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Committee notes

The Irish Meteorological Society (IMS) includes members not only from Ireland but from all over the world who are interested in weather and weather- related topics. The membership is drawn from the ranks of those who work in Meteorology. Aviation, Marine and Agriculture, from teachers and lecturers and indeed anyone who is interested in meteorology and the environment.

The objects of the Society are:

1) The promotion of an interest in meteorology.

2) The dissemination of meteorological knowledge, pure and applied.

The Annual General Meeting of the Society will be held on 16April immediately following the one- day. We would encourage as many members as possible to attend. There will be a number of vacancies on the committee so please consider now if you would be interested. Please don't rule yourself out if you are based outside Dublin- Ideas and suggestions can easily be communicated via post or telephone. In fact members are always invited to submit their comments etc. Please write to the Secretary, Irish Meteorological Society, C/O Irish Met Service, Glasnevin Hill, D9.

Committee for IMS 1993-1994

President----- Dr. Peter Lynch Vice-President----- Mr. Philip Vardon Secretary----- Ms. Evelyn Cusack Assist-Sec.---- Mr. Edward Graham Treasurer----- Mr. Sean McCarthy Assist-Treas.----- Unfilled Mr. Dermot McMorrow Mr. Liam Campbell Mr. Seamus Walsh Dr. Pat Shannon Mr. Paul Halton Capt. Kilian Tormey

A note from the Treasurer : Thanks to all the members who have paid their subs. to date and a gentle reminder to those who haven't!

Irish Meteorological Society 1993-1994 Season

Since our last Newsletter the Society has presented lectures by Professor Mike Baillie, Palaeoecology Centre, Queen's University, Belfast and Dr. John Maunder - President of the WMO Commission for Climatology (a resume appears in this issue).

1994 for the Society got off to a great start with our Annual Dinner. Our next lecture, by Dr. John Sweeney, on 4March will discuss the human impact on Irish Climate and should appeal to a wide variety of interests.

The one-day meeting has been scheduled for 16April in the Tara Towers Hotel, Dublin.

Our field trip, 21 May, is to Birr so mark this date in your Diary now especially members in the midlands.

All details in Newsletter 41.

September 17th 1993	Lecture-"Fronts and Cyclogenesis"
October	Newsletter No. 39
November 19th	Lecture-"Past Met. Conditions From Irish Tree-Rings"
December 10th	Lecture-"Policy aspects of
January	Climate and Climate Change."Newsletter No. 40
January 22nd 1994	Annual Dinner
March 4th	Central Hotel, D2.
March /April	Irish Climate" Newsletter No. 41
	One Day Meeting
April 16th	A.G.M.
May 21st	Field Trip
Summer	Newsletter No. 42

The Outlook is Bright

-----by Peter Lynch-----

Weather is a favourite topic of conversation. Its constantly changing patterns influence us all.

With the vast Atlantic Ocean to the west, forecasting for Ireland presents a particularly challenging problem. Agriculture, fishing, tourism and transport are all strongly affected by adverse weather.

Accurate forecasts are essential for efficient planning and operations, and are of considerable financial value.

Indeed, the guidance provided by the Meteorological Service results in economic benefits far above the cost of producing it.

During recent decades there has been significant progress in our ability to forecast the weather. This is largely thanks to the development of advanced numerical models running on powerful computers. The Meteorological Service has an ongoing programme of research and development with the aim of producing forecasts of higher quality. valid for longer periods and tailored for specialised applications. The Met Service has recently acquired an SGI Challenge-L, a computer capable of running a new, sophisticated forecasting system. This will provide more detailed. accurate and timely guidance, and increase the range and value of the products issued to industry and the public.

How can forecast accuracy be improved?

The atmosphere is a sheet of fluid bound by gravity to the rapidly rotating earth, its motion driven by solar energy. The tropics receive more heat than the polar regions.

The resulting temperature gradients are hydrodynamically unstable, so that small disturbances amplify into large weather systems in a few days. This process is difficult to predict and imposes a limit on the predictability of the weather: the system is essentially chaotic, and detailed forecasts beyond about two weeks may never be possible. However, shorter range predictions may be made with increasing accuracy by modern methods. Scientific forecasting is based on application of the fundamental laws of physics to predict the evolution of the atmosphere.

The principles which govern the atmosphere, conservation of mass and energy and Newton's laws of motion. have been known for a long time, but their use in forecasting requires extensive calculation and is feasible only using a powerful computer. The physical laws are expressed as mathematical equations for each variable: pressure, temperature, humidity, winds and so on. These quantities vary continuously in space and time; to calculate how they change, one approximates them by their values at a finite set of points, dividing the atmosphere into a series of cells and considering the central value to be representative throughout the cell. This process is called discretisation. It has the drawback that one cannot represent



2nd August, 1990, 2pm: a cold front approaches Ireland from the west. ------Satellite; NOAA11; Picture; Dundee

phenomena smaller than the cell size. But its great advantage is a simplification of the mathematical system of partial differential equations to a large but soluble algebraic system.

The computer program to solve this system is called a model.

A new forecasting model, HIRLAM (High resolution limited area model), is currently being implemented at the Met Service.

The research and development work is being done in collaboration with the meteorological Institutes of Denmark, Finland, the Netherlands, Norway and Sweden.

The model calculates how variables such as pressure evolve in time, using the basic laws of motion and also allowing for the effects of radiation, friction, stratiform and cumuliform clouds, air-ocean interactions and various other physical processes.

