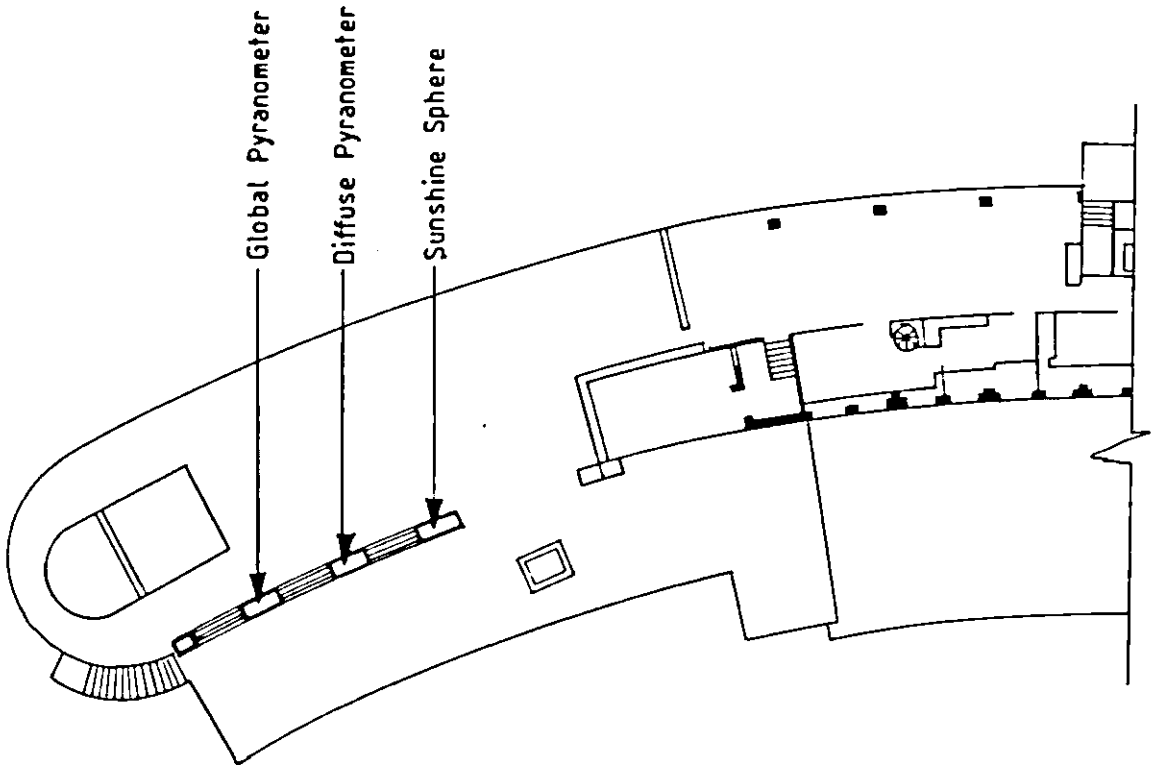


Fig. 10. Map showing site of Dublin Airport Meteorological Station

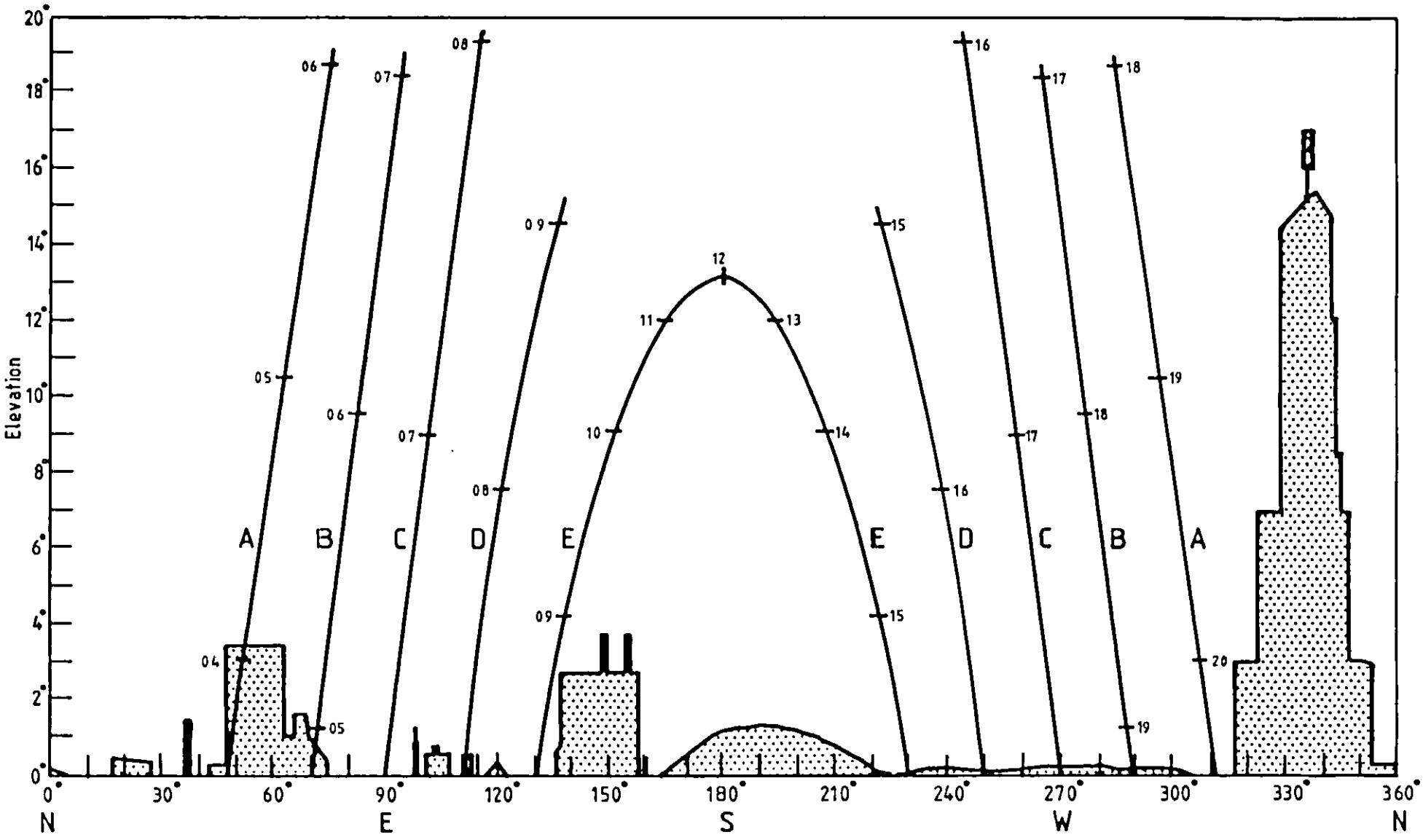


EAST ELEVATION



THIRD FLOOR PLAN

Fig. 11. Dublin Airport - layout of specified instruments on terminal building.



DUBLIN AIRPORT

Fig. 12. Exposure diagram showing (1) azimuth and elevation of all objects which obscure pyranometer.
(2) azimuth and elevation of sun at various times of year as follows (A) June 22, (B) April 21, August 23 (C) March 21, September 23 (D) February 18, October 25 (E) December 22

SOLAR RADIATION OBSERVATIONS AT MALIN HEAD METEOROLOGICAL STATION

1981

1. Introduction

Measurements of Global and Diffuse Solar Radiation were begun at Malin Head in June 1981. Data given in this volume represent the results for June to December 1981.

2. Site of the Observations

The Meteorological Station is situated about 300 metres from the shoreline on the northwestern headland of the Inishowen peninsula at Latitude 55° 22'N; Longitude 07° 20'W. The site is 2.5 Km southeast of the most northerly point of Ireland. The countryside to the southeast, south and southwest is mostly hilly. Open sea lies to the northwest, north and northeast. The nearest major industrial centre is Derry City which is 40 Km to the south.

3. Measurement of Global Solar Radiation

3.1 Exposure of the Pyranometer

The global pyranometer is installed on the southern end of a concrete stand at the western side of the flat roof of the station building 4 metres above ground level (Fig 14) and 28 metres above sea level.

Some obstruction is caused by nearby buildings, poles and an anemometer lattice tower in the northeast to southeast sector and by a hill in the sector southwest to northwest (Fig. 15).

3.2 Pyranometer Used

See Appendix.

3.3 Observing Procedure

Time marking of the records and control of printout is by means of an electronic clock, which is maintained within ½ minute of L.A.T. The general procedure for maintaining the instruments and tabulating the records is the same as that already described for Valentia Observatory.

3.4 Calibration of the Pyranometer

The instrument in use is similar to that in use at Valentia Observatory and was calibrated, before installation, against the Valentia Standard.

4. Measurement of Diffuse Solar Radiation

4.1 Exposure of the Pyranometer

The diffuse pyranometer is mounted on the same concrete stand as the global pyranometer at a distance of 1.2 metres to the north of the latter. A description of the site is given in Section 2 above.

4.2 Pyranometer Used

See Appendix.

4.3 Calibration of the Pyranometer

The pyranometer was calibrated against the Valentia Standard before installation. The calibration was checked by displacing the shade ring below the horizontal during periods of overcast or clear sky conditions and comparing the values recorded with the corresponding values as recorded by the global pyranometer.

4.4 Shading-Ring Correction

Corrections have been made to increase the values extracted from the charts to compensate for the diffuse energy intercepted by the ring simultaneously with the eclipse of the sun's disk. Theoretical corrections were computed following the method described by Blackwell [2].

