Irish Meteorological Society

Newsletter

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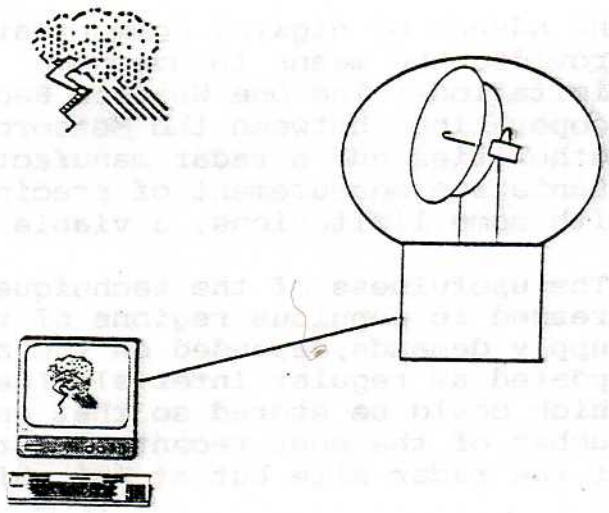

Contents:

President: J.A.Scott *Secretary: A.Kelly*

THE NEW DUBLIN AIRPORT WEATHER RADAR.

This new radar is now almost ready for operational use. The all white radome protecting the antenna, mounted on a three metre mast on top of the Aer Lingus TASC building at the Airport is already the subject of favourable comment.

While this new Ericsson Radar Electronics AB installation and the 24 years old Selenia which it is replacing, were both intended to detect the intensity and movement of weather systems within range, their capabilities differ greatly. The old system provided information in the form of analogue PPI (plan position indication), RHI (range height indication) and 'A' scope displays. The performance of an observation was in many cases a tedious operation. A number of schemesere implemented to transmit the resulting information to interested centres within the Service. In general none of these were very successful, particularly in cases of quickly changing weather situations.

The advent of digital communications and microcomputers provided the means to overcome many of the above mentioned limitations. The Dee Weather Radar Project (1967-76) involving cooperation between the Meteorological Office, the Water Authorities and a radar manufacturer in the UK, demonstrated that quantative measurement of precipitation by a digitised radar was, with some limitations, a viable prospect.

The usefulness of the technique to the Water Authorities, hard pressed in populous regions of the UK to meet the ever increasing supply demands,depended on the availability of displays, updated at regular intervals (generally 15 minutes maximum), which could be stored so that animated pictures of a suitable number of the most recent pictures could be provided, not alone at the radar site but at any suitably equiped remote location.

At the radar site the radar signal was processed by microcomputer, averaged in range and azimuth and converted from polar to cartesian coordinates. Various corrections were applied before it was transmitted over telephone lines to other locations for display.

Another significant advantage to be derived from the capability of readily exchanging radar data was the possibility of providing composite displays from a number of radars within a geographical area. An EEC sponsored research project, supported mainly by meteorologists and hydrologists within Europe led to the production of a European weather radar map. This composite map which consisted initially (in 1984) of displays from two radars in Switzerland and four in the UK, is expected to combine data from about eighty installations in western Europe by the end of this year.

Although the technology was supported initially by hydrologists, (which accounted for the adoption of the units of measurement of millimeters of rainfall per hour rather than units appropriate to reflectivity), meteorological forecast offices, keen to meet the demands for improvement in the accuracy of short term forecasts were quick to realise the potential of this now very powerful tool, which with time lapse sequences could provide precise information on the speed of movement and on the development or

decay of rain systems.

At the end of 1984 the existing Shannon weather (a Plessey S-band installed in 1972), was modified to incorporate a microcomputer and provide digitised displays, locally, at the Central Analysis and Forecasting Office in Glasnevin (CAFO) and in the meteorological centre at Telefis Eireann. In addition the signal was transmitted to Bracknell in the UK for inclusion in both the European product and in a new UK-Ireland composite display.

Even since the digitising of the Shannon radar, there have been further major advances in the technology. One of these was the application of Doppler to measurement of wind shear and turbulence and to detection and removal of 'clutter', i.e, unwanted reflectivity returns from obstructions such as high ground or buildings. Another advance was the development of wide band communication systems which meant that it was no longer necessary to carry out most of the signal processing at the radar site, a practise which could deprive research personnel at a central office of data in its useful original form.

Both of these advances are among those incorporated in the new Dublin Airport radar. It is expected that the Doppler facility will prove its worth in providing measurements of wind shear and turbulence, hazards of particular interest to pilots using Dublin Airport and nearby Casement Aerodrome. Doppler will also distinguish between the 'clutter' returns from the Dublin -Wicklow mountain range and 'wanted' echoes. It also has the capability of detecting sea breezes, which should be a very useful facility to forecasters in CAFO.