The most important weather phenomena are associated with water, and these are also the hardest to simulate. Even the largest thunder clouds are smaller than the computational cell, so that they cannot be modelled directly; they are represented in an empirical way using a so-called parameterisation scheme. The accuracy of precipitation forecasts improves as the cell size is reduced, but the computation time also rises sharply, so a compromise choice is necessary.

The HIRLAM model uses a cell size of 50 km, covering Europe and the North Atlantic with a grid of about 10 000 cells.

With some 20 vertical levels and five dependent variables (temperature, two wind components, humidity and cloud water) there are one million degrees of freedom: thousands of calculations are required to compute the changes of each variable, and many short time-steps must be made to complete a one-day forecast. The computational task is truly enormous. The time required for this task on the new computer (with two processors) is about 40 minutes. Early availability is critical if the forecaster is to give maximum advance notice of impending severe weather.

Improvement in computer modelling of the atmosphere during recent years has been spectacular. Older models were capable only of simulating the flow in the free atmosphere.

The latest models, such as HIRLAM, give a good indication of future conditions at the earth's surface. Guidance provided by the model includes predictions of surface temperature and winds. However, it is still essential to interpret

the computer predictions in terms of local weather conditions, and this is where the expertise and experience of the forecaster comes in. The best forecasts are produced by this 'manmachine-mix' and human intervention in the production of forecasts will be required for the foreseeable future.

The satellite picture shown on page 6 shows a cold front approaching Ireland.

This front sharply divides clear warm air to the east from cold showery conditions to the west. Heavy rainfall occurred as the front passed across the country.

Computer models increase the accuracy and range of prediction of events such as this, so that the forecaster can issue more timely and precise warnings. The implementation of the HIRLAM model will greatly aid the forecaster and ultimately lead to further benefits for agriculture, industry and the general public.

The outlook is bright!

This article first appeared in the new Irish science magazine The Irish Scientist, issue No 1, January 1994. The second issue is scheduled for September 1994.

FRONTS AND CYCLOGENESIS: - AN HISTORICAL RESUME OF THE CONCEPTS.

Huw C. Davies.
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Low pressure systems and their accompanying frontal features exert a major influence upon weather and climate in mid-latitudes. The environment that parturates these systems is usually characterized by two main signatures: a band of enhanced baroclinicity at lowlevel (often an elongated cold front) and the presence of significant flow structures

(-most typically a deep trough or strong baroclinicity)

at higher elevations. It is one, or both, of these signatures that is regarded as seminal in the prevailing views on cyclogenesis.

THE FIRST PERSPECTIVE.

One view attributes cyclogenesis to an instability of the surface front with the the cyclone constituting the finite-amplitude development of a wave disturbance growing on the front.

Central to this view is the simple and elegant depiction by the Bergen School (Bjerknes, 1919; Bjerknes and Solberg, 1921) of the weather and frontal palette that accompany an extratropical cyclone. This was a masterful crystallization of the prime observed features. In 1922 Bjerknes and Solberg extended their analysis

technique to portray a family of wavecyclones developing on an extended polar cold front. An individual cyclone was postulated to grow to maturity as the parturating front underwent a major distortion. Here we sketch some of the studies that preceded the work of the Bergen School and then comment on its present status.

In the first half of the 19th century Fitzroy and Blasius expressly linked juxtaposed counter-currents of warm and cold surface air with cyclogenesis. Fitzrov gave particular consideration to the airflow of the synoptic-scale systems and thereby inductively inferred from observations that groups of cyclones formed along the interface of the juxtaposed cool NE'ly and warm SW'ly airstreams. In a throwback to Fitzroy's studies Lempfert and Shaw (1906) studied the near-surface airflow trajectories relative to a translating cyclone. This mode of representation served to bring into focus the existence of two confluence lines that ran respectively southward and eastward from the cyclone centre and were associated with the principal rain belts. These two lines also served to separate three air masses each of differing thermal and flow characteristics. The succinct portrayal of this flow model (Shaw,1911) bears the hallmarks of the present day mode of characterizing fronts on surface charts.

On the theoretical side Helmholtz (1888) and Margules (1906) derived the equilibrium condition for two juxtaposed homogeneous layers of differing density on a rotating earth. Helmholt further

hypothesized that the observed cyclones and anticyclones were the manifestation of an instability of the frontal surfaces. (Lord Kelvin had already shown that the counter-directed flow of two juxtaposed homogeneous layers in a non-rotating atmosphere was unstable). Likewise Margules asserted that the hydrodynamic stability of such a configuration was a key physical issue and a major mathematical challenge.

Perceptively he wrote "Are there larger disturbances of the dynamic equilibrium, which grow on their own, feeding from the potential energy, perhaps also from the store of kinetic energy?", and further pondered "which disturbance one needs to introduce, cannot be guessed at the outset."

Exner (1918, 1920, 1923) pursued this task.and considered in a semi-qualitative fashion the development that would ensue following a disruption of a Marguelian front by a localized southward protrusion of cold air. His depiction of the response shows an incipient cyclone on a deforming frontal zone comprising a strong cold front and a weaker warm front. He further argued that perturbations of frontal zones abound in the atmosphere and were therefore to be regarded as the main instigators of frontal cyclones.

Sandwiched in time between these contributions of Exner was the publication of the aforementioned papers of the Bergen School. It was these that transformed the mode of viewing cyclogenesis and radically altered the practice of weather forecasting. They provided the meteorological community with a readily assimilated, physically based method of graphically representing

the key surface components of extratropical weather. It was a boon for the analyst who had hitherto been confined principally to mapping surface isobars. After a period of comparatively mild resistance or tentative examination, the polar frontal model of cyclogenesis was enthusiastically adopted by most weather services. In the period to 1950, and indeed later too, considerable effort was devoted to the elaboration and refinement of the Bergen mapping procedures.