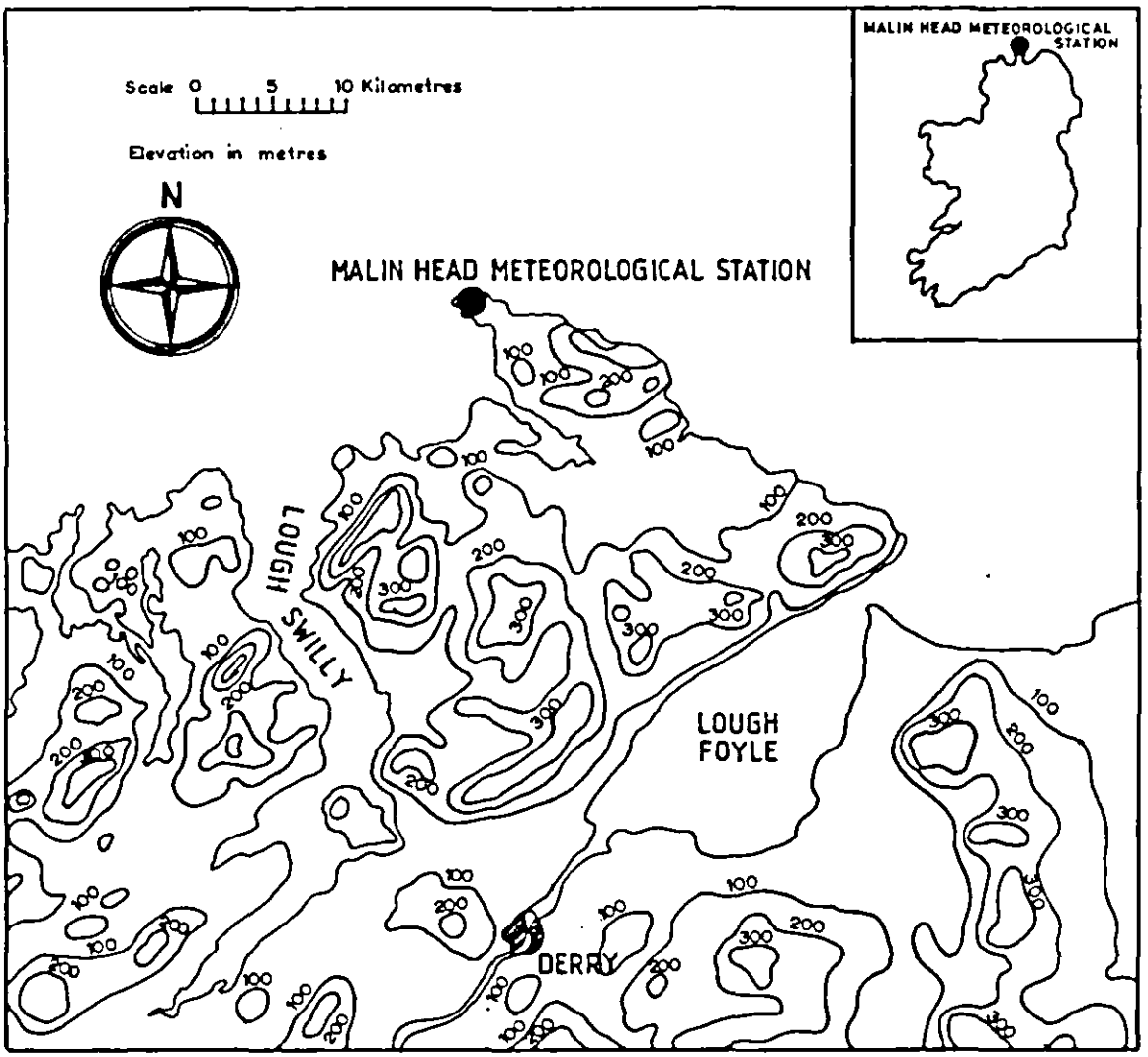
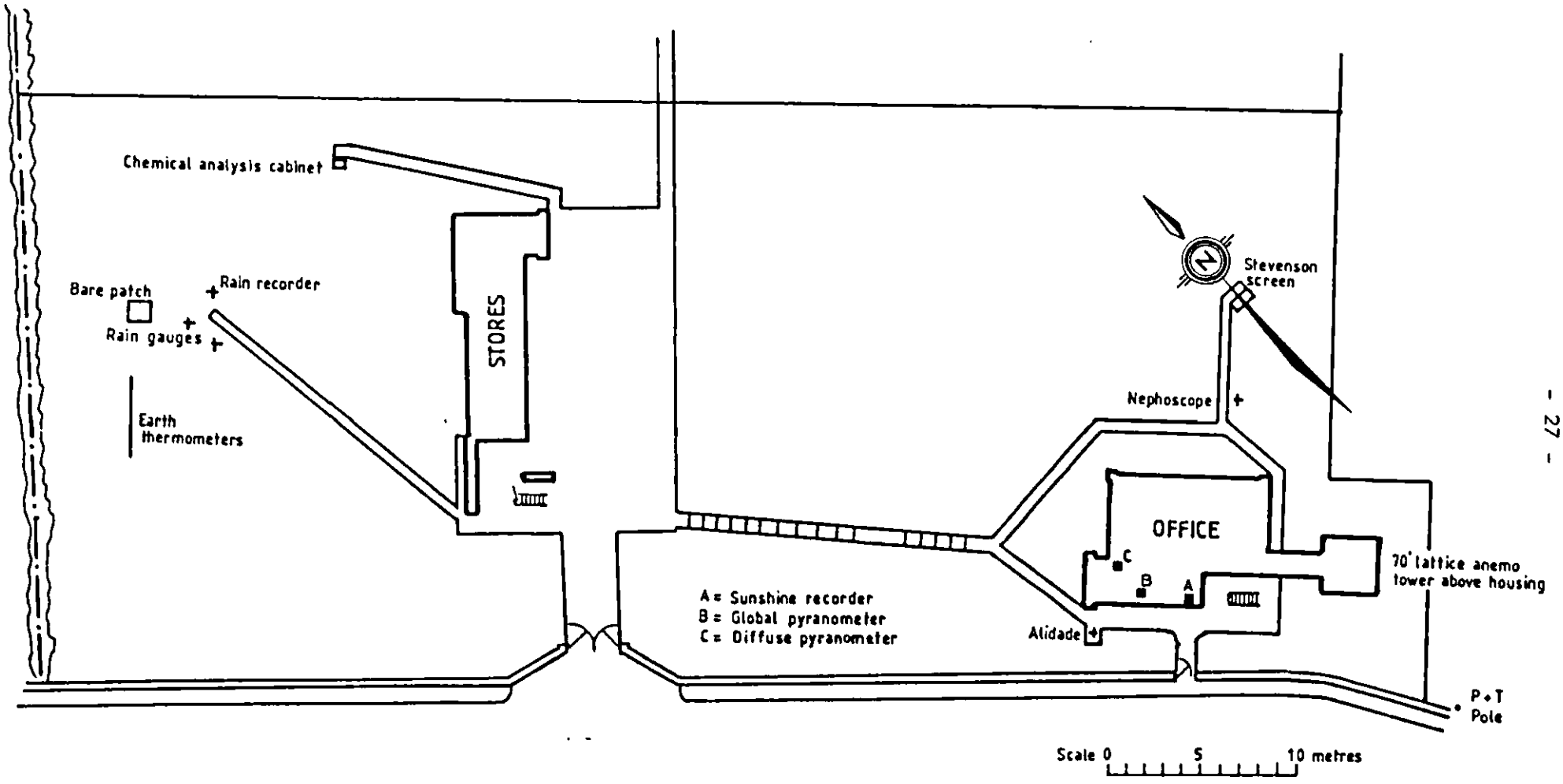
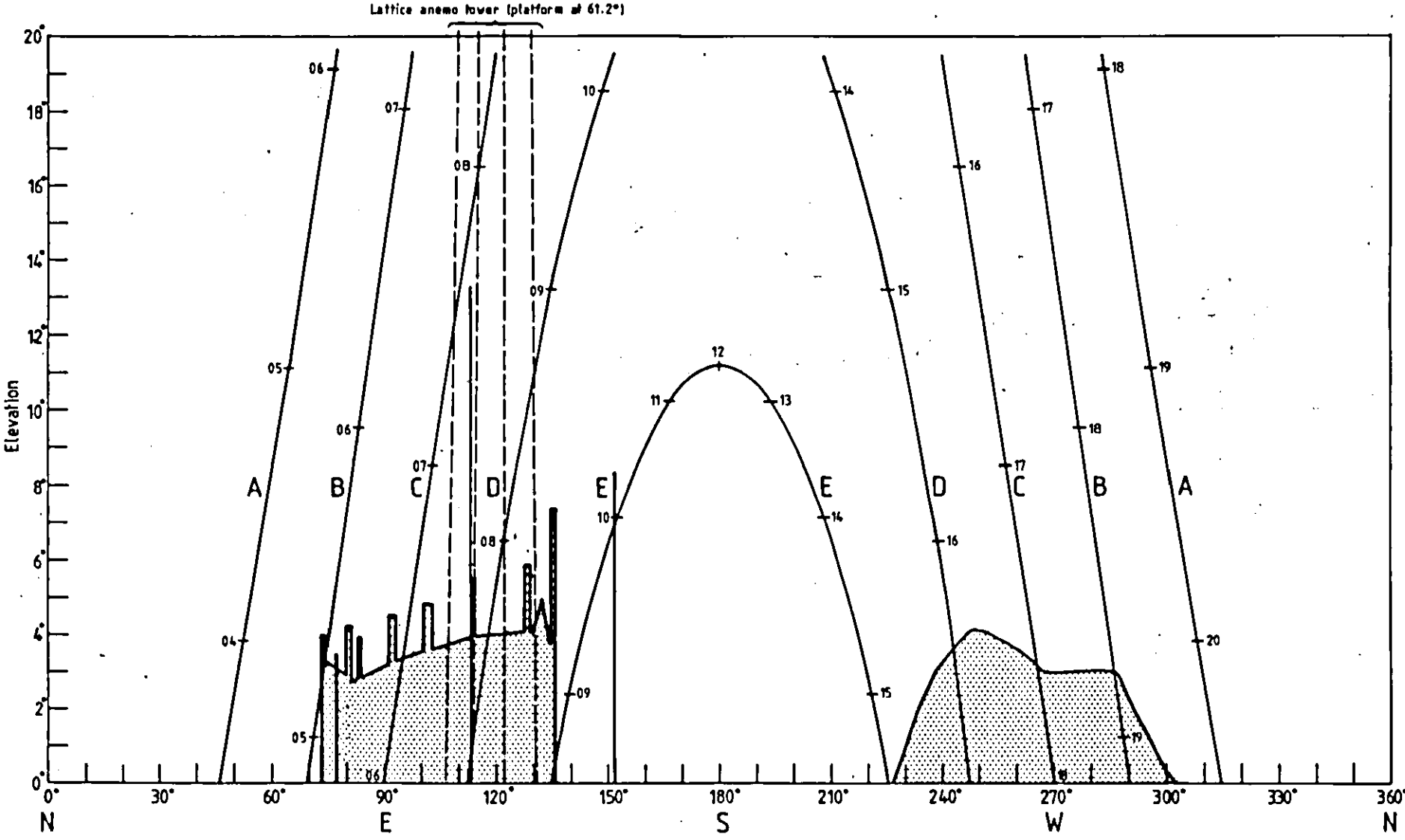


Fig. 13. Map showing site of Malin Head Meteorological Station.



MALIN HEAD METEOROLOGICAL STATION - LAYOUT OF BUILDINGS AND INSTRUMENTS

Fig. 14.



MALIN HEAD

Fig. 15. Exposure diagram showing (1) azimuth and elevation of all objects which obscure pyranometer.
(2) azimuth and elevation of sun at various times of year as follows (A) June 22 (B) April 21, August 23
(C) March 21, September 23 (D) February 18, October 25 (E) December 22

SOLAR RADIATION OBSERVATIONS AT CLONES METEOROLOGICAL STATION

1981

1. Introduction

Measurements of Global and Diffuse Solar Radiation were begun at Clones in June 1981. Data given in this volume represent the global radiation results for the period June to December 1981. Due to instrument malfunction and other problems encountered in the recording of the diffuse data there are considerable breaks in continuity and these data are not published.

2. Site of the Observations

The Meteorological Station is situated on a hill about 1 Km to the north of the town of Clones at Latitude 54° 11'N; Longitude 07° 14'W. The site overlooks the adjacent countryside but at a distance of 10 Km from the station there are gently sloping hills in most sectors. (Fig. 16).

3. Measurement of Global Solar Radiation

3.1 Exposure of the Pyranometer

The global pyranometer is mounted on a concrete pillar 2½ metres above ground level (Fig. 17) and 89 metres above sea level.

The exposure is generally good but a terrace of houses obstructs to between 7° and 9° elevation from aximuth 310° to 020°. In addition an anemometer mast and some poles obstruct to about 20° elevation (Fig. 18).

3.2 Pyranometer Used

See Appendix

3.3 Observing Procedure

Time marking of the records and control of printout is by means of an electronic clock, which is maintained within ½ minute of L.A.T. The general procedure for maintaining the instruments and tabulating the records is the same as that already described for Valentia Observatory.

3.4 Calibration of the Pyranometer

The instrument is use is similar to that in use at Valentia Observatory and was calibrated, before installation, against the Valentia Standard.

4. Measurement of Diffuse Solar Radiation

4.1 Exposure of the Pyranometer

The diffuse pyranometer is mounted on the same pillar as the global pyranometer at a distance of 1.2 metres north of the latter. A description of the site is given in Section 2 above.

4.2 Pyranometer Used

See Appendix.

4.3 Calibration of the Pyranometer

The pyranometer was calibrated against the Valentia Standard before installation. The calibration was checked by displacing the shade ring below the horizontal during periods of overcast or clear sky conditions and comparing the values recorded with the corresponding values as recorded by the global pyranometer.

4.4 Shading-Ring Corrections

Corrections have been made to increase the values extracted from the charts to compensate for the diffuse energy intercepted by the ring simultaneously with the eclipse of the sun's disk. Theoretical corrections were computed following the method described by Blackwell [2].