After a modest amount of processing at the radar site, the data are transmitted over a 2 M-bit microwave link from the airport via a repeater station at Howth Head to the radar data processor (RDP) in the Meteorological Service headquarters at Glasnevin Hill where the main computer processing takes place.

Products from this RDP will be available on specially designed 'workstations' located at the Service's forecast centres. The new Dublin Airport display will also be included in both the UK-Ireland and in the European composite pictures. In addition, if the trend in other countries is to be followed, products in the form of displays on 'user friendly' PCs or of specially tailored data, will become available to interests such as water management authorities or agricultural interests.

Gerry McDonald

Data Extraction from Europe's Meteorological Satellites
Talk to Irish Meteorological Society
8 pm UCD Earlsfort Terrace

The talk was given by Tom Sheridan of the Irish Meteorological Service and was concerned mainly with the work of the Meteorological Information Extraction Centre (MIEC) of the European Space Agency at the European Space Operations Centre (ESOC) in Darmstadt Germany.

After a brief introduction which included a sketch of the organisation of ESOC, Mr. Sheridan went on to talk about the Meteosat series of geostationary satellites.

First he gave an outline of the history of the program which started with Meteosat 1 in 1977. The talk was originally timed to coincide with the launch of the latest in the series (MOP2) but the launch was postponed because of a problem with the Ariane 4 rocket. He then presented a brief summary of the physical characteristics of the satellites.

After describing briefly those aspects of the electronics and other subsystems which were of more direct relevance to the meteoroligical community, he went on to describe the radiometer optics and the detectors. Meteosat has detectors for three channels - visible, water vapour and thermal infrared. The resolution at the sub-satellite point is 5 by 5 kilometers for WV and IR and 2.5 by 2.5 km for the vis.

Meteosat is located 36,000 km over the equator and the prime meridian and its field of view includes all of Africa, Europe and the Atlantic.

Some of the problems which can occur on board the satellite were mentioned at various stages in the talk. These include the contamination of the detectors by ice which causes loss of images for up to 2 days while the problem is dealt with. On board arcing, operations in eclipse periods (when the sun-supplied power to the satellite is cut off by the earth), gain changes, manouvres etc. are all handled by the mission and the satellite controllers.

Then the various missions of the system were described. These include :

The Data Collection System, where the satellite is used to collect reports automatically from Data Collection Platforms (ships, aircraft, buoys, automatic weather stations etc.). These reports are then forwarded to the DCP owner either through landline or via Meteosat itself.

The Meteorological Data Distribution system, which is used to disseminate alphanumeric and graphical meteorological data from major meteorological centres to any receiver within the satellite field of view.

The dissemination of full resolution digital images in the three channels to the Primary Data User Stations. The PDUS usually include computer processing of images.

The dissemination of analogue (WEFAX format) images to Secondary Data User Stations. These are much cheaper systems from the user point of view. A selection of images from the American GOES satellite and some aviation forecast charts from Offenbach are also included in the transmission schedule.

The ground segment of the mission was then covered - how the image data is received at ESOC, rectified (to ensure image pixels coincide with fixed earth locations) and retransmitted to the users via the satellite itself.

After this, the process of meteorological information extraction begins. As a first step in the scene identification procedure, the images are segmented into areas of 32 by 32 pixels. This is a convenient size for statistical work. Thus most MIEC products have a resolution of this segment size (160 by 160 km approximately).

After a description of the various types of information required to support the work of the MIEC (geographical, astronomical, climatological, for example, as well as housekeeping data from the satellite and approximate meteorological forecast fields) and a brief description of some theoretical and calibration matters the problem of scene interpretation itself was tackled. This is done mainly by automatic analysis of histogram data. The 1-D histograms consist of plots of radiance value against number of pixels of that value for each channel segment by segment. 2-D histograms of WV-IR and Vis-IR showing the number of pixels corresponding to radiance value pairs are also used. These with the supplementary information and a feedback from the previous run enable the system to produce a description of each segment consisting of scene type, mean radiance, standard deviation and size for a number of objects within the segment.

After briefly explaining the method of handling semi-transparent cloud, the speaker went on to talk about the most important of the MIEC products - the Cloud Motion Winds. About 700 of these are produced four times per day at ESOC and are used mainly as input to the analysis stage of numerical weather prediction models throughout the world. They are derived from three successive satellite IR images.

The segment processing scheme outputs a list of segments with good tracers and essentially the system tries to find a correlation maximum between the 'source' segment and target areas in the neighbourhood of the forecast displacement. After the automatic height assignment the MIEC operator spends something in excess of an hour per run quality controlling the product before he sends results to be coded and transmitted to the meteorological community via Offenbach.