Caveats have been expressed regarding the Bergen perspective. For example from an observational standpoint the model is highly idealized and the implied surface changes do not account for the observed upper tropospheric signal. From a theoretical standpoint it remains to prove, despite assiduous but unconvincing attempts by numerous authors (e.g. Solberg, Bjerknes and Godske, Kotchin and Orlanski), that the frontal waves would have wavelengths of ~1,000 km. as opposed to, say, 1 km. Interest in the topic waned in the Forties in the face of evidence accumulating that upperlevel larger scale features in the free atmosphere were also a significant feature.

THE SECOND PERSPECTIVE

A second view of cyclogenesis links the formation of the Low to the passage aloft of a trough toward, and over, a band of low-level baroclinicity.

Prior to the advent of regular upper air measurements observational evidence for the upper-level induced cyclogenesis was fragmentary. There was an early hint of a rich structure in the vertical, e.g. it was known that the axis of the Low slanted westward at an acute angle (1:100) to the ground, and that cyclones and anticyclones tended respectively to be overlaid by cold and warm air (Hann, 1890,1891).

Balloon soundings in the first decades of this century enabled statistics to be compiled of the relationships between the surface pressure and the height of the tropopause and the air temperature at various levels in the troposphere and stratosphere (e.g. Dines, 1912). The results indicated that the lower stratosphere was colder above a High pressure system than a Low, whereas the tropospheric layer between 1-9 km. was warmer above a surface High in comparison with the Low. Shaw (1913, 1914) went further and inferred that

"the proximate cause of the variation of pressure in the region of the British Isles must be looked for in the layer at a height of about 7-to-9 km",

and Dines (1914) argued that divergence in the upper troposphere is both necessary and sufficient for cyclonic development. In a similar vein Austrian meteorologists inferred that the observed surface pressure variations were the combination of a strong upper-level component - the primary signal- together with a weaker low-level thermally related component-the secondary signal.

In the next three decades (i.e. to circa 1950) the evolving but still comparatively sparse routine aerological network, supplemented by data acquired in special field programmes provided the basis for several cyclogenesis hypotheses. Ficker (1920) postulated that a of the upper and lower level signals would herald cyclogenesis. Another link -

that between a diffluent (or so-called delta) upper-level pattern and surface cyclogenesis-

was noted by Ryd (1923,1927) and reemphasized by Scherag (1934).

This semi-empirically based relationship was put on a firm theoretical footing by Sutcliffe (1947) who deduced the concept of the thermal steering of cyclones and the cyclogenetic potential of the left-exit of a strong upper-level jet (see also Namias and Clapp, 1949).

Nowadays it is recognized (see e.g. Shapiro, 1983) that the relative phasing and orientation of the upper-level jet structures and surface fronts are an important factor in determining the likelihood of cooperative interaction. Another useful guide for assessing the potential for cyclogenesis is the so-called Q-vector formulation of the vertical velocity forcing (Hoskins et.al., 1978). In essence it indicates that regions of strong thermal gradients accompanied by large variations (strength and /or direction) of the airflow along the isentropes demarks the regions favourable for cyclo- and anticyclo-genesis.

This formulation embodies and dynamically accounts for many of the empirically derived rules for forecasting the development of the synoptic-scale flow.

SOME CURRENT DEVELOPMENTS

An alternative view of cyclogenesis is provided by the concept of potential vorticity (PV).

For our present purposes it is appropriate to note that: -

- (i) PV is conserved for adiabatic inviscid flow, and that the flow field can be deduced (or qualitatively inferred inferred) if the distribution of PV (and surface temperature) is known
- (ii) frontal cloud aligned parallel to a surface cold front can generate an elongated band of enhanced PV
- (iii) it is large in the polar stratosphere and decreases substantially both across the tropopause and with latitude.

The first property is particularly useful for visualizing flow development. Together with this conceptual tool the second property has been used to consider aspects of surface frontal wave development, and the third property for considering upper-level influence upon surface cyclogenesis. We comment in turn upon these applications.

It was noted earlier that the origin of the smaller-scale rapidly growing wavecyclones remains somewhat of an enigma. Observational studies have revealed that the low-level band of enhanced PV at, or contiguous to, the surface cold front frequently undergoes wave-like undulations and that these then grow until the band breaks-up into separate vortex-like structures. These objectively determined features often bear a one-toone relationship with the

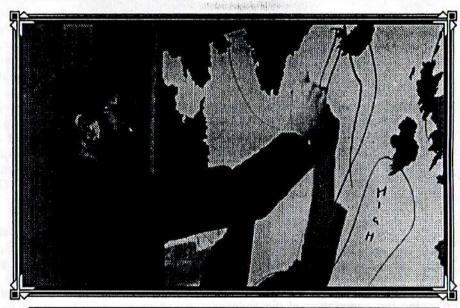
more subjective hand-drawn surface frontal waves. Also recent studies (Schar and Davies, Joly and Thorpe) have linked this break-up to an instability associated with the presence of fine-scale pre-frontal PV-band. This suggests that the observed waves might be the result of such an instability, and that the determination of the structure of the band would constitute an objective method of locating the frontal waves-secondary developments.