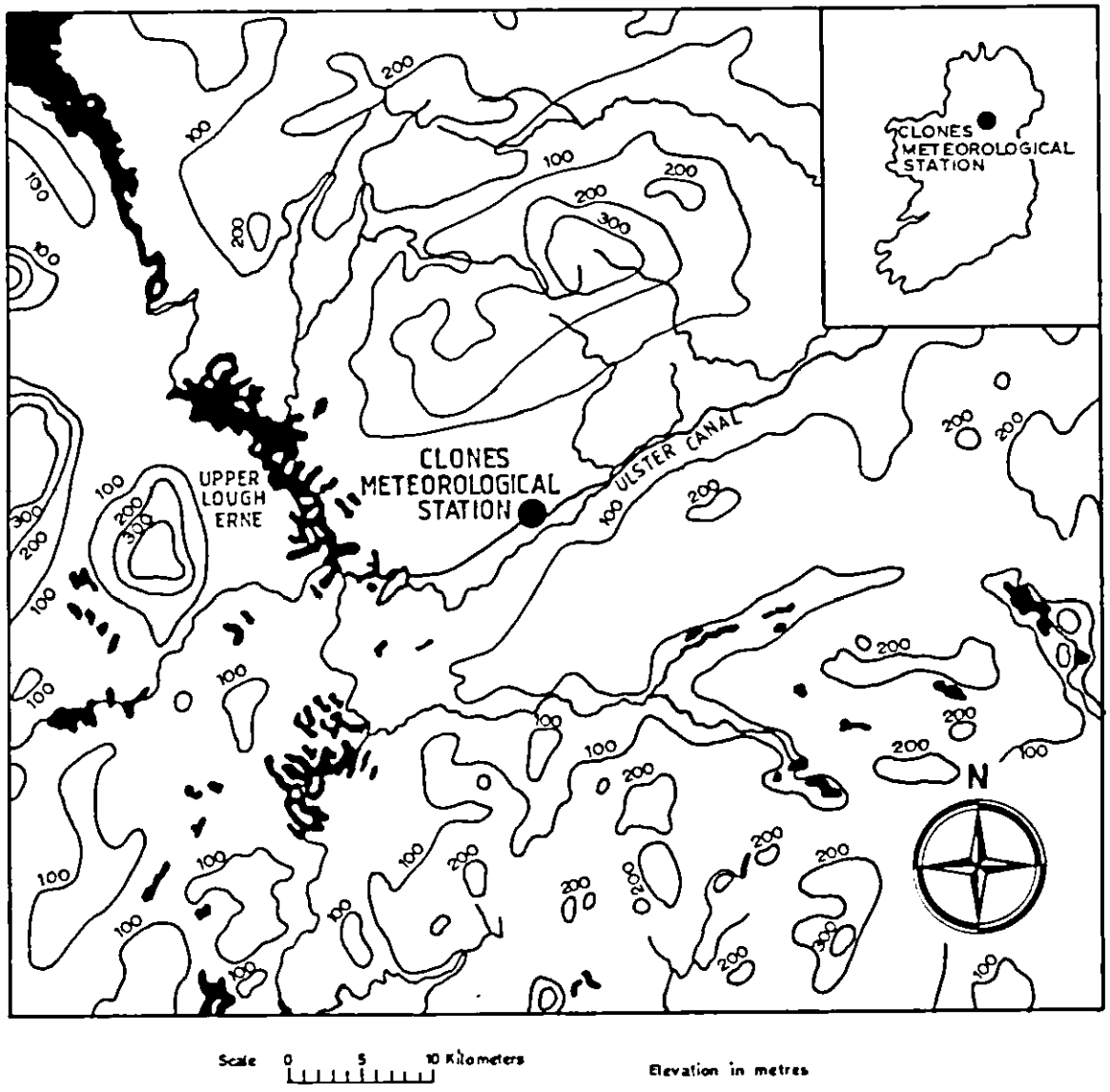
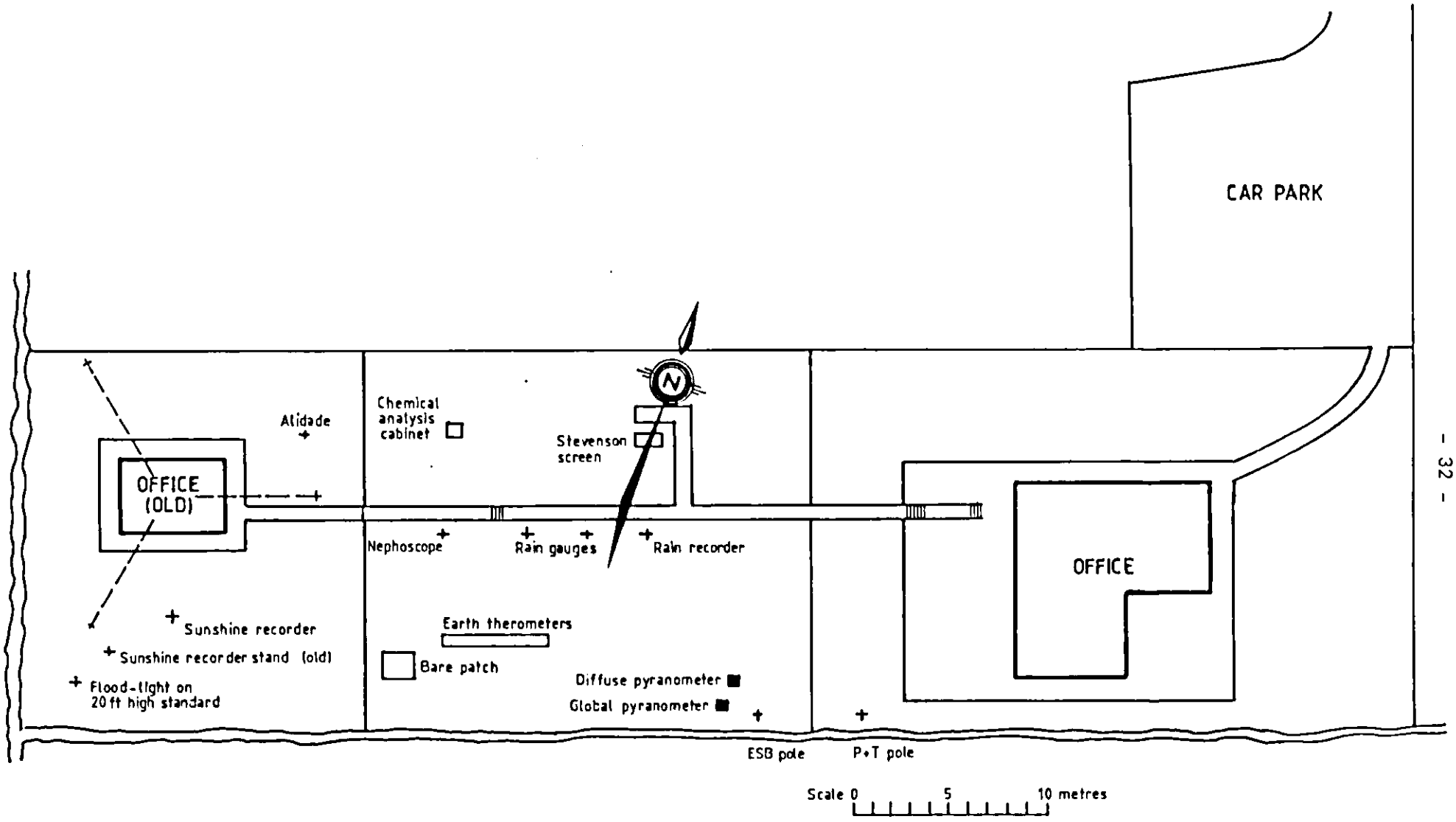
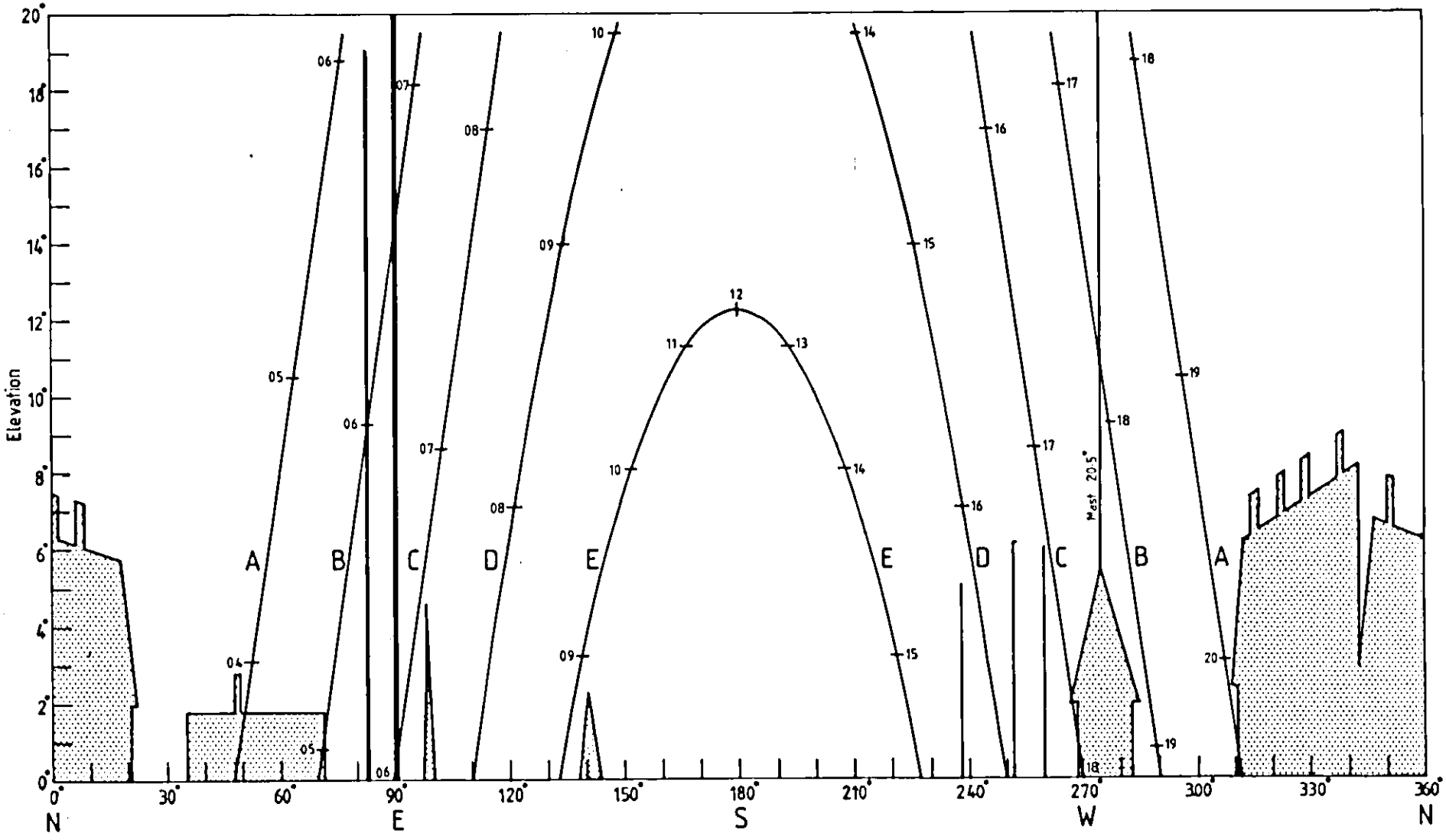


Fig. 16. Map showing site of Clones Meteorological Station.



CLONES METEOROLOGICAL STATION - LAYOUT OF BUILDINGS AND INSTRUMENTS

Fig. 17.



CLONES

Fig. 18. Exposure diagram showing (1) azimuth and elevation of all objects which obscure pyranometer.
(2) azimuth and elevation of sun at various times of year as follows (A) June 22 (B) April 21, August 23
(C) March 21, September 23 (D) February 18, October 25 (E) December 22

SOLAR RADIATION OBSERVATIONS AT BELMULLET METEOROLOGICAL STATION

1981

1. Introduction

Measurements of Global Solar Radiation were begun at Belmullet in 1977. Due to instrument malfunction and non-availability of replacements there was a long break in continuity of the records. Measurements recommenced with the installation of new equipment in mid 1981 and data given in this volume represent the results for June to December 1981.

2. Site of the Observations

The Meteorological Station is situated on the northern edge of Blacksod Bay about 1½ Km west of the town of Belmullet at Latitude 54° 14'N; Longitude 10° 00'W. The surrounding countryside is generally flat but with some low hills in the distance.

3. Measurement of Global Solar Radiation

3.1 Exposure of the Pyranometer

The pyranometer is installed on a stand at the southern edge of the flat roof of the station building 4 metres above ground level (Fig. 20) and 14 metres above sea level.