Finally the speaker spoke briefly about the other MIEC products. These include a Climate Dataset and a precipitation index which are not disseminated in real time. Products which are disseminated in real time (and which, incidentally, are all manually quality controlled) include the following:-

Sea Surface Temperature: This would not be the most accurate such product available to the meteorological community but is an essential part of the vicarious calibration mechanism.

Upper Tropospheric Humidity: derived mostly from the WV channel data.

Cloud Analysis: This product contains a huge amount of data consisting of temperatures and percentage of a number of clouds in almost all segments.

Cloud Top Height is the only MIEC product disseminated over the satellite itself. This consists of the identified cloud top in 8 height categories and is intended for aviation use.

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Society News

The date for the Annual Outing this year was incorrect in the last Newsletter. The correct date is **MAY 11th.**

Members of the Society may subscribe to the Irish Meteorological Service's Monthly Weather Bulletin at the substantially reduced rate of £15 per annum, the normal rate being £25 p.a.

Cheques should be made payable to the Irish Meteorological Service and should be forwarded, along with name/address to:
Climate Division,
Irish Meteorological Service,
Glasnevin Hill,
Dublin 9.

WEATHERILL'S WEATHER

A member of the Society, Rob Weatherill has prepared a weather prediction for Spring 1991. He has prepared a number of these for each season over the last number of years with the help of R.A.S Ratcliffe of the British Met. Office.

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Weather prospects for spring 1991. (England, Wales and Ireland).

The winter of 1990-91 has been rather cold with some spells of snow, most notably in the first half of February. Below normal temperatures were indeed predicted, with snow. As forecast, this winter has been colder than the last three.

The period of anomalously high temperatures from December 1988 to August 1990 (+31.6C), seems to be at an end. Such warm periods tend to be followed by cold winters and rather cold springs. Indeed cold winters, in their own right, tend to be followed by cold springs. The most recent 45 cold or rather cold winters, have been followed by 30 springs that have had below normal temperatures, 11 with normal, and only 4 that have been above normal.

Spring rainfall has shown increased variability in recent years, with a definite tendency to be above normal. The springs of 1979, 1981, 1983 were very wet, whereas 1990 was the driest spring since 1893. The 8 driest springs of the last 150 years have been followed by springs with more normal rainfall. But cold Februaries are followed by wet springs nearly three times more often than dry ones.

The fact that the winter has been more anticyclonic than was anticipated is no reliable indicator for the following spring.

Spring 1991 is likely to be colder than normal overall, with some further brief wintry conditions at times. Of those springs that follow on cold winters, April is often the month with its mean temperature furthest below normal. This will be bad news for growers. Rainfall is more problematic, but the indications are that it will be in excess of normal.

(Based on Manley Central England Temperature figures, and England and Wales rainfall figures that go back over 300 years).

WMO FEATURE

WORLD METEOROLOGICAL ORGANIZATION

A SPECIALIZED AGENCY OF THE UNITED NATIONS

(For use of information media — not an official record)

WORLD METEOROLOGICAL DAY

23 March 1991

THE ATMOSPHERE OF THE LIVING PLANET EARTH

INTRODUCTORY NOTE

In 1973, the world meteorological community celebrated a century of organized international collaboration in meteorology. One hundred years before that date, the First International Meteorological Congress met in Vienna and prepared the ground for the establishment of the International Meteorological Organization (IMO). Almost eight decades later, this organization was replaced by an intergovernmental body, within the United Nations system, known as the World Meteorological Organization (WMO). The Convention of WMO came into force on 23 March 1950 and that day has been celebrated annually since 1961 as World Meteorological Day (WMD).

To mark the occasion, the WMO Congress and Executive Council (formerly Executive Committee) recommended that all Members of the Organization should make a particular effort on this day to bring the importance of meteorology to the attention of everyone concerned. To facilitate this task, it was decided that a specific theme should be designated each year in order to ensure the co-ordination of activities and efforts. The theme for the year 1991 is "The atmosphere of the living planet Earth".

Irish Meteorological Society

World Meteorological Day Lecture
on
"The Atmosphere of the Living Planet Earth"

The World Meteorological Organisation has chosen the theme of "The Atmosphere of the Living Planet Earth" for World Meteorological Day 1991.

Dr. Owen Wilson,
Environment Officer of the E.S.B.,
will deliver the W.M. Day lecture to the
Irish Meteorological Society

in

Lecture Theatre G33
Earlsfort Terrace (U.C.D.)
Dublin 2
on
Friday March 22nd 1991
at 8.00 pm.

Admission Free

Open to the Public