With regard to upper-level induced cyclogenesis Kleinschmidt (1950, 1957) viewed this as a response to an isolated PV anomaly in the upper troposphere drawn from the reservoir of high PV in the stratosphere. Such an anomaly would be associated with positive circulation at the surface, a cool midand upper-level troposphere and a warm lower stratosphere (c.f. the early statistical studies). Hoskins et. al. (1985) confirmed this picture. They showed examples cyclogeneses.preceded by southward and downward extruding PV streamers emanating from the stratosphere to form isolated pools over the surface cyclones. An important element is the need for there to be a co-existing band of low-level front / baroclinic zone which the PV pool can distort to provide the necessary additional in-situ vorticity generation at low-level - c.f. the socalled Type B Development.

Thus the PV perspective offers a new and distinctive framework for a cartography of synoptic-scale flow.

Recollections of a Meteorologist

-----by Charles Daly------



Charles Daly drawing a weather map for television in 1965

I joined the Irish Meteorological Service on January8 1952 together with Seamus Miller (RIP), Tim Cronin (retired from Bradford University), Norman Montgomery (retired from Irish Pension Trust) and Dominic Finn (retired from Irish Met. Service 1984).

We were taken on in a temporary capacity (unusual at the time). There was however a big shortage of weather forecasters and many of the staff were from overseas, principally from the US or continental Europe. The minimum qualification for entrance for Irish candidates was (as it still is) an honours degree in maths, physics, engineering or the equivalent.

After an interview with the Assistant Director Dr A. Bourke and a gentleman from personel plus the usual medical we were assigned for about six months to the training division at Dublin Airport with Jimmy McNamara and the late Freddy Dixon.

Unlike the present time Meteorology then was mostly devoted to aviation requirements such as forecasting for weather at airports and weather and winds en route.

Aviation was beginning to adapt to post-war requirements and many pilots would have served in the comparatively recent World War 2. Dublin Airport was quite small in those days, the great majority of flights being provided by

Aer Lingus. The Aer Lingus fleet comprised 14 Dakotas (two-engine) each carrying only 27 passengers, two flying crew and two hostesses.

Not long after we started at Dublin Airport an Aer Lingus plane, on the way from London to Dublin, crashed over the Welsh Mountains with tragically the loss of everyone on board. This alarmed everybody, especially the Met. Service as there was some talk that severe icing may have been a contributory cause of the crash. This however was not the case. Nevertheless after any crash or near crash the flight documents were always closely scrutinised, including the weather forecast issued by the relevant Met. Office. Naturally we were always very apprehensive of being summoned to an enquiry to give evidence on the forecast supplied to the pilot.

Following the completion of the training course (we may not have learned much about Meteorology but we had a few laughs on the way) we were assigned as shadow forecasters. We soon realised that the time for laughing was over and that we would have to take the job seriously, which we did for a while anyway! One of our tasks was to provide vertical and horizontal cross-section forecasts for flights going to mainly UK and Irish destinations. The cross-section was supposed to show the weather and winds that an aircraft would encounter en route.

In addition to Aviation forecasts we provided limited forecasts for newspapers and Radio Eireann. After 18 months we were all posted to Shannon Airport which was a compulsory fuel stop for all flights between Europe and North

America.

The forecasting staff at Shannon numbered about 24, including some Germans, Spanish, Portuguese, Americans and Italians. It was an extremely busy office as every flight crew called for a personal briefing (Pity they didn't bring along the hostesses!). It was quite an ordeal for us rookies to brief senior captains on often complicated weather systems across the wide Atlantic. In those days passenger flights did not fly above 18,000 feet and the average flight time from Shannon to New York was 11 or 12 hours, including a stop at Gander Airport in Newfoundland.

We had a very severe shift roster - 4 nights, 2 days off, 4 evenings,1 day off, 4 mornings and then back on nights. However the social life at the airport, in Limerick and in Ennis was excellent. Nearly everyone played golf, or tried to; the annual membership fee was £2 at Ennis and £4 at Limerick. I left Shannon in 1961 to join the new Central Analysis and Forecast Office (CAFO) at 44 Upper O'Connoll St., Dublin. This new office was established to provide a service to the general public, farmers, shipping and also to the media.

In December 1961 we were asked to provide weather presenters for Ireland's first television station, due to open on New Year's Eve. The fee was £2 per appearance. Most of us did not have a TV set at the time and had not even seen the BBC presentation! We got no help or guidelines from anybody although RTE did provide us with a revolving weather board and some



Charles with Lorna Madigan , Head of Presentation, RTE Radio 1 and John Cowley, the well known actor. (CAFO in March 1990)

crayons. We were absolutely dreadful for the first few months (or was it years?). I think we looked as if we were facing a firing squad without a blindfold. I remember after a week of severe storms suggesting to the late Michael Gilligan that he might throw in a remark that, in view of the bad weather, fresh fish might be a bit scarce. This immediately produced a furious denial from the PRO of the fish merchants. However, a newspaper reporter followed up the story and found that there was a shortage - so we made the headlines for the first time. The time allocated to the TV forecast could be anything from 15sec to 4mins depending on the duration of the news! Imagine talking about a cloudy anticyclone for 4 minutes! Somehow

or other we managed to survive though we had a few close shaves.

Looking back I see some milestones:

Looking back I see some milestones; the advent of passenger jets in 1959 which could fly above the weather, satellite imagery and weather radars and the establishment of central aviation offices in London and Frankfurt which provided all the data necessary for low and high level flights. The latter marked the beginning of the end of regional aviation forecasting. Computer based forecasts, which began in the 70's, have continued to improve in quality and range.

Looking back over the years, like Edith Plaf used to sing, I have no regrets.