The exposure is good with practically all effective obstruction being below 2° elevation. Between 20° and 22° Azimuth an anemometer mast obstructs to 64° elevation (Fig. 21).

3.2 Pyranometer Used

See Appendix.

3.3 Observing Procedure

Time marking of the records and control of print-out is by means of an electronic clock, reset each night to maintain timing within ½ minute L.A.T. The method of tabulation of the records is the same as that already described for Valentia Observatory.

3.4 Calibration of the Pyranometer

The instrument in use is similar to that in use at Valentia Observatory and was calibrated, before installation, against the Valentia Standard.

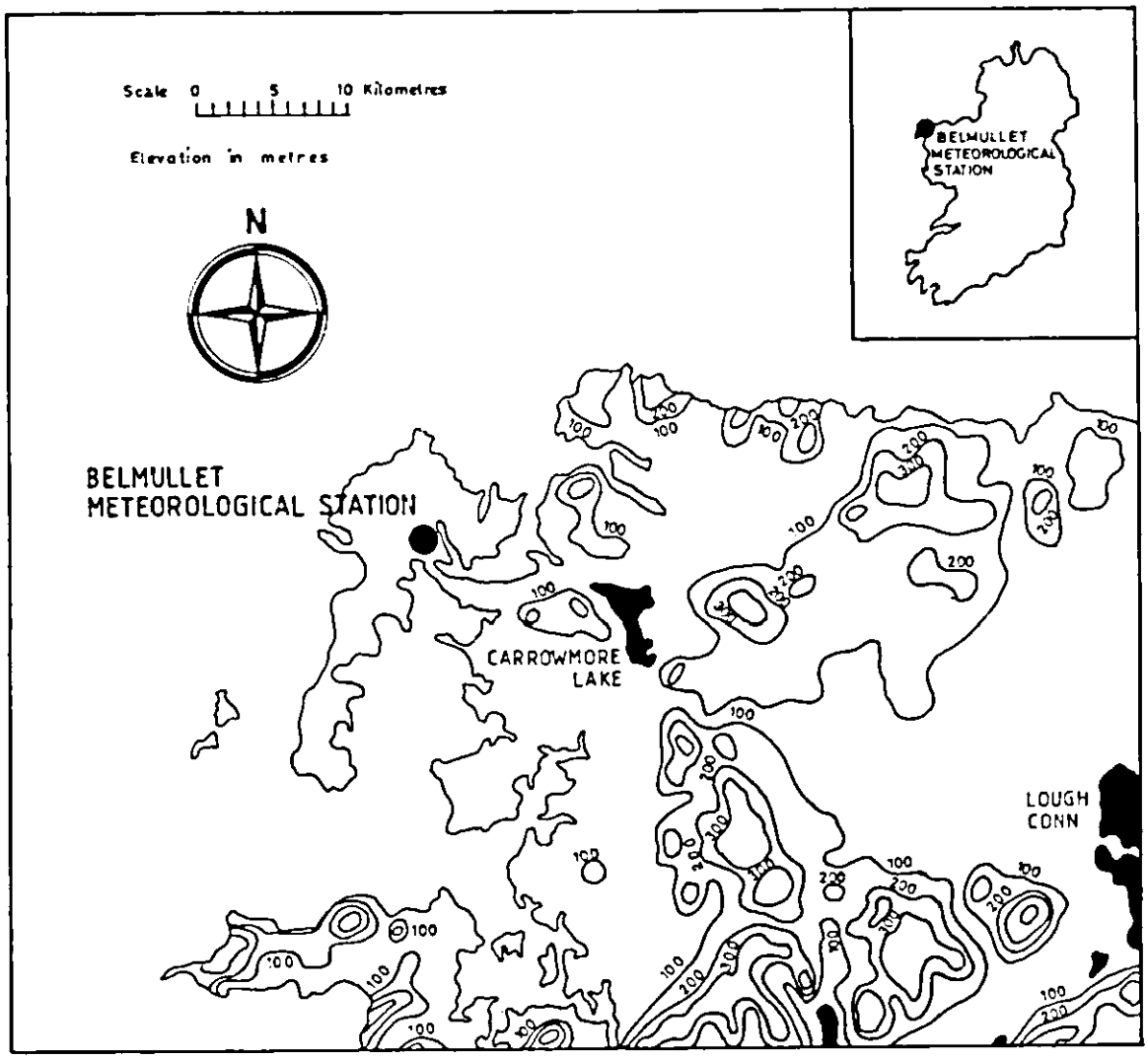


Fig. 19. Map showing site of Belmullet Meteorological Station.

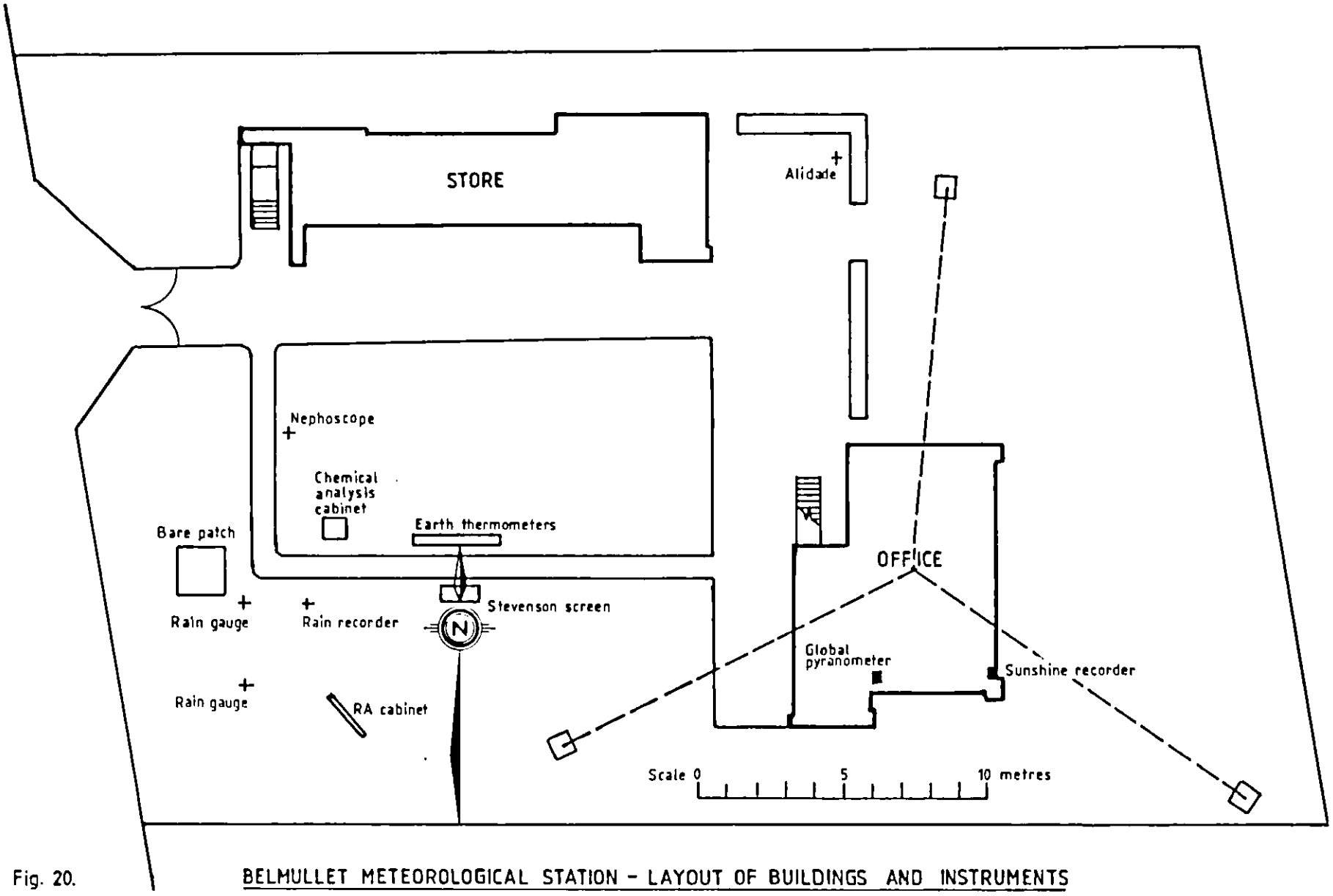
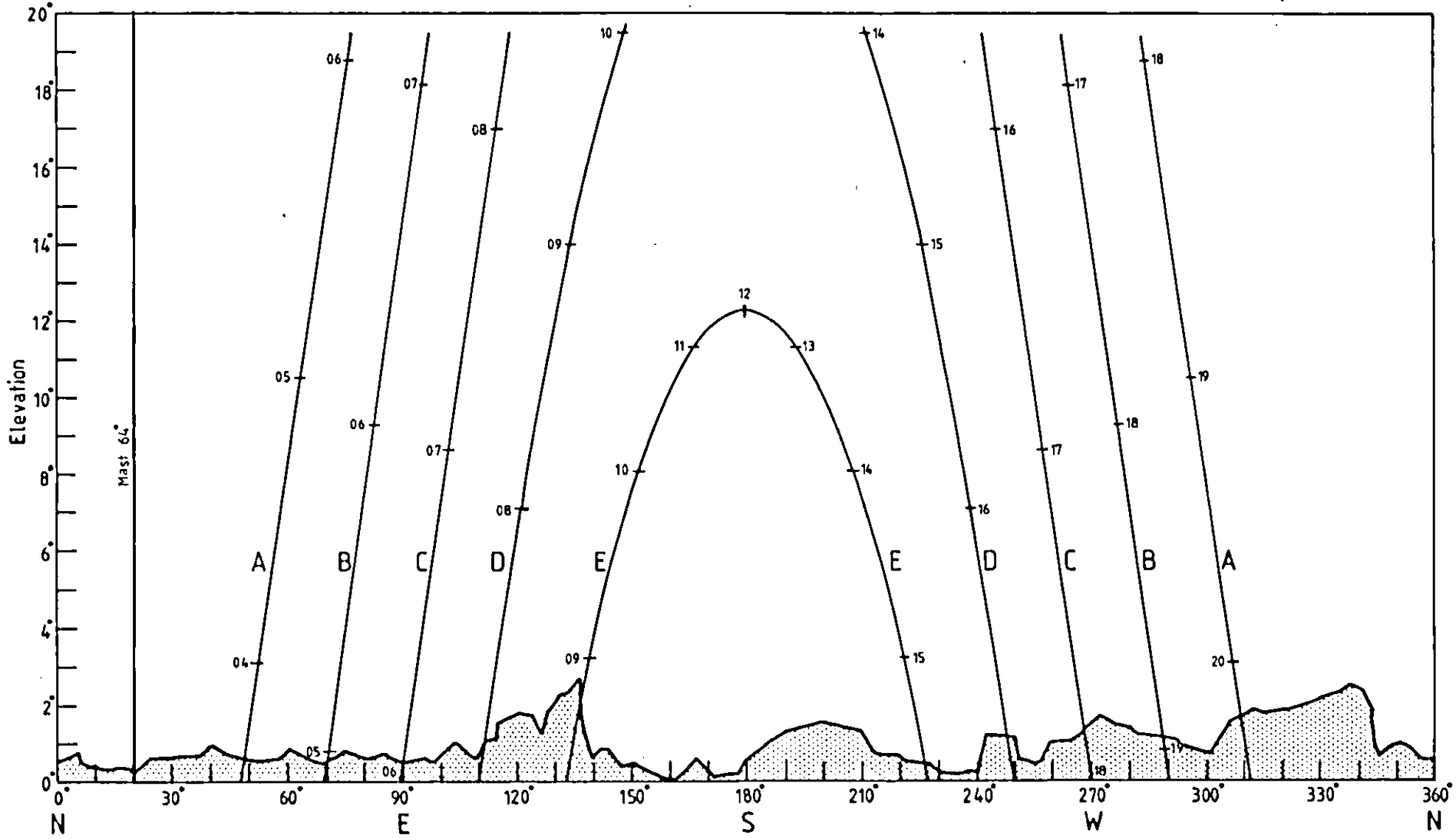


Fig. 20. BELMULLET METEOROLOGICAL STATION - LAYOUT OF BUILDINGS AND INSTRUMENTS



BELMULLET

Fig. 21. Exposure diagram showing (1) azimuth and elevation of all objects which obscure pyranometer.
(2) azimuth and elevation of sun at various times of year as follows (A) June 22 (B) April 21, August 23
(C) March 21, September 23 (D) February 18, October 25 (E) December 22

APPENDIX

TABLE OF INSTRUMENTS IN USE - 1981

	Sensor	Recorder	Integrator	Diffise Shade Ring Width	Diffise Shade Ring Diameter
Valentia					
Global	G2-847	No. 29	Lintronic 717A	-	-
Diffuse	G18-1387	No. 168	Lintronic 484B	48mm	308mm
Balance	Funk 695	Honeywell 68B/2124	-	-	-
Infra-Red	Eppley 1715F3	-	Eppley 411-5879	-	-
Direct Sun	Eppley 17247E6	-	Eppley 411-5880	-	-
Kilkenny					
Global	CM5-690224	XR4-550106	Lintronic 415A	-	-
Diffuse	CM5-78514	BD8-774733	-	51mm	305mm
Birr					
Global	CM5-690246	XR4-188730-13	CC1-680076	-	-
Diffuse	CM5-785160	BD8-785761	-	51mm	305mm
Dublin Airport					
Global	CM5-773731	Philips 8053	CC2-750338	-	-
Diffuse	CM5-752732	Philips 8056	CC2-750262	52mm	315mm
Malin Head					
Global	CM5-807223	BD8-806738	Eppley 411-7092	-	-
Diffuse	CM5-807230	BD8-806748	-	51mm	304mm
Clones					
Global	CM5-807237	BD8-806742	Eppley 411-7093	-	-
Diffuse	CM5-807231	BD8-806752	-	51mm	304mm
Belmullet					
Global	CM5-683279	XR4-188730-15	CC1-680082	-	-

NOTE : All instruments are Kipp and Zonen unless otherwise stated.

