Irish Meteorological Society

Newsletter

SERIES 2, EDITION 3 NOVEMBER 2010

INSIDE THIS EDITION:

Note from the Editor

Hello everyone,

2010 has been a very interesting year weatherwise with the prolonged cold, snowy snaps and the volcanic ash plumes from Eyjafjallajökull. Unsurprisingly, several of the top entries in our photography competition depicted wintry scenes.

As well as the successful photography contest, we held 5 evening lectures in 2010, a conference in the National Botanic Gardens in March and a weekend trip to Valentia Observatory last October. Over the past twelve months the membership of the Irish Met Society (IMS) has steadily grown to almost 250 members, which is a record for the Society.

This is my third newsletter as editor and I am very grateful to everyone who has written articles and to Sinéad Duffy, Dominic Foley, Morgan Geraghty, Kilian Harford and Aidan Kelly for helping with the proof-reading.

As well as articles on volcanoes, climate change, Nature Watch and Green Schools, you will also find reports on Met Society events including the Valentia field trip and photography competition. We have two books to give away: "Rambling Round Ireland: A Commodius Vicus of Recirculation" by Peter Lynch and "Deluge - Ireland's Weather Disasters, 2009-2010" by Kieran Hickey-see inside for details.

We are already planning for 2011 and you will find details about our upcoming lectures inside this newsletter. In May the Society will celebrate its 30th anniversary with a lecture by its founder Professor Ray Bates. As well as the evening lectures, we will hold a conference in NUI Maynooth on March 26th - registration for this is now open.

The Irish Met Society is a voluntary organisation, independent of Met Éireann. I would like to take the opportunity to thank my fellow committee members for their help and enthusiasm throughout the year. We are all extremely grateful to you, the members, for attending our events, supporting the Society and for making our work really worthwhile.

Nollaig Shona,

Emily Gleeson

Secretary, Irish Met Society

Meet the IMS Committee

Liam Burke, Committee Member

Liam Burke graduated with a B.Sc. in Physics from UCD in 1963. He worked in the Irish Meteorological Service (later renamed Met Éireann) as a weather forecaster in aviation and general meteorology, then as a marine meteorologist and finally as Head of the Instrumentation and Environmental Monitoring Division. Liam retired from Met Éireann in 2007 and was Secretary of the Irish Meteorological Society for 2 years: 2007-2009.

Kieran Commins, Treasurer

Kieran graduated with a B.Sc. (Honours) in 1978 and an M.Sc. in 1990 from UCD. He joined the Irish Meteorological Service in 1979, with initial training in Galway and shadow duties in Shannon and CAFO (Dublin). Kieran was assigned to Valentia Observatory in 1981 and became Chief Scientist in 1990. In 1994 he transferred to the Instrumentation and Environmental Monitoring Division in Dublin and was project manager for the Shannon radar installation which was completed in 1996. He moved to the General Forecasting Division in 2000 as Head of Applications Development and is currently responsible for visualisation systems for forecasting and radar meteorology.

Evelyn Cusack, Vice President

Evelyn Cusack is a meteorologist with Met Éireann and is currently Deputy Head of Forecasting. She is passionate about promoting science and the scientific method.

Sinead Duffy, Public Relations Officer

Sinéad has been a member of the Irish Met Society since 2002 and joined Met Éireann in 2004. She has worked as a Meteorological Officer at the military airport in Baldonnel since starting and in 2008 completed a masters degree in Meteorology from UCD.

"Evening Light and Fog near Bottle Hill, Co. Cork"

Photograph taken by Tom Hayes

"Storm Clouds over Ballycotton Lighthouse"

Photograph taken by Mark Clehane

Denis Fitzgerald, Committee Member

After graduating in Physics from UCD in 1962, Denis joined Met Éireann and studied meteorology in Rosslare during 1963. He was then sent to Shannon Airport to work as a forecaster in aviation meteorology. Denis was transferred to CAFO in late 1965 and served in general forecasting for radio and TV until 1975. Then finding the night-duty shifts very disagreeable he embraced poverty and transferred to the agrometeorological unit where he worked until 1979. There he developed an interest in climatology which led to a move to the Climatology and Observations Division, of which he became head in 1981. Denis remained there until 2001 and then served as Head of the Research and Applications Division until his retirement in 2005.

Dominic Foley, Committee Member

Dominic is a second year Environmental Science student in Dublin City University (DCU). The weather has fascinated him since he was a child and he was delighted to learn that there is a society in Ireland promoting meteorology to the general public. He became a member in October 2009 and joined the committee in March 2010.