CLIMATE, CLIMATE VARIATIONS, AND CLIMATE CHANGE: THE IRISH RESPONSE

(Extracts from an introductory and overview paper prepared for a Conference on "Climate, Climate Variations and Climate Change: The Irish Response" held in Dublin on January 24, 1994, and based on a Lecture to the Irish Meteorological Society in Dublin on December 17 1993.)

(President WMO Commission for Climatology)

I. CLIMATE AND CLIMATE CHANGE

While the meaning of the various 'climate' terms may be considered at length, I believe that the majority of experts working in the field of climate - whether scientists or advisers - appreciate that climate is indeed "the fluctuating aggregate of atmospheric conditions characterized by the states and developments of weather of a given area", and that the only real problem is stating what period of time is being used. That is, are we concerned with the climate over the last 10 years, 50 years, 100 years, 1000 years, or 10,000 years?

From a practical and planning point of view, it is reasonable to suggest that the time interval should be of the order of about 100 years, or possibly a little less. If that is accepted, then a climate change could also be considered to be something that happens OR WILL HAPPEN on a "reasonably frequent"

basis" outside the experience of say the last 100 years.

II. IMPLICATIONS OR NATIONS

At the Second World Climate Conference held in Geneva in November 198' a number of specific regional and/or national recommendations, proposals/comments were made including the following:

- (i) From the Conference Statement from the Scientific/Technical Sessions (The emphasis in CAPITALS is mine)
- * Variations of climate have profound effects on natural and managed ecosystems, the economies of NATIONS and the well-being of people everywhere.
- * The economic and social costs and benefits of (... reducing carbon dioxide emissions) should be urgently examined by all NATIONS.
- * COUNTRIES are urged to take immediate actions to control the risks of climate change with initial emphasis on actions that would be economically and socially beneficial for other reasons as well.
- * Data acquisition, collection, management and analysis must be more vigorously supported in all COUNTRIES....
- * Further development of the methods for predicting short-term variations in climate and the environmental and social impacts shouldbe vigorously pursued (...in all COUNTRIES)....

- * Immediate steps to be taken include ... NATIONAL and REGIONAL analyses of the impacts of climate variability and change on society, and study of the range of response and adaptation options available.
- * GOVERNMENTS ... should give more emphasis to providing accurate public information on climate issues.
- * GOVERNMENTS should establish national committees for the World Climate Programme to mobilize support for national activities and to coordinate activities.
- (ii) From the Ministerial Declaration
- * Recognizing climate change as a common concern of mankind, we commit ourselves and intend to take active and constructive steps in a global response, without prejudice to the sovereignty of STATES.
- * We maintain that there is a need to intensify research on the social and economic implications of climate change and response strategies. We commit ourselves to promoting the full participation of developing COUNTRIES in these efforts.
- * We urge that special attention be given (.. by COUNTRIES) to the economic dimensions of climate and climate change research.

It is clear that while many of these recommendations, and proposals/comments are noteworthy, they are understandably not

particularly specific, especially from the viewpoint of individual countries who both now and in the future will face many problems, only some of which are climate related. What follows is an attempt to look at the climate and climate change dilemma from the viewpoint of decisionmakers in a specific country - which could well be Ireland, the crucial questions concerning competitors both now and in the future, the urgent need to produce national econoclimatic impact studies - considering both the present and any future climates, the controversial issue of winners and losers amongst the 170+ nations of the world, and finally the need to look upon climate change as a challenge and not a threat.

III. CRUCIAL QUESTIONS ABOUT COMPETITORS

A number of crucial questions need to be asked when discussing the regional implications of climate climate variations. and climate change. They include the choices regional, national, and local decision-makers have in responding to both climate variations, and a greenhouse gas induced climate change of either their country or countries which are their "competitors". In this context, the decisions-makers will be either people at local, national, or in the case of some countries in Europe, at the regional level. The real decision-makers could well be someone at the Ministerial level. someone who advises the Minister, or it could be an individual farmer, or manufacturer, or exporter who has to make a climate or climate-change related decision. But, clearly the real decisionmaker must be someone who can actually make AND implement decisions.

In the context of climate variations, and climate change, however, the competitors that need to be considered are NOT only the present competitors. but also the ways in which the competitors are likely to change over time. For example, how will the international competitiveness in the trade of white wine be affected in the next 30 to 50 years by either the predicted or actual changes in the regional and national atmospheric climate. Moreover, if you believe that the southeastern part of Ireland could become a white wine growing area in direct competition with Germany, and New Zealand by the year 040, because of the anticipated climate change in these areas, what should you do?

In reality, of course, we are not dealing with a simple one crop situation, but rather with a multi-dimensional "economic-climate chess game" in which the pawns and the Kings are likely to change, as well as the "rules" of climate, economics, and politics. That is, we must deal with the real world of both today and tomorrow.

IV. NATIONAL ECONOCLIMATIC IMPACT STUDIES

But first, the following question could well be asked: is the climate of Ireland, and countries which are currently the competitors of Ireland, ideal from Ireland's point of view? From an economic and political viewpoint, there would be some countries - including Ireland, who would argue that a little warming, or a little more rain, would not be a bad thing, and that you - as a decision-maker - may be perfectly

reasonable in thinking that a little less rain would also not be a bad thing if it occurred to the climate of both Ireland and the countries which are currently your competitors.