Table 1 VALENTIA DAILY TOTALS OF GLOBAL SOLAR RADIATION (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1	217	92	160	1167	693	1094	2107	2736	1127	493	129	264
2	321	102	184	1351	2226	1278	2513	1583	1186	569	239	264
3	101	276	605	1795	1287	1185	1876	1449	1150	428	148	102
4	246	216	396	1185	1405	1929	893	2250	401	311	630	240
5	180	362	260	1288	778	1294	2472	1072	701	1081	289	78
6	133	200	506	607	592	1999	1533	997	1544	1163	290	280
7	160	201	343	1151	447	662	1548	2223	943	561	360	155
8	66	344	908	1733	1577	1067	2215	1605	1549	441	291	120
9	279	749	198	1062	1920	2467	2702	2001	905	821	290	202
10	331	731	262	707	251	1081	629	883	1376	518	170	168
11	297	274	679	280	1820	849	1005	1401	1364	450	249	266
12	226	151	836	1206	1687	1275	1286	466	1451	996	322	333
13	141	451	1064	754	1812	292	1700	692	933	962	223	87
14	47	276	1127	968	1840	291	596	1888	414	273	146	146
15	160	309	1224	1682	2240	2295	1503	2254	1021	1120	74	235
16	240	792	1242	866	1563	2358	2071	1995	432	1112	433	218
17	342	233	919	560	1612	1898	2299	1598	210	970	349	314
18	243	197	630	1972	1340	2617	1005	1370	1300	286	456	349
19	125	280	370	2201	1277	1976	819	959	218	116	202	35
20	74	921	902	2365	1575	2688	890	1337	1065	776	282	227
21	135	733	702	1704	1286	2922	694	483	1053	571	127	258
22	243	674	736	776	1089	2651	1962	1063	1451	572	48	344
23	275	934	907	881	1051	1855	1737	893	259	255	424	84
24	399	784	324	2245	2306	2298	1884	1968	1319	610	399	175
25	307	595	537	2507	1619	1540	526	1638	671	525	245	75
26	213	217	986	1967	2449	3158	1430	2118	509	298	65	82
27	296	318	293	2619	423	2109	2216	2031	1180	600	294	315
28	235	570	1158	671	2104	1452	774	800	1312	549	254	149
29	156		1362	1141	1989	1897	2750	695	450	269	71	393
30	190		870	1096	648	1315	2627	1496	813	154	108	286
31	240		1452		1762		2299	739		386		248
Total	6618	11982	22142	40507	44668	51792	50561	44683	28307	18236	7607	6492
Mean	213.5	427.9	714.3	1350.2	1440.9	1726.4	1631.0	1441.4	943.6	588.3	253.6	209.4

Table 2 VALENTIA DAILY TOTALS OF DIFFUSE SOLAR RADIATION (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1	177	91	159	802	687	877	1332	506	870	471	128	258
2	197	102	178	773	610	1157	1142	1123	915	405	234	215
3	99	252	328	685	989	1090	1450	839	838	428	139	101
4	195	198	380	819	1009	1184	861	682	400	310	241	207
5	179	238	253	571	665	1044	1283	942	617	461	264	78
6	131	196	464	576	586	1153	1129	910	795	421	270	253
7	159	194	337	991	435	643	1054	779	864	390	331	155
8	65	301	640	898	1005	895	967	963	709	414	265	120
9	165	213	197	841	821	1242	916	1032	780	535	282	168
10	156	200	259	609	249	922	621	823	674	468	168	162
11	191	263	613	278	998	820	970	998	661	265	233	194
12	185	145	529	733	1340	1098	1069	465	544	366	268	126
13	140	377	557	648	1347	289	1267	662	720	393	216	87
14	44	264	589	662	858	287	590	1028	412	272	145	141
15	160	301	514	948	946	1372	1142	633	808	182	74	193
16	194	361	532	809	1117	1383	1142	974	432	170	206	142
17	218	229	566	520	1145	1491	982	800	208	274	253	117
18	197	197	601	653	1043	1141	931	914	615	286	154	80
19	124	277	364	571	1085	1113	811	857	216	116	196	34
20	73	347	642	463	1052	802	864	1102	594	401	236	170
21	133	324	564	922	1064	735	677	481	509	433	125	154
22	234	425	602	732	989	1174	1115	961	477	363	48	128
23	257	308	622	832	964	1616	1194	849	256	255	187	84
24	241	453	322	604	1036	1069	1269	646	539	386	169	173
25	285	525	508	529	1250	1234	521	976	515	385	229	75
26	212	216	820	633	907	758	1253	637	466	248	65	81
27	190	316	290	531	418	1544	1124	563	615	357	191	103
28	220	412	750	635	1280	1291	644	687	405	349	233	138
29	155		669	1010	1404	1211	631	631	431	265	71	230
30	182		784	992	637	1234	611	898	554	154	108	103
31	229		854		1275		1059	646		343		157
Total	5387	7725	15487	21330	29211	31869	30621	25007	17439	10566	5735	4427
Mean	173.7	275.9	499.6	711.0	942.3	1062.3	987.8	806.7	581.3	340.8	191.2	142.8

Table 3 VALENTIA DAILY TOTALS OF RADIATION BALANCE (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1	-88	8	93	555	327	530	1000	992	515	172	69	102
2	83	61	45	522	838	767	1295	760	538	35	100	-72
3	15	6	208	744	554	564	863	777	604	129	-89	44
4	-91	2	121	383	663	948	493	1065	236	131	-133	-61
5	-39	110	147	512	354	521	1409	511	278	293	-102	-47
6	-34	33	241	144	281	1133	786	401	611	377	-2	-3
7	89	60	208	380	230	348	892	933	379	63	-27	-19
8	-23	183	465	632	675	536	1077	848	650	88	-70	-151
9	-126	128	136	479	780	1102	1239	938	453	274	62	-131
10	-219	37	156	317	79	422	353	474	567	65	30	-97
11	-57	26	349	165	904	460	566	777	482	19	99	-252
12	-101	5	304	517	768	685	704	273	563	192	27	-239
13	4	-81	518	391	769	186	831	409	362	179	38	-44
14	-30	7	523	426	825	147	306	1034	258	50	-20	-213
15	-34	-68	399	613	1122	1038	782	1058	486	75	-155	-98
16	- 19	226	404	412	725	1207	1149	944	198	-3	-37	-203
17	-146	-25	364	121	768	878	1217	869	15	20	50	-352
18	28	46	261	552	451	1328	511	729	439	105	-86	-371
19	2	45	81	723	613	909	474	514	-45	88	13	-55
20	53	140	406	784	794	1253	528	652	255	83	4	-107
21	83	219	305	704	642	1216	366	248	322	87	52	-15
22	87	157	184	341	532	1251	1125	517	461	70	9	-183
23	98	86	413	442	558	906	820	428	16	91	-44	-230
24	8	167	181	1019	1073	1198	914	895	446	155	-102	-101
25	43	310	188	979	790	737	318	801	126	84	37	-22
26	30	36	449	836	1109	1371	783	908	189	50	43	-107
27	-90	105	170	970	173	781	1181	681	358	64	-81	-133
28	-136	139	409	289	978	669	393	438	409	79	-111	-73
29	-61		368	606	984	1013	1167	416	204	-52	36	-221
30	36		259	584	337	702	1161	640	291	64	68	-55
31	-83		614		907		1015	270		32		-82
Total	-718	2168	8969	16142	20603	24806	25718	21200	10666	3159	-322	-3591
Mean	-23.2	77.4	289.3	538.1	664.6	826.9	829.6	683.9	355.5	101.9	-10.7	-115.8

Table 4

Valentia

DIRECT SOLAR RADIATION AT NORMAL INCIDENCES

INSTANTANEOUS VALUES (mW/cm^{-2}) 1981

MONTH AND DAY	TIME L.A.T.	ZENITH DISTANCE (Z)	AIR MASS (m)	RADIATION				PRESSURE	TEMPERATURE	VAPOUR PRESSURE	VISIBILITY	CLOUD	
				CLEAR	RED (RG_2)	YELLOW (OG_1)	RED (RG_8)					TYPE	AMOUNT
				x10^{-1}	x10^{-1}	x10^{-1}	x10^{-1}	mb	^{o}C	mb	Km		Okta
Feb													
9	1336	69.7	2.86	737	506	546	417	1021	8.0	6.4	45	CuFc	1
10	1128	66.6	2.51	802	539	658	444	1031	8.0	7.2	50	CuFc	2
16	0948	70.3	2.95	758	525	637	432	1025	8.5	8.1	50	CuSc	2
21	1144	62.5	2.16	802	530	650	440	1008	9.4	7.2	25	CbSc	3
23	1036	64.3	2.30	712	511	607	429	1014	5.7	6.8	10	CuSc	1+
23	1328	64.5	2.31	693	506	601	425	1015	5.8	6.6	16	Cu	1-
Apr													
3	0852	60.6	2.03	698	460	568	380	1024	10.0	10.5	30	Ac	Tr
3	1328	50.0	1.55	687	457	562	379	1024	12.5	12.6	30	Fc	Tr
18	0904	54.3	1.71	811	549	666	454	1027	12.5	8.5	25	Fc	Tr
19	0804	62.3	2.14	573	429	506	361	1028	10.0	10.0	18		0
19	0912	52.9	1.65	666	475	570	397	1028	10.5	10.3	18		0
19	1028	44.8	1.41	715	497	601	418	1028	11.8	10.5	18		0
19	1304	42.7	1.36	724	496	602	419	1027	13.2	11.1	18	CuFcCi	3
19	1356	46.9	1.46	674	479	570	404	1027	13.2	11.1	18	FcCi	3
19	1620	65.8	2.43	654	470	561	392	1026	14.2	11.6	15	Ci	3
20	0808	61.5	2.09	779	530	643	437	1032	7.5	7.0	30	CuSc	Tr
20	0832	58.1	1.89	790	531	648	439	1032	9.0	7.5	30	Cu	Tr
20	1016	45.5	1.43	848	556	684	457	1033	11.0	7.7	30	Cu	1
20	1312	42.9	1.36	832	544	676	448	1033	13.0	8.3	30	Cu	Tr
24	1032	42.9	1.36	882	564	699	469	1009	8.1	5.4	50	CuCi	3+
24	1508	54.1	1.70	825	560	680	454	1010	7.3	5.8	50	Cu	5
25	0920	50.2	1.56	890	583	716	487	1018	7.1	4.9	45	Fc	Tr
25	1112	39.9	1.30	923	595	738	489	1019	8.9	5.6	60	CuFc	1
25	1316	41.5	1.33	912	586	731	483	1019	9.4	5.1	60	CuFc	1
27	1248	39.3	1.29	897	568	705	470	1025	11.0	7.0	60	CuCi	3
May													
2	1240	37.4	1.26	916	582	725	478	1021	10.0	7.6	45	Cu	3
2	1512	52.6	1.64	866	558	693	456	1020	9.7	8.0	50	CuCi	3
2	1556	58.9	1.93	825	540	668	443	1020	9.7	8.0	50	CuCi	3
26	1248	32.1	1.18	833	534	667	439	1004	13.4	10.9	35	Cu	4
June													
16	1300	30.8	1.16	791	506	627	406	1028	13.8	10.2	40	CuScCi	4
18	1116	29.8	1.15	882	542	691	445	1030	14.3	13.3	50	CuAcCi	4
18	1324	32.7	1.19	873	539	679	437	1029	14.5	13.1	50	CuAc	3+
18	1348	35.2	1.22	842	524	655	432	1029	14.5	13.1	50	CuAc	3
19	1356	36.1	1.24	796	506	629	410	1025	15.2	15.6	40	StCu	3
20	0944	38.6	1.28	850	526	665	425	1026	17.5	15.0	45	StCuSc	4
20	1444	42.3	1.35	790	491	617	401	1026	17.4	15.5	50	CuFc	4
24	1332	33.5	1.20	882	547	688	444	1024	15.4	12.0	45	CuSc	4
26	1224	28.9	1.14	861	549	681	449	1020	15.3	10.9	60	CuSc	1

Table 4
(Contd.)