Morgan Geraghty, Assistant Secretary

Morgan became a member of the Met Society in 2006 and part of the committee in 2008. After graduating from NUI Galway with a B.Sc. in Physics and Electronics, he joined Met Éireann in 2005 and was first posted to the weather station in Malin Head. Currently he works in the Dublin Airport office where he is responsible for all Met Éireann equipment at the airport including the Dublin weather radar.

Dr Emily Gleeson, Secretary

Emily took on the role of Secretary of the Irish Met Society in May 2009. She has a B.Sc. in Experimental Physics and Chemistry from NUI Maynooth and a Ph.D. in Submillimeter Astronomy. Following the Ph.D., Emily firstly worked as a postdoctoral researcher and subsequently as a Yield Analysis Engineer in Intel, before joining Met Éireann in September 2006. She worked as a forecaster for almost 2 years before transferring to the Research and Applications Division to work in the field of climate modelling.

Dr Aodhagán Roddy, President

Following an M.Sc. in Physics at University College Galway, Aodhagán carried out postgraduate work at the University of Edinburgh and postdoctoral research at the Department of Atmospheric Science, Colorado State University. He lectured in the Department of Physics, NUI Galway but has now retired. His main research interests were in the areas of cloud physics (more recently, mesospheric clouds) and atmospheric methane. In recent years he was a member of the Royal Irish Academy's Committee on Climate Change (including a period as chairman), the Academy's Geosciences Committee and the Irish National Committee for the International Year of Planet Earth.

Climate Change - A Personal View

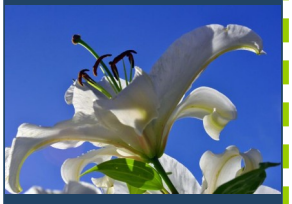
By Dr John Butler, Armagh Observatory

"Maple Leaf with Rain"

Photograph taken by Karl Jordan

"A Taste of Summer"

Photograph taken by Ciara Stephens



"Summer Lily"

Photograph taken by Linda Nolan

Few people in the western world, or indeed further afield, can now be unaware of the concern expressed in the media about the possible effects of climate change and, in particular, of global warming. The last, much trumpeted, IPCC report received the ultimate accolade of a Nobel Prize for its thorough assessment of the current state of climate science. But, as always in science, this is not the end of the story for we are dealing with a constantly evolving planet that changes according to processes we are only beginning to understand. High performance computers are used to model what we think should happen, but it is the Earth itself, not the climate models, that defines reality. The computer climate models are essential in refining our understanding of the physical processes involved but observations of the Earth and its atmosphere are paramount.

So where are we now after a decade when there was so much discussion, hype and media attention given to global warming and its cause? Almost every climate scientist agrees that the world is warmer now than it was in the late 19th century; however, is this really all that remarkable in view of the historical and geological evidence for climate change over past millennia? If you think it is, then you are naturally drawn to the enhanced greenhouse interpretation but, if not, a multitude of natural processes which may modulate the Earth's climate, come into view. It is these poorly understood natural processes which are now in need of major research effort. Even the Royal Society, a strong advocate for the anthropogenic origin of global warming, now concedes that there are significant uncertainties in the contributions of feedback processes and natural variability. Several recent highly publicised "scandals" may have helped to push the venerable society in this direction.

First there was the so-called "hockey stick" furore in which a selection of data (much of it from tree-rings) had been used to suggest that there was a prolonged period (from 1000AD) of unchanging global temperatures followed by a rapid rise in the 20th century. This tended to exaggerate changes in the last century when man's influence would be apparent compared to previous centuries.

"Fire and Ice" Photograph taken by Robert Riddell

More recently, the media highlighted large errors in the timescale for the melting of Himalayan glaciers contained in the IPCC report. The third scandal, "climate-gate", centred on the disclosure of emails from the University of East Anglia which implied that scientists were not being as open with their data as good practice would normally require. Though the individuals concerned were exonerated, the result has been to raise questions in the minds of both scientists and the general public on the reality and causes of global warming and to break the apparent monopoly of the Doomsday protagonists. Now it appears there is a greater awareness that other mechanisms than greenhouse may also be involved.

"High and Dry" - Photograph taken by Kevin Murphy.