Useful statements on the monetary value to any nation of its PRESENT climate are few and far between. It is therefore imperative to assess - as a matter of some urgency - data on the monetary value to each nation including Ireland, of the value of not only the future climate, but also the present climate, if meaningful decisions are to be made as to how each nation - including Ireland, should react to or adjust to any future climate change. Clearly if this is not done, then countries including Ireland could well be making and will continue to make the wrong decisions.

Since each nation is also in a very competitive real world situation, it is important that economic/climate and economic/climate change budgets be prepared not only for each country, but also - from the viewpoint of each country - for each competitor country.

V. NATIONAL WINNERS AND LOSERS

In considering the overall subject of green-house gas induced climate change some countries believe that they will be "winners" and some believe they will be "losers" with a problem not of their own making.

(There are of course "winners" and "losers" among the nations of the world when the PRESENT climate is considered.) This belief needs to be

taken into account irrespective of political arguments made in some quarters that overall the world as a whole will be a "loser" as a result of the forecast climate change. At present, the information available on climate change impacts is not sufficient to predict winners or losers, but some countries could well perceive that they will be. But, whether countries be "winners" or "losers" in a "warmer world" a number of important issues need to be considered:

- * Every nation must be aware of how a climate change will affect their own nation and also that of their competitors, and in order to do this each country must know the 'value' of the present climate.
- * There will be a strong demand for country by country studies, since most communities will want to know how a greenhouse gas/climate change will affect their country, and the present and future location of their competitors and competitor industries.
- * The role of national political and social groups will need to be recognized. For example, Irish dairy farmers will see a climate change in a completely different way than say investors on the Frankfurt stockmarket, or the management of General Motors, and coffee growers in Brazil may well view with concern any trend for competitor coffee growers in other countries to be more favourably affected by any climate change than they are.

- * Another key factor in any consideration of climate change is the question: "What sort of society can each country including Ireland, realistically expect in the year 2020, or 2040?", and "How should each country react/adapt to any climate change in the light of the kind of society each country would like to have in the future?"
- * Irrespective of any climate change (through greenhouse gases or any other cause), climate variations will remain. All countries and their competitors will continue to be subject to these climate variations (both large and small), and it would be very unwise for any country to place all of their "climate eggs" in the 2030, or 2050 basket, and not be equally or even more concerned with what will go into and out of the climate basket during each of the coming years.
- * All countries have limited financial and people resources. In considering humaninduced climate change, it is important that these resources be directed with appropriate vision to meet the real needs of EACH country. To do this a "balance sheet" needs to be made of (a) what HAS happened to the climate of each country and the regional and local impacts to each country of that climate, (b) what IS actually happening to the climate of each country and the regional and local impacts to each country of that climate, and (c) what ARE the current predictions of a climate change in each country and the regional and local impacts to each country of these climate changes. Moreover, it is suggested that such "climate balance sheets" need to be updated on a regular basis, and at least every five years.

VI. THE REAL VALUE OF CLIMATE TO A NATION

Irrespective of the predicted significant climate warming in many areas of the world in the 21st century as a result of the greenhouse effect, many consider that by far the most significant weather and climate variations in the coming years and decades will still occur from week to week, month to month, season to season, and year to year.

To determine the value that can be placed on these weather and climat related disasters, together with all other weather and climate variations including floods and droughts, but also the less spectacular but much more common and in many cases much more important economic events such as a mild or cold winter or rainfall 30 % above or below average, requires the identification of those economic, social and political activities that are specifically affected by these variations.

Clearly, in any analysis of the impact of climate or climate change or the social, political, and economic structure of any nation, specific econoclimatic studies must be made, and the need for such studies is paramount if decision-makers in each country are to be put in a position where they are able to make climate-related decisions on the basis of facts rather than emotion.

VII. CONCUSION

"What does the past, present, and future climate mean to each country in the world?" Do we have answers to this question? If not, how should we obtain the answers? This is by no means an easy question to answer, but it is imperative that we begin by first assessing in quantitative monetary terms the impact of the past and the present climate on each nation, and then, and only then, assess in quantitative monetary terms the impact of various projected climate changes on each country for specific time periods such as 2010, 2020, 2030 etc.

As noted in the introduction, the Second World Climate Conference made several recommendations with regard to the national aspects of the climate change problem. Perhaps of most relevance, taking into account the arguments advanced above, are the following:

- * Variations of climate have profound effects on natural and managed ecosystems, the economies of NATIONS and the well-being of people everywhere.
- * Immediate steps to be taken include ... NATIONAL and REGIONAL analyses of the impacts of climate variability and change on society, and study of the range of response and adaptation options available.
- * GOVERNMENTS should establish national committees for the World Climate Programme to mobilize support for national activities and to coordinate activities.

REFERENCES

Finally, it is extremely important to note that climate change must be regarded as a challenge, and NOT a threat. Indeed, the challenge is to all scientists, economists, engineers, geographers, entrepreneurs, and politicians, to produce a better environment for all people of all nations.

The beginning of that better environment begins with us in the country in which we live.

Maunder, W.J., 1986. "The Uncertainty Business: Risks and opportunities in Weather and Climate", Methuen, London, 420 p.

Maunder, W.J., 1992. "Dictionary of Global Climate Change", UCL Press, London, 240 p.

Maunder, W.J., 1993. "Global Warming: Change of Climate or Part of Climate", WMO Bulletin, April 1993.

Enclosed with this Newsletter is a flyer about a new meteorological journal - METEOROLOGICAL APPLICATIONS

Mr. Brendan McWilliams is on its Editorial Board.
As well as being Assistant Director of the Irish Met.
Service his daily column in the Irish Times is a
compulsive read for many.