DIRECT SOLAR RADIATION AT NORMAL INCIDENCES
INSTANTANEOUS VALUES (mW/cm^2) 1981

MONTH AND DAY	TIME L.A.T.	ZENITH DISTANCE (Z)	AIR MASS (m)	RADIATION				PRESSURE	TEMPERATURE	VAPOUR PRESSURE	VISIBILITY	CLOUD	
				CLEAR	RED (RG_2)	YELLOW (OG_1)	RED (RG_8)					TYPE	AMOUNT
				$x10^{-1}$	$x10^{-1}$	$x10^{-1}$	$x10^{-1}$	mb	^oC	mb	Km		Okta
June													
26	1320	32.4	1.18	855	546	679	444	1020	15.5	8.2	60	CuSc	Tr
26	1408	37.6	1.26	796	525	643	432	1020	16.1	11.6	60	CuSc	Tr
26	1448	43.0	1.37	789	517	640	425	1020	16.0	12.2	60	Cu	Tr
26	1540	50.5	1.57	745	499	613	411	1020	16.0	12.2	60	Cu	Tr
July													
8	1448	43.7	1.38	802	508	635	413	1014	14.6	14.6	30	Cu	3
9	1440	42.7	1.36	826	529	656	433	1019	15.5	11.3	45	CuCi	5
17	0848	48.0	1.49	775	497	618	411	1017	13.1	12.0	30	CuCbSc	4
29	0916	46.1	1.44	777	490	594	401	1022	16.1	13.2	30	CuScCi	1+
29	0956	41.2	1.33	804	507	637	411	1022	17.0	13.6	30	CuSc	1
29	1108	34.8	1.22	826	518	652	416	1022	17.8	14.1	30	FcSc	Tr
29	1252	34.8	1.22	816	509	643	410	1022	18.6	14.3	30	FcSc	Tr
29	1400	40.7	1.32	784	494	617	398	1022	18.8	15.6	30	Fc	Tr
29	1520	51.1	1.59	742	471	586	381	1021	19.5	16.4	30	Fc	Tr
30	0848	50.1	1.56	754	489	607	400	1022	17.2	17.0	18	FcCi	1
30	0956	41.4	1.33	773	501	619	405	1022	18.8	17.4	25	CuCi	Tr
30	1056	35.8	1.23	799	513	634	416	1021	19.5	16.6	25	CuCi	1+
30	1248	34.8	1.22	770	496	617	405	1020	21.5	16.0	25	CuFc	1
30	1412	42.3	1.35	686	460	565	376	1020	20.6	17.5	25	FcCi	Tr
30	1520	51.4	1.60	633	431	526	354	1020	18.5	17.6	25	FcCi	Tr
Aug													
1	0908	47.8	1.49	814	528	654	432	1018	14.8	10.9	40	CuCi	Tr
1	1132	34.4	1.21	852	546	852	441	1018	17.0	9.4	60	Ci	Tr
1	1352	40.6	1.32	792	515	636	421	1018	18.5	13.3	60		0
4	1308	37.3	1.26	874	538	677	435	1025	19.0	15.4	40	CuCi	1
4	1408	42.9	1.36	851	526	666	427	1025	18.8	16.2	40	CuCi	1-
14	1044	40.6	1.32	867	524	670	418	1019	22.1	17.9	50	CuSc	3
15	0932	48.1	1.50	813	517	647	419	1021	17.0	13.6	50	CuScAc	2
15	1056	40.1	1.31	802	520	642	420	1021	17.6	14.1	50	CuFc	1
15	1320	41.2	1.33	730	483	596	397	1021	17.1	13.7	70	Cu	1
15	1444	50.1	1.56	709	475	582	385	1021	17.0	13.6	70	CuFc	1
17	1248	39.8	1.30	823	511	646	411	1026	18.6	17.9	50	CuSc	4
26	0832	59.0	1.94	781	495	624	396	1030	18.7	18.8	40	FsSc	2
26	1004	47.7	1.48	813	507	643	410	1030	19.2	19.4	50	CuFc	3
26	1048	44.0	1.39	842	518	659	416	1030	20.0	19.2	50	CuFc	1
26	1116	42.5	1.36	823	512	645	410	1030	20.0	19.2	50	CuFc	1
26	1508	56.3	1.80	660	441	547	373	1029	21.6	19.9	50	CuFc	5
27	1108	43.3	1.37	694	480	579	393	1023	23.3	18.1	18	Fc	Tr
27	1236	42.6	1.36	685	473	571	390	1022	24.2	18.1	18	Fc	Tr
Sept													
11	1512	61.8	2.11	741	488	602	393	1003	14.6	10.7	30	CuFc	3

Table 4 (Contd.)

DIRECT SOLAR RADIATION AT NORMAL INCIDENCES
INSTANTANEOUS VALUES (mW/cm^2) 1981

MONTH AND DAY	TIME L.A.T.	ZENITH DISTANCE (Z)	AIR MASS (m)	RADIATION				PRESSURE	TEMPERATURE	VAPOUR PRESSURE	VISIBILITY	CLOUD	
				CLEAR	RED (RG_2)	YELLOW (OG_1)	RED (RG_8)					TYPE	AMOUNT
				$x10^{-1}$	$x10^{-1}$	$x10^{-1}$	$x10^{-1}$	mb	^oC	mb	Km		Okta
Sept													
12	1312	50.1	1.56	856	544	680	434	1008	15.0	11.6	45	Cb	5
21	1508	64.7	2.33	751	498	619	402	999	14.3	11.9	50	Cb	3
22	1112	52.7	1.65	764	498	615	398	1011	15.0	12.8	25	CuCbCi	3
22	1556	71.3	3.10	584	411	499	331	1013	15.0	12.3	30	CuCb	2
28	1332	57.5	1.86	813	521	650	419	1013	15.2	11.5	50	Cu	1
Oct													
6	1402	62.8	2.18	812	530	649	427	1000	11.0	8.3	30	CuCb	3
15	0924	69.1	2.79	758	522	634	421	1012	7.3	6.1	60	Sc	Tr
15	1244	61.3	2.08	838	557	725	454	1013	9.9	6.5	60	Sc	Tr
15	1444	69.9	2.89	740	511	618	415	1013	9.8	6.8	60	FcSc	1+
16	0928	69.0	2.77	789	547	661	445	1018	6.7	2.5	60	Sc	Tr
16	1044	63.0	2.20	845	566	695	457	1018	9.3	7.1	60	Sc	Tr
16	1400	66.2	2.47	792	542	661	439	1018	12.5	7.2	60		0
17	1500	72.5	3.31	664	486	578	395	1016	11.0	8.6	60	FcCi	1
Nov													
16	1016	74.3	3.68	676	468	574	379	1018	9.9	8.3	35	CuSc	1
18	1024	74.3	3.68	682	472	577	383	1004	9.4	8.3	25	CuSc	3
23	1052	73.9	3.59	575	395	474	323	1013	8.6	8.6	30	CuFc	3
23	1232	72.7	3.35	633	439	532	357	1015	9.4	7.4	40	CuFc	3
Dec													
17	1128	75.7	4.02	612	456	531	386	1002	3.3	6.5	30	ScCi	Tr
18	1114	76.1	4.13	749	556	655	464	1016	2.8	4.1	30		0
22	1204	75.3	3.92	626	477	557	392	996	5.7	7.5	20	Cu	2
22	1336	78.2	4.83	592	461	532	386	995	6.0	6.9	25	Cu	Tr

Table 5 VALENTIA DAILY TOTALS OF DIRECT SOLAR RADIATION AT NORMAL INCIDENCES (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1	121	0	0	381	1	189	819	3466	296	24	0	17
2	396	3	1	1024	2647	78	1577	436	325	260	0	242
3	0	41	508	1712	351	80	372	1035	321	0	65	0
4	131	22	0	428	394	956	13	2112	1	0	1070	102
5	1	268	0	1057	239	384	1408	118	124	1334	32	0
6	1	0	22	14	0	1049	-	272	992	1435	11	85
7	0	0	5	124	2	2	-	2251	45	338	38	1
8	0	67	400	1050	676	234	1963	756	1220	28	51	0
9	386	1525	0	272	1601	1554	2422	1200	104	463	0	131
10	669	1464	0	74	3	350	2	32	1054	70	0	23
11	440	1	44	0	898	2	23	405	1107	474	17	242
12	99	0	375	714	389	166	143	0	1413	1459	116	875
13	0	145	781	89	-	0	408	19	375	1209	29	0
14	0	19	949	379	1347	0	9	990	0	0	0	16
15	0	4	1179	843	1802	1090	349	2445	223	2397	2	148
16	115	1033	1354	8	493	918	1036	1342	0	2428	704	334
17	332	12	522	16	552	673	1530	1049	0	1711	293	803
18	96	0	1	2228	573	1673	62	483	1080	6	1017	1332
19	0	0	11	2710	171	1284	5	79	0	0	8	0
20	0	1831	300	3189	638	2483	5	174	864	837	130	283
21	0	926	148	1077	226	3094	11	3	942	263	0	565
22	1	524	175	25	80	1783	1019	44	1813	610	0	911
23	12	1635	431	14	37	135	683	30	26	0	842	0
24	480	686	17	2327	1655	1571	564	2071	1654	536	867	7
25	35	62	18	2950	402	260	0	714	439	318	25	0
26	1	0	170	1844	1775	3631	124	2422	78	135	0	11
27	279	0	0	3292	0	876	1329	2405	1273	576	317	994
28	3	217	595	16	1116	156	260	141	1764	435	65	5
29	0		1128	67	617	743	3099	43	13	0	0	722
30	7		62	22	0	76	2898	836	402	0	0	993
31	8		761		482		1778	127		51		367
Total	3613	10485	9957	27946	-	25940	-	27500	17948	17397	5699	9209
Mean	116.5	374. 4	321.2	931.5	-	849.7	-	887.1	598.3	561.2	190.0	297.1