Another development in this story is that global warming, so apparent in the last two decades of the 20th century, has faltered in the first decade of the 21st. Global temperatures reached their peak in 1998 and since that time have remained roughly constant. In recent years, there has even been a slight fall and this has occurred in spite of a roughly 5% rise in atmospheric CO_2 concentration. Many people have noticed that the pause in the global temperature curve has coincided with a drop in the amplitude of the sunspot cycle and this behaviour would be consistent with former studies which linked the Earth's temperature to solar activity. However, although there has been a flattening of the global temperature curve in the first decade of the 21st century, the fall towards the end of the decade is still rather minor compared to the rise since 1980 and other explanations involving global climate oscillations could be responsible.

"Back Strand" - photograph taken by Thomas Quilty.

Where does all this leave us in the ongoing discussion of the causes of global warming and the strategy to reduce greenhouse gases which has become such a major rallying call for environmentalists in recent years? Firstly, in spite of the newly recognised uncertainties about the root causes of global warming, the ever increasing concentration of carbon dioxide and methane in our atmosphere remains a cause for concern and is not to be encouraged. For although other processes may be involved, the anthropogenic greenhouse contribution to global warming could be substantial. Therefore, we should continue to develop ways in which our energy requirements can be met by sustainable, non-polluting, methods such as wind and wave power. The huge potential of such currently under-utilised energy resources is nowhere clearer than in the massive water-driven linen mills that once dotted the Ulster countryside and which powered the first Irish industrial revolution there in the late 18th century. But will renewable energy sources be enough to save the world from the worst case scenarios of the IPCC, as it is not just the cars, aircraft etc relevant to our modern lifestyle that are the problem but the number of people who wish to use them? As the much larger populations of the new industrial nations of China, India, Brazil etc aspire to living standards which emulate those in the West, there will be ever increasing demands on our planet's resources. Ultimately, it seems it could be a battle between Mankind's insatiable desire for more of everything and the Earth's ability to supply it. Eventually, governments will have to grasp the problem of the world's rapidly rising population - something many governments don't even seem to recognise, let alone confront. Only China, with its "one child" policy has made serious efforts to control its population; many more countries may need to do so in future.

"Carraroe" - photograph taken by Conor Ledwith.

Up, Up and Away

Meteorology for Hot Air and Gas Balloons

By Dr Emily Gleeson, IMS Committee and Met Éireann

The Irish Met Society 2010-2011 evening lecture series 'took flight' on September 30th with a talk on hot air and gas balloon meteorology by the Head of the Luxembourg Meteorological Service, Claude Sales.

Claude became an aeronautical weather forecaster in 1983 and 5 years later also began working as a balloon meteorologist. In 2010 he became director of the Luxembourg Met Service.

In his talk, Claude took the audience on an historical tour of ballooning, focussing on the importance of meteorology, particularly in competitions. With 22 years of experience, he showed a great range of striking imagery taken during international races in Switzerland, Tanzania and Kilimanjaro among others. He had just returned from the Gordon Bennett International Gas Balloon Race 2010, the oldest and most prestigious aeronautical race in the world (the Formula 1 of gas ballooning) and ended his lecture with an account of that.

The Irish Met Society was delighted to see several Irish balloon pilots in the audience. With dry conditions, and a wind speed of less than 5 knots, required for balloon take off, it's amazing that these Irish pilots get to pursue their hobby at all!

The Society is extremely grateful to Joan Comiskey, Custom House Dublin, for providing the conference room for this event.

L to R: Dominic Foley, Claude Sales, Sinéad Duffy, Emily Gleeson, Liam Burke, Denis Fitzgerald, Morgan Geraghty (IMS committee with Claude Sales (speaker)).

L to R: Claude Sales, Aodhagán Roddy (IMS President).

Audience at Claude Sales' lecture on balloon meteorology, conference room, Custom House, Dublin.

Benoit Mandelbrot

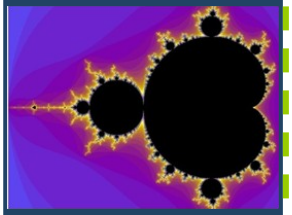
Mathematician, 20th Nov 1924 – 14th Oct 2010

By Sinéad Duffy, IMS Committee and Met Éireann

Benoit Mandelbrot

"Clouds are not spheres, mountains are not cones, coastlines are not circles, bark is not smooth, nor does lightning travel in a straight line."

Cloud Spiral Fractals, courtesy of www.miquel.com



Mandelbrot Set

Benoit Mandelbrot, father of fractal geometry and namesake of the Mandelbrot Set, died in October 2010 of pancreatic cancer. His work developed a way of visualising nature in the complex way that we see it, rather than in the spheres, lines, cones and circles of Euclidean geometry. He coined the term 'fractal', from the Latin term for broken or fractured, to describe a rough geometric shape which can be split into parts, each, at least approximately, a smaller copy of the original shape.