A Monthly Weather Bulletin is published by the Climate and Applications Division of the Irish Met. Service. It is available to members at the preferential annual subscription of £15 - excellent value and highly recommended.

The Sandeman Ghost at Aldergrove

-----By Séan Byrne-----

How I came to be a Meteorological Assistant in World War 2 is one of those, inexplicable almost, things that happen, a spur of the moment suggestion and decision.

I had been working in pre-war UK in an aircraft engineering factory (a reserved occupation i.e. not suspect to call-up for military service). Yet mid-way through the war I found myself volunteering for the RAF with the mistaken notion (perhaps?) that I could fly "something" having contributed to some small degree in their manufacture! Well I coudn't - at least the RAF Opticians thought so but I could still "play my part" they said - a mechanic perhaps? wireless operator? etc. etc. or they were looking for 'weather people". The rest for me is history. I had heard of Meteorology - hadn't it come into Geography courses?

So it was off on a Met. course after square-bashing in Skegness, down to London, billited in very desirable (forgetting about the blitz) quarters - St. Rege's Hotel in Cork St. just off the Picadilly end of Regent St. alongside Saville Row. The course itself was in offices which were very near, just a little down-wind (and a very prevailing wind it was!) from Paddington Piggeries. Now there was an instant when one could well do without foreknowledge of weather ahead - bad enough having to endure the stink without suffering in advance

knowing what the next day would be like!

Having got into the RAF and the Met. Office albeit as a humble assistant by the aforementioned fluke I soon grew to like and even enjoy the job - later experiences were to dampen my enthusiasm somewhat. I recall wishing in all my many postings that I might meet another Irish Met. man, but I only met one at war's end. He was from Belfast and it was from him that I heard of the Aldergrove haunting.

I had heard of Aldergrove but only after I'd joined-up, never in my youth in Ireland. I was eventually to discover that it had existed since 1918 and was known throughout the Met. Service because upper-air observations emanated from there.

My Belfast colleague had been stationed at Aldergrove but I could never get him to give a positive answer as to whether he had seen the spectre or not. However one of his Met. Office mates had seen it; and it was Met Operations, firstly among many others(mainly RAF service men) who saw and reported the phenomenon.

The first sighting was at about 3am. one night towords the end of the war. Two observers were taking readings from a Hydrogen filled released balloon, one which was aided to heights of about 60,000 to70,000 feet. They were part of an 'upper-air unit' of the Met. and were using radar.

Now, we others in the Met. had'nt heard much of this, just the odd rumour or two - radar even at this late stage still being treated with great secrecy.

In this instance at Aldergrove it needed

power and this was supplied by a diesel generator. The two lads that night were having difficulty 'swinging' the engine to spark it into life (no easy task). They could do with some help they thought. The black-out was still in force but there was bright moonlight.

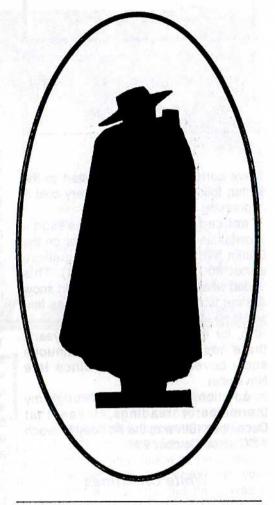
"Give us a hand mate", shouted one of the two to a shadowy figure nearby whom they thought was one of the R.A.F. Security Patrol.

No answer!

So he shouted again moving a little closer to the figure but as he moved forward 'yer man' was gone - just like that! Only he could'nt have been a man as he just was'nt there and he could'nt have gotten off the roof or away.

Both Met. men had seen 'him' - they were 100% sure - a figure dressed in a kind of cloak and a tall wide-rimmed hat. It was seen again several times subsequently and by varying people especially from the upper-air unit. 'It' became known almost affectionately (becoming quite popular in fact) as 'Sandeman's Ghost' because of the uncanny resemblance to the cloaked figure seen to this day on Sandeman port advertisements.

Long after the war, in the 1960's, Aldergrove became Belfast's International Airport - a modern terminal replacing the old war-time and war damaged buildings. None of the passengers passing through the place have (to my knowledge) spotted the Don except on the advertising hoardings or unless they have had a surfeit of the beverage (but then it's most likely of pint elephants they'd be rambling on about)



Local enquiries by the two Met. lads who first spotted the ghostly 'Don' brought the more or less usual explanation - foul deeds in the area in the past including brutal murder by a notorious highwayman.....

Weather Corner

- And the strange sighting of 'The Irish Snow-Devil'! by Edward Graham

Chilly Start

There certainly was a chilly start to the winter, following on from the very cold & depressing Autumn.

I noticed the first of the season's snowfall as early as 16th October on the Dublin hills with a light covering above about 600 metres (2,000 feet). This ended what was a remarkably short snow & sleet free period, as snow fell as late as May 14th last year.

Also, for the first time in several years, there has been a almost continuous snow cover above 600m since late November.

In addition, looking back through my thermometer readings, I see that December 18th was the first day to reach 14°C since October 9th!

White Christmas

I was delighted to see that many parts of the country had their first white Christmas in many years. Here in Dublin, the snow level was a high as 250m or so (800 feet) on the Dublin hills, despite the temperature being as low as 1°C in the city during the precipitation late on Christmas Eve.

I noticed, during a walk in the hills on St. Stephens day, that the snowline itself probably corresponded closely to the

local freezing levels, as the snow level was very precise to within about 20 metres of the vertical. The effect of the different thermal conductivites (e.g. grass, bare soil) could be seen to have an effect on the actual snowline, with some snowfree fields directly adjoining those with a full white cover.