*No data available 13th May and 6th/7th July due to instrument malfunction

Table 6 VALENTIA DAILY TOTALS OF LONG-WAVE (INFRA-RED) RADIATION (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1	2628	2917	2657	2846	2867	2978	1337	2487	3225	2862	3207	2910
2	2878	3060	2576	2641	2262	3024	1812	2942	3220	2555	3138	2635
3	2852	2714	2410	2412	2757	2835	2371	3150	3305	2827	2866	2973
4	2468	2679	2490	2003	2668	2728	3069	2935	3422	2991	2275	2679
5	2696	2812	2812	2624	2868	2780	-	3135	3182	2568	2688	2759
6	2749	2965	2775	2552	2881	2805	-	2965	2950	2576	2876	2691
7	2947	2955	2448	2458	2956	2952	-	2657	3155	2767	2732	2822
8	2909	2867	1693	2394	2684	2895	2788	3048	3028	2920	2721	2410
9	2508	2297	2024	2721	2612	2636	2663	2906	3330	2758	2834	2396
10	2198	2143	1727	2904	2894	2799	3166	3212	2970	2748	2967	2461
11	2456	2603	2937	2957	2777	3103	3138	3279	2701	2598	3023	2026
12	2523	2775	2793	2615	2909	3044	3117	3316	2744	2480	2794	2041
13	2788	2330	2651	2828	2719	3150	3159	3417	2964	2433	2839	2748
14	2909	2633	2544	2763	2597	3087	3212	3322	3384	2657	2830	2453
15	2676	2520	2327	2495	2515	2669	3221	2904	3119	2050	2744	2383
16	2693	2417	2297	2860	2701	2783	3020	3028	3250	1985	2496	2157
17	2414	2612	2590	2658	2683	2730	2849	3238	3122	2107	2834	1867
18	2808	2714	2740	2169	2610	2725	3111	3193	2811	2799	2475	1781
19	2904	2538	2689	2205	2909	2718	3293	3232	2858	3218	2859	2780
20	3060	2142	2741	2104	2907	2564	3257	3218	2668	2465	2818	2395
21	3050	2459	2768	2524	2924	2442	3063	3352	2751	2629	3117	2285
22	2968	2423	2370	2741	2880	2637	2827	3207	2695	2671	3170	2132
23	2883	1918	2798	2771	2890	2796	2914	3169	2978	2998	2637	2279
24	2612	2176	3030	2216	2457	2724	2848	2985	2720	2777	2390	2247
25	2744	2685	2781	2087	2808	1662	3213	3145	2723	2548	2768	2739
26	2818	2520	2605	2306	2599	1043	3217	3004	2895	2855	3193	2675
27	2592	2512	2968	2108	2900	1157	3086	2831	2696	2623	2594	2319
28	2654	2333	2582	2791	2713	1376	3135	3357	2716	2685	2604	2658
29	2766		2287	2926	2873	1473	2617	3351	3158	2667	2996	2152
30	2796		2578	2944	3046	1552	2682	3158	2941	3079	3091	2172
31	2641		2586		2895		2630	3181		2844		2338
Total	84588	71719	79274	77223	85761	75867	-	96323	89681	82760	84576	75363
Mean	2728.6	2561.4	2557.2	2574.1	2766.5	2528.9	-	3107.2	2989.4	2669.7	2819.2	2431.1

No data available 5th-7th July due to instrument malfunction.

Table 7 KILKENNY DAILY TOTALS OF GLOBAL SOLAR RADIATION (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1	234	369	336	601	1301	915	1990	1806	1060	233	274	116
2	65	186	281	1432	2421	1490	1620	2170	554	763	239	141
3	274	315	327	1702	1856	1214	1744	867	762	646	130	119
4	349	598	534	1125	2120	1366	1495	2299	779	247	558	325
5	169	554	127	620	581	2030	1530	1664	1422	1124	513	192
6	168	107	521	1090	1047	1788	1740	1499	1513	754	248	149
7	126	401	376	1026	553	641	1447	1290	862	916	250	165
8	185	140	678	1204	1745	1902	899	908	1136	493	178	258
9	265	642	255	1467	2202	2175	2324	1040	1048	373	286	206
10	398	720	317	1208	390	1496	958	1778	1013	470	252	128
11	175	332	472	370	2531	815	1252	1213	1387	846	237	257
12	317	144	970	340	1537	1355	1538	874	1120	897	397	344
13	137	559	654	647	310	1342	1327	669	1353	831	282	24
14	54	297	484	689	2068	619	967	1138	478	584	234	94
15	330	576	1211	1916	1818	1909	1135	1772	961	1056	30	141
16	299	837	1165	2138	1789	2372	1978	2288	491	1040	526	121
17	438	311	634	1919	1542	1308	1924	1363	382	692	339	275
18	186	100	841	2211	637	1092	1491	1504	1139	703	390	343
19	181	738	502	1807	1503	2603	1297	829	329	241	297	76
20	68	251	925	1831	832	1629	1430	1595	1225	884	296	259
21	145	368	311	1125	760	2724	727	821	1375	599	199	152
22	300	382	1458	974	1564	2570	1764	1032	1032	680	106	21
23	224	273	503	1414	1280	1238	1628	1195	529	281	343	201
24	475	399	663	1280	1852	1242	1192	863	917	414	439	319
25	421	105	1198	2087	2120	1297	703	1883	1123	831	310	180
26	384	186	1196	1894	1682	2244	1834	1825	733	201	132	34
27	197	223	219	2154	1132	1841	1832	1658	1063	616	376	185
28	351	522	838	443	1945	2379	1120	1007	1177	258	402	21
29	104		1454	1163	1588	1308	1620	717	245	387	82	126
30	240		1834	1052	720	1688	1992	1613	900	144	146	72
31	539		1852		2122		1666	954		438		339
Total	7798	10635	23136	38935	45548	48592	46164	42134	28108	18642	8491	5383
Mean	251.6	379.8	746.3	1297.8	1469.3	1619.7	1489.2	1359.2	936.9	001.4	283.0	173.6

Table 8 KILKENNY DAILY TOTALS OF DIFFUSE SOLAR RADIATION (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1	144	265	331	564	827	854	1177	1067	847	233	266	113
2	63	179	281	609	671	1181	1106	1038	536	504	236	134
3	204	259	319	531	854	980	1497	761	759	371	116	119
4	115	199	505	812	983	1001	1296	710	637	246	211	185
5	165	261	127	595	560	1158	1104	1149	767	412	285	189
6	165	107	435	816	931	1133	1073	1198	703	463	240	136
7	126	312	374	856	536	634	928	1181	762	369	246	165
8	157	134	513	798	1032	1189	700	786	819	392	178	152
9	136	248	255	696	749	1131	1243	1013	711	353	247	172
10	95	164	317	862	374	1008	851	961	504	455	246	128
11	175	312	433	370	767	794	1154	1058	575	361	211	162
12	179	144	621	339	1174	1321	1222	847	498	367	196	104
13	137	332	573	573	307	1121	1260	669	571	367	205	24
14	54	295	429	603	1179	614	962	1017	470	408	233	90
15	207	297	468	708	1056	1233	1111	729	771	224	30	121
16	184	223	522	383	1114	1332	1058	505	485	167	124	118
17	148	257	541	838	1153	1268	1104	1102	371	517	228	105
18	168	100	584	416	574	988	1171	1040	601	493	179	104
19	179	370	493	786	1114	684	1131	777	298	240	232	75
20	68	251	698	775	734	1090	1207	884	499	348	242	106
21	143	278	311	868	747	932	720	780	481	338	185	152
22	203	371	468	921	1077	954	1172	872	564	318	106	19
23	206	261	464	1002	1123	1153	996	976	452	281	165	123
24	148	362	533	685	1116	1087	1147	782	515	352	132	98
25	238	105	735	830	1100	1244	703	654	480	257	202	171
26	209	186	700	854	1190	1226	906	619	563	201	128	34
27	169	201	217	741	961	1426	1337	676	544	312	120	148
28	277	323	701	440	1163	1556	967	903	466	237	146	21
29	101		630	1077	1103	1216	697	671	244	334	82	124
30	216		243	839	695	1318	1009	848	507	143	140	71
31	193		280		1234		1112	925		320		140
Total	4972	6796	14101	21187	28198	32790	33121	27198	17000	10383	5557	3603
Mean	160.3	242.7	454.9	706.2	909.6	1093.0	1068.4	877.5	566.7	334.9	185.2	116.2

Table 9 BIRR DAILY TOTALS OF GLOBAL SOLAR RADIATION (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1	195	429	319	1153	1373	1463	2230	2470	1108	356	199	132
2	117	111	402	858	2173	1635	1621	2163	944	797	361	155
3	237	291	428	1749	1509	1533	1796	799	1125	521	134	101
4	358	472	490	1628	2242	1136	1093	2264	1009	155	637	323
5	171	438	302	710	713	2089	1932	1077	506	835	558	182
6	149	200	538	1153	722	1734	1414	1064	1388	763	285	129
7	137	279	349	672	395	679	1260	1367	882	829	439	94
8	143	142	618	1432	2107	1402	1476	738	1250	423	319	220
9	310	709	353	1954	2458	2283	2138	1192	1112	286	117	192
10	420	710	316	1105	463	1424	1057	1404	1074	389	121	130
11	186	284	415	278	2545	571	1048	1001	1282	991	173	143
12	193	174	1028	450	1930	1482	1358	705	1409	875	462	372
13	119	504	624	617	323	634	1121	840	1361	918	337	41
14	75	327	615	815	1948	889	806	1436	795	657	287	131
15	276	417	977	1992	2301	1671	805	1691	857	975	71	199
16	217	758	1154	2002	1960	2005	1683	2139	494	1036	535	276
17	454	263	670	1452	1544	1417	1696	1162	323	778	261	306
18	225	164	938	2192	822	970	1159	1340	1098	592	398	372
19	197	720	480	2086	1981	2355	897	601	414	181	249	93
20	76	852	976	1951	1300	1836	1183	1420	1260	592	293	280
21	115	562	538	925	1242	2667	643	421	1270	478	123	108
22	257	301	1241	1333	1208	2293	1512	585	1132	410	129	125
23	213	245	440	1291	1155	954	1178	1164	294	354	341	263
24	459	832	700	1089	1941	1207	1309	1026	1210	348	395	385
25	269	375	1044	2077	2400	1051	535	1387	1137	712	309	158
26	262	416	966	1504	1912	1792	1656	1827	907	218	156	69
27	194	533	431	2286	1468	1609	1638	1950	845	571	325	227
28	389	831	806	438	1730	2003	940	1302	1012	337	331	54
29	248		1286	952	1748	1403	1659	798	514	351	66	118
30	127		1395	926	1140	1569	1438	1380	1029	128	113	110
31	457		1743		1615		1935	1028		415		259
Total	7245	12339	22582	39070	48368	45756	42216	39741	29041	17271	8524	5747
Mean	233.7	440.7	728.5	1302.3	1560.2	1525.2	1361.8	1281.9	968.0	557.1	284.1	185.4

Table 10 BIRR DAILY TOTALS OF DIFFUSE SOLAR RADIATION (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1	163	230	307	854	1000	1225	1199	657	1009	178	198	130
2	97	111	343	690	784	1250	1199	1103	836	519	335	155
3	192	272	375	589	983	1076	1367	740	885	440	134	98
4	150	239	489	744	967	1041	1035	986	793	149	198	190
5	159	332	300	644	711	1190	1121	1018	501	448	334	182
6	148	200	443	755	696	1112	1097	1032	768	526	279	128
7	117	270	348	625	376	678	1119	1143	800	419	339	92
8	127	138	494	844	955	979	1144	715	753	408	279	169
9	128	223	352	466	633	1225	1206	1165	786	269	116	192
10	102	209	305	885	435	1030	1040	1178	626	379	120	116
11	182	281	387	234	630	562	1033	928	505	395	164	136
12	151	165	432	445	1404	1181	1149	690	663	376	274	164
13	119	289	568	518	308	630	1095	830	598	401	237	40
14	59	311	538	695	1075	849	791	1042	734	376	280	104
15	235	254	659	582	997	1201	796	975	746	290	69	160
16	148	279	543	520	1242	1552	1047	546	484	163	137	-
17	123	261	610	971	1067	1272	1145	1110	311	381	222	98
18	177	164	611	429	721	914	1064	1060	603	472	149	115
19	177	370	461	709	1285	857	894	584	339	177	242	93
20	71	286	787	833	926	1194	1098	1006	511	350	257	132
21	102	384	508	830	1131	925	628	419	437	392	115	108
22	182	289	611	1122	1070	1197	1259	575	560	369	129	125
23	186	241	422	1020	1111	951	1083	1083	292	344	163	168
24	152	471	669	752	1036	1155	1261	837	536	329	126	179
25	219	374	701	621	1045	1005	522	951	436	321	233	158
26	242	407	761	890	1189	1363	1204	451	734	200	153	68
27	163	482	428	656	1128	1400	1308	511	618	293	206	175
28	309	422	653	438	1542	1585	926	1077	516	322	177	52
29	236		656	929	1144	1235	946	765	434	315	66	101
30	110		615	880	1052	1188	977	915	647	128	110	108
31	218		331		1089		794	863		341		136
Total	4944	7954	15707	21170	39732	33022	32547	26955	18461	10470	5841	-
Mean	159.5	284.1	506.7	705.7	959.1	1100.7	1049.9	869.5	615.4	337.7	198.0	-