Mandelbrot was an American citizen when he died, but was born in Warsaw to a Lithuanian Jewish family. In 1936 his family moved to Paris but at the outset of World War II they left the city for a small town near Lyon. He came from an academic tradition, with a physician mother and mathematician uncle, and was himself a talented mathematician. He was also highly intuitive and often spoke about "the unity of knowing and feeling". It was his mathematician uncle, Szolem Mandelbrot, who started him on his fractal journey by directing him to the work of Gaston Julia and Pierre Fatou on self-similarity (a feature of fractals) and iterated functions.

He started his mathematical career with a degree from the École Polytechnique in Paris. In 1947 he moved to the California Institute of Technology where he studied turbulence and got a Master of Science degree in Aeronautics. After this, he worked for a time as a professional engineer, then returned to Paris and obtained his doctorate in 1952. He then went back to the US for post-doctoral studies sponsored by John von Neumann at the Institute of Advanced Studies Princeton, New Jersey.

In 1958 Mandelbrot took up a research position with IBM. He had a relationship with the company until he died, becoming an IBM Fellow in 1974 and an IBM Fellow Emeritus in 1993. He initially worked on eliminating random noise in signal transmissions between computer terminals. However, on investigation, the noise did not seem random but appeared in bunches. Mandelbrot found that the bunching was the same whether plotted by day, month or year. This was another step to fractal geometry, an area he described as "the first broad attempt to investigate quantitatively the ubiquitous notion of roughness".

While at IBM he took up many positions part-time or while on leave. He held positions at the Massachusetts Institute of Technology, Harvard and others, in fields as diverse as fluid dynamics, information theory, physiology, cosmology, psychology and economics. In the 1960s, while studying galaxy clusters, he happened upon the work of mathematician and meteorologist Lewis Fry Richardson (1881-1953).

Richardson summarised his personal insight that turbulence had self-similarity by the following rhyming verse: "*Big whirls have little whirls that feed on their velocity, and little whirls have lesser whirls and so on to viscosity*". However, it was his work on how to measure the length of coastlines and other borders that interested Mandelbrot. Richardson observed that the measured length of various country borders depended on the measurement scale, with smaller measurement scales giving longer measured lengths. Mandelbrot's work in 1967 built on this and interpreted it as showing that coastlines/borders have self-similarity. It was nearly a decade later, in 1975, that he coined the term fractal geometry.

He was a keen computer programmer, and said "for me the first step with any difficult mathematical problem was to programme it, and see what it looked like". In 1980, his work on programming and visualising Julia sets, an area of complex dynamics, led to the naming of one of those sets as the 'Mandelbrot Set'.

Rambling Round Ireland

By Professor Peter Lynch, UCD Meteorology and Climate Centre

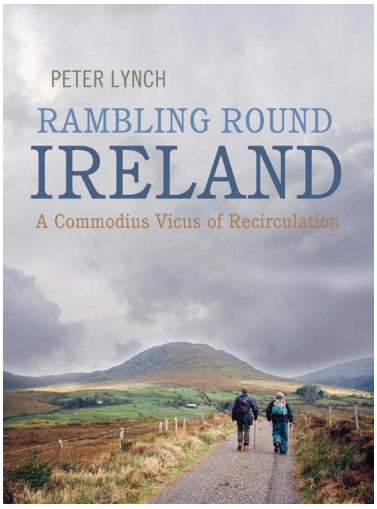
"Winter's Grip"

Photograph taken by Ray Kellett

"While the nation became inundated with mobile phones and iPods, and the Celtic Tiger roared briefly before slinking back to his lair, I hobbled onward round the coastal counties"

"Over Galway Bay"

Photograph taken by Seán Tompkins



Everywhere in Ireland there is something of interest or beauty or wonder. It might be a spectacular landscape, or some fascinating industrial curiosity, or just a conversational encounter with one of the gentle people of the country. In a book due out soon, I tell the story of a journey around Ireland, on foot over many years, and of the various adventures I had on the way. While the nation became inundated with mobile phones and iPods, and the Celtic Tiger roared briefly before slinking back to his lair, I hobbled onward round the coastal counties, soaking up the landscape (often literally) and enjoying the company of chance-met people.