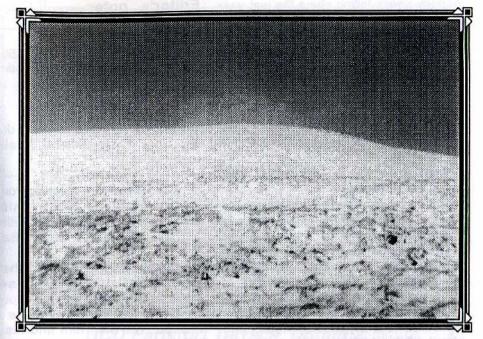
Unusual Rainbow

Usually, we get a bad windstorm nearly every winter, but did anyone notice, during the storm of December 8th last, the phenomenon of a very long-lasting rainbow, over the Dublin area, at least?

It appears that the frontal trough of the storm depression passed into the Irish Sea during the early morning, and was followed by the very strong southwesterly flow, later westerly, which contained the storm force winds. This flow contained a mixture of light showery bursts of rain from a thin veneer of stratus and fractostratus cloud. However, this cloud was thin enough to allow continuous faint sunlight through from the hours of 9 a.m. to 11:30 a.m., and from noon until about 2pm.

The result was an almost continuous full arc or part of a rainbow arc during these hours over Dublin. It may have been that the Wicklow hills to the south thinned the cloud sufficiently for the low elevation sun to shine through. The Guinness Book of Records shows that the record for the length of a single rainbow is only 3 hours. This was recorded at Llandudno, in North Wales, interestingly, during the Fastnet storm of August 1979.

Is it that in very stormy conditions the clouds are stretched out and thinned



Picture: E. Graham

' Snow - Devil '

Back to the subject of snow, but you've probably been wondering what the photo above is all about. It's a rather poor picture of what I can only describe as a 'snow-devil', not unlike a dust-devil, but made of snow.

The picture was taken at about 1p.m. on Friday 31st December 1993, high on the southern slopes of Galtybeg mountain (850m) in Co Tipperary. From the time I first observed it, it lasted only about a further 10 seconds, and the picture was taken as it was dissipating, from about 100m away.

However, I did notice a few aspects; It was spinning anticlockwise; it was about 10m in height and about 5m across; and it was definitely hollow in the middle.

The meteorological conditions were bright and sunny, but there was a fierce Gale Force 8 to 9 wind blowing towards the mountain crest in the background, whereas the wind in the foreground was about Force 6, and coming rather obliquely from the left. The air temperature was difficult to measure, but was probably about -1.5°C.

Perhaps you have seen a 'snow-devil' or something similar before in Ireland?

Wet Year

Nobody needs telling about the wet year we've just had. Up to last May in Dublin, it had been several years since the last month we had over100mm. But, we had as many as 4 such months during 1993, with 170mm in May and 160mm in June to boot.

Definitely, the most interesting statistic of the year must go to poor ole Cloone Lake in Co.Kerry, where I read in The Monthly Weather Bulletin recorded a massive 244mm on September 18th, which is an incredible 10 inches!

Looking back through my diary of the day, I had been walking around Bohernabreena in Co.Dublin in the afternoon, and noticed a very active fohn situation over south Co. Dublin, with warm sunshine and a temperature of 18°C, but there were thick black clouds away from the rain-shadow to the west & northwest. That day, Dublin Airport, only about 10 km to the North-northwest recorded nearly an inch of rain, whereas I recorded a comparative paltry 8mm(1/3 inch) in Clonskeagh. Did anyone else notice other weird happenings in the sky on September 18th, particularly if you're in Co.Kerry?

If you have something to add to Weather Corner, or if you would like to raise some other questions, or just mention a statistic or two, drop a line to either myself or Evelyn, Irish Met. Society,

c/o Meteorological Service, Glasnevin Hill, Dublin 9.

Editor's notes-----E.Cusack-

Our Society numbers about 150 now and my thanks first to all our members who have renewed their subs. and a welcome to new members.

This newsletter contains many diverse papers - many thanks to all the contributers.

Mr. Sean Byrne is a member from Co. Kilkenny and his ghostly tale will surely inspire you to write in with your own weather 'story'. Well done Sean.

Mr. Charles Daly retired from the Met. Service in Jan. He was a senior forecaster in CAFO and his expertise, generosity of spirit and wit will be sadly missed. We wish him and his wife Maureen all the best.

Prof. Davies and Dr. Maunder addressed the society this season and, like all our lecturers, gave of their time freely and generously.

Dr. Peter Lynch, as well as being our esteemed President, is a senior meteorologist and is head of the research division in the Met. Service.

As always the Society gratefully acknowledges the assistance and facilities which it enjoys from the Meteorological Service.

Human Impact on the Climate of Ireland

by
Dr. John Sweeney
(St Patrick's College Maynooth)

8pm 4th March 1994

Venue : Lecture Theatre G32 UCD Earlsfort Terrace, Dublin 2.

For most of its history Ireland has been a victim of the vagaries of weather fluctuations and climatic change, sometimes tragically as during the Famine. However, the future would appear to suggest that climate will become increasingly a prisoner of human activities as modification to both surface and atmosphere change the radiation balances at local as well as global scales.

This talk examines the extent to which indications of human induced effects on Irish climate can be identified, particularly focusing on aspects of visibility and urban climate in the Dublin area. In addition some observations on the implications of current predictions concerning the enhanced greenhouse effect for the future course of Irish climate will be discussed.