*No data available for 16th December due to instrument malfunction

Table 11 DUBLIN AIRPORT DAILY TOTALS OF GLOBAL SOLAR RADIATION (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1	246	443	211	1120	1786	1938	1986	1372	1484	155	308	95
2	88	120	453	1269	2232	1243	1441	2236	1060	487	328	85
3	230	368	304	967	1604	1853	1566	1164	978	606	252	145
4	324	496	371	1533	1533	1190	1428	1930	1129	402	594	294
5	210	391	148	840	724	2411	1650	1814	670	1196	502	205
6	64	172	904	1576	923	1673	2249	1856	923	768	379	144
7	132	238	581	642	376	701	1434	646	575	888	443	55
8	120	93	537	1547	2014	1651	867	1243	1387	551	131	340
9	231	542	342	1247	1696	1857	1817	1236	1050	436	128	313
10	322	699	389	844	693	1687	1369	2016	413	616	128	105
11	156	282	442	547	2029	449	912	905	1374	905	226	192
12	245	73	886	286	2289	2059	981	1000	1006	936	393	504
13	81	542	404	495	918	1824	1300	780	1470	885	441	19
14	70	424	611	828	1542	1135	648	1476	508	777	271	140
15	312	578	944	2043	1879	1650	854	1246	871	956	78	145
16	224	801	1280	2132	2141	1944	1752	1948	635	981	500	136
17	204	285	843	2006	1216	1342	1563	1240	549	729	277	256
18	198	165	989	2172	471	944	1606	1134	1334	681	338	165
19	254	544	601	1669	1669	1907	1436	638	473	257	249	103
20	104	191	811	1754	1027	1618	1143	1332	1277	654	270	240
21	135	177	570	824	1675	2666	743	1052	1358	685	163	12
22	237	131	1429	935	1352	1174	914	777	1035	532	211	14
23	260	227	434	1442	1381	816	1417	850	484	259	297	103
24	438	663	700	503	1737	1092	784	871	1050	313	386	274
25	314	266	1044	1708	2394	1013	1056	1385	1149	657	276	175
26	128	96	1247	1727	983	2499	1814	1266	327	300	210	25
27	193	303	219	2091	1887	1789	1973	1368	736	624	264	38
28	427	714	1067	365	1333	1580	1086	1088	1131	235	188	10
29	470		1320	1042	1130	1133	2056	1232	393	464	71	28
30	108		1759	987	1332	1794	1354	1669	849	101	125	50
31	421		1741		1779		1714	1370		520		264
Total	6946	10024	23581	37141	45745	46632	42913	40140	27678	18556	8427	4674
Mean	224.1	358.0	760.7	1238.0	1475.6	1554.4	1384.3	1294.8	922.6	598.6	280.9	150.8

Table 12 DUBLIN AIRPORT DAILY TOTAIS OF DIFFUSE SOLAR RADIATION (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1	159	221	209	785	1015	1170	1161	979	918	130	262	85
2	84	117	405	772	568	978	924	749	896	460	302	75
3	149	296	300	681	829	1084	1089	947	753	423	178	129
4	88	200	371	577	939	1048	1065	836	792	324	142	98
5	147	271	139	555	702	1038	960	927	625	356	198	166
6	57	167	373	713	805	928	1388	960	586	443	281	121
7	127	226	415	600	363	684	974	594	511	259	319	39
8	119	85	461	802	938	1088	705	772	649	406	113	101
9	134	233	337	921	669	1171	1108	1127	735	372	105	88
10	130	138	351	774	441	1067	829	822	281	511	111	88
11	156	280	438	449	971	441	853	796	503	352	202	69
12	162	67	441	261	918	1312	922	876	525	251	203	54
13	81	339	403	401	651	1152	1182	747	486	281	211	6
14	70	256	541	701	965	978	644	1005	492	236	231	116
15	153	212	422	497	851	1084	847	663	753	156	66	137
16	168	148	436	292	857	1264	1108	611	626	114	111	134
17	178	258	640	548	879	1234	1140	864	421	460	160	78
18	165	164	572	323	372	938	1165	946	528	382	131	129
19	177	337	512	931	1030	1099	1197	612	308	232	215	100
20	104	185	692	689	659	892	1052	897	505	315	241	113
21	135	164	546	553	988	911	724	917	452	281	155	8
22	177	131	379	614	1070	1162	849	676	429	320	187	12
23	200	225	410	893	1084	816	1048	779	375	241	114	97
24	124	345	580	484	1024	1032	760	701	476	272	122	92
25	262	264	635	711	831	940	931	890	365	284	188	159
26	127	96	510	894	824	1191	971	741	305	278	158	21
27	192	293	218	526	1264	1151	1167	893	559	239	116	31
28	209	288	769	339	1201	1215	992	803	350	198	151	7
29	251		649	967	948	1093	785	1011	349	237	56	23
30	105		203	918	971	1376	1038	680	384	66	94	48
31	237		294		969		898	732		229		132
Total	4627	6006	13651	19171	26596	31537	30476	25553	15937	9108	5123	2556
Mean	149.3	214.5	440.4	639.0	857.9	1051.2	983.1	824.3	531.2	293.8	170.8	82.5

Table 13 MALIN HEAD DAILY TOTALS OF GLOBAL SOLAR RADIATION (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1						2117	2154	2532	1651	574	86	79
2						1023	1883	1342	1528	255	176	87
3						1520	2450	1466	780	324	110	87
4						1158	1379	2199	667	269	488	207
5						1971	1388	1947	1486	806	455	122
6						2136	1068	1780	864	591	320	98
7						1023	1287	1590	989	832	234	74
8						1260	1560	823	1220	202	382	189
9						1972	2031	2059	561	441	289	142
10						2649	913	923	500	665	75	264
11						2762	1138	636	1112	703	240	246
12						2079	2018	491	1593	679	323	333
13						289	1418	695	1618	608	337	28
14						1561	1537	1330	300	603	227	120
15						2032	1194	775	851	809	99	86
16						1294	2040	2079	854	752	235	142
17						1924	1904	470	399	876	225	217
18						681	1397	1280	940	266	219	179
19						1368	688	297	1072	322	224	63
20						1919	837	1165	1059	490	181	191
21						2449	576	1312	1232	370	68	48
22						1795	2097	869	1085	318	185	66
23						839	2098	1060	170	251	255	225
24						2304	1277	1411	781	363	205	227
25						2175	747	1372	962	514	114	151
26						2676	1208	2000	185	213	126	48
27						2566	1816	1960	232	485	196	60
28						2392	722	904	649	284	129	29
29						1405	1804	1725	594	439	60	57
30						1816	687	1624	727	156	56	19
31							1676	1943		488		83
Total						53155	44992	42059	26661	14948	6319	3967
Mean						1771.8	1451.4	1356.7	888.7	482.2	210.6	128.0

Table 14 MALIN HEAD DAILY TOTALS OF DIFFUSE SOLAR RADIATION (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1						1335	1104	485	601	494	85	74
2						756	1085	852	699	255	176	87
3						962	1076	953	711	309	110	87
4						1033	1104	707	563	267	211	127
5						1261	953	834	694	467	188	122
6						1117	928	1286	708	358	282	90
7						968	872	1094	643	424	225	72
8						875	1040	760	773	202	259	125
9						1262	1287	794	523	412	243	111
10						889	830	840	473	352	75	69
11						715	1073	617	504	377	222	204
12						1023	1232	491	438	345	188	156
13						289	1127	681	315	377	224	28
14						1133	1325	1064	300	338	214	93
15						1199	1096	673	674	284	98	85
16						1194	1196	532	729	312	185	99
17						1391	1258	469	354	173	139	73
18						663	1184	982	536	265	153	131
19						1268	676	296	508	284	194	61
20						1208	827	944	393	329	143	78
21						1068	571	1014	467	306	62	48
22						1553	1273	711	525	313	168	65
23						832	911	890	170	251	148	120
24						1029	1190	884	429	286	122	85
25						1444	732	622	361	222	113	146
26						824	1150	462	185	202	113	47
27						936	1189	452	231	259	150	60
28						1454	694	792	511	265	122	29
29						1209	1226	763	457	248	61	55
30						1487	687	756	487	156	52	19
31							1362	340		249		82
Total						32377	32258	23040	14962	9381	4725	2728
Mean						1079.2	1040.6	743.2	498.7	312.7	157.5	88.0

Table 15 CLONES DAILY TOTALS OF GLOBAL SOLAR RADIATION (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1						1771	2001	2343	1045	442	67	121
2						1325	2105	1998	1026	356	261	150
3						1746	1983	1106	1205	900	104	243
4						1007	1365	2132	686	247	582	257
5						2440	2158	973	1775	973	512	142
6						1721	1761	1696	801	775	288	139
7						866	1087	1369	725	878	307	66
8						1734	1195	734	1356	402	376	228
9						2183	1949	1204	1109	405	133	204
10						1686	1115	1315	731	841	113	87
11						982	748	873	1311	792	202	315
12						1726	1265	1005	1426	865	307	293
13						521	1326	597	1242	686	298	30
14						1838	704	1970	282	751	240	94
15						1728	970	1350	872	881	126	97
16						1550	2015	2172	646	728	467	193
17						1378	1633	485	395	593	401	405
18						378	1076	871	1114	346	342	348
19						1640	1045	372	723	203	265	118
20						2147	722	1073	1254	744	255	99
21						2745	492	781	771	745	54	68
22						1310	1974	450	1203	538	153	181
23						906	1771	1171	194	225	345	243
24						1101	1080	1051	1043	337	288	411
25						1336	684	1185	1004	735	188	148
26						2356	1600	1382	331	188	88	63
27						1918	1400	1792	341	653	240	46
28						1555	1414	1073	778	215	180	36
29						1198	1937	766	400	469	77	31
30						1440	1815	1156	842	112	115	62
31							2334	1481		509		112
Total						46232	44724	37926	26631	17534	7374	5030
Mean						1541.1	1442.7	1223.4	887.7	565.6	245.8	162.3

Table 16 BELMULLET DAILY TOTALS OF GLOBAL SOLAR RADIATION (J/cm^2) 1981

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Day 1						2175	2386	2507	1362	857	96	174
2						850	2349	1456	1156	766	170	101
3						730	2094	1766	876	258	213	89
4						1118	1242	1971	796	471	605	188
5						2142	2271	1901	1558	939	383	96
6						2616	1946	1133	1006	700	213	93
7						1026	1026	2071	1029	624	330	105
8						1997	2515	1499	1126	186	69	122
9						2038	2706	1923	581	418	304	141
10						1271	640	570	1267	477	101	145
11						2416	1246	609	945	570	309	336
12						1153	1501	395	1410	873	317	325
13						394	1570	956	1444	618	237	47
14						1392	777	1524	618	558	262	176
15						2451	1146	984	817	841	74	219
16						1679	2270	1823	584	795	153	186
17						1764	2005	385	650	862	313	290
18						780	597	1227	1031	340	363	316
19						1435	906	339	857	222	210	46
20						1532	810	1217	1248	531	226	220
21						2888	473	934	1226	393	59	143
22						2300	1785	702	1239	529	102	186
23						1274	1870	921	258	300	343	198
24						1720	1159	1020	1166	531	268	298
25						1056	660	1225	1027	623	183	60
26						2707	1202	1560	335	412	58	33
27						1815	1811	1920	694	546	243	274
28						1142	1371	1065	1002	351	188	62
29						1760	1199	1035	269	501	62	24
30						1119	976	1617	958	109	73	49
31							2128	1481		477		192
Total						48740	46637	39736	28535	16678	6527	4934
Mean						1624.7	1504.4	1281.8	951.2	538.1	217.6	159.3