The book, Rambling Round Ireland: a Commodius Vicus of Recirculation, is to be published by Liffey Press before Christmas. I will write here of a few weather adventures during the trip, but you will have to read the book for the full story. On the morning of Sunday 3 August, 1997, while on a ramble through Wicklow, I was awoken by the sound of heavy rain. All indications were that it was 'down for the day'. On the "wireless", a hapless weather forecaster was bravely attempting to explain what transpired to be the most serious forecast failure for many years. The forecast the previous evening had been for excellent Bank Holiday weather. Would you like to know the terrible things I write about my colleagues in a certain National Meteorological Service? Then, buy the book!

On the last day of September 1999 my walking buddies and I were in the Victoria Hotel in Macroom watching the news and weather forecast. Evelyn Cusack appeared and told us of showery, blustery weather to come, with occasional gale gusts and heavy rain. She ended her presentation with a fond farewell. This was to be the last night on which the Met Éireann weather presenters would appear; they were to be replaced by non-meteorologists, a decision made by RTÉ to the satisfaction of no-one but themselves. A decision, too, that was reversed some weeks later in response to strong popular demand.

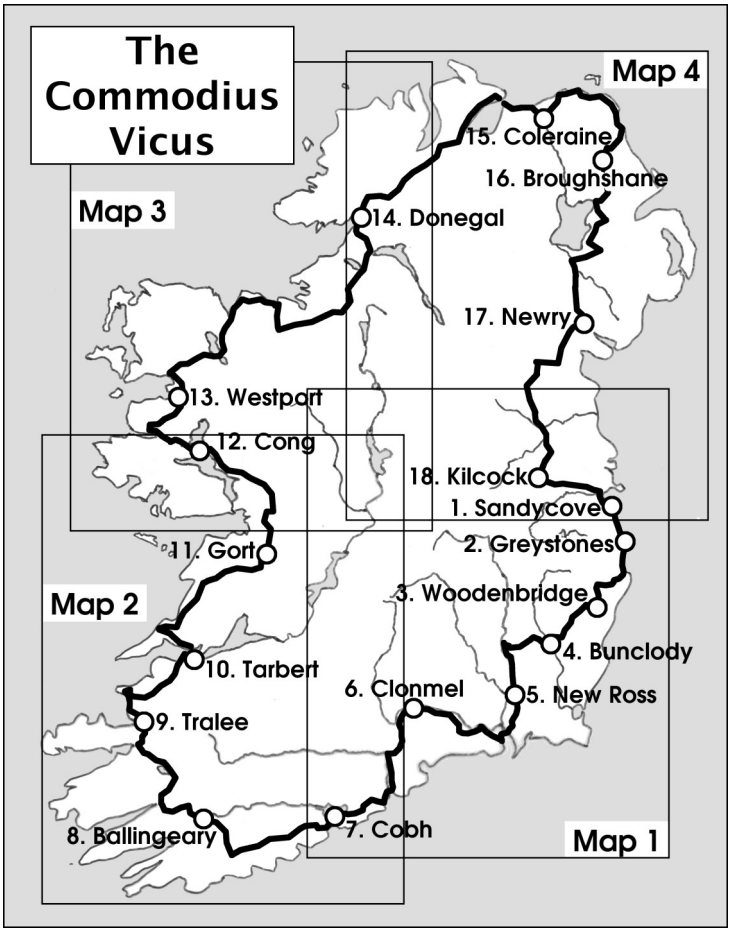
Rambling into Kilrush, I came to the headquarters of Nowcasting International. This company provides a computer-based system for mariners, giving them detailed and up-to-the-minute forecasts of sea-conditions. Leaving my haversack at the door, I went in and the Senior Software Engineer showed me round the office, demonstrating the system and explaining how it is used. Little did he know that I was an industrial spy for you-know-who.

Here are a few chapter titles: The Land of Heart's Desire; Where the Stars are Big and Bright; The March of the Quiet Maniacs; In the Steps of King Billy; Mounting Mater Diaboli; The Great Anabasis. Can you guess which counties they refer to? Bet you don't know the last one! If such trivial pursuits amuse you, then you will enjoy the book. If purile and mildly smutty humour are to your taste, you should definitely buy a copy, and another to shock your maiden aunt! Moreover, you will be helping a great cause: I won't get a farthing, as all author royalties go to Scouting Ireland. So, as regards choosing Christmas presents for your many wonderful friends, all your problems are over. Happy Christmas!

"Spring Day Killary Harbour Feb 2010" - photograph taken by Seán Kennedy.

[Information about the book, and about the Commodius Vicus itself, available at:

http://www.ramblingroundireland.com]



The Irish Met Society is giving away a copy of "Rambling Round Ireland: A Commodius Vicus of Recirculation" to one lucky reader. To be in with a chance to win, email info@irishmetsociety.org and put Rambling in the subject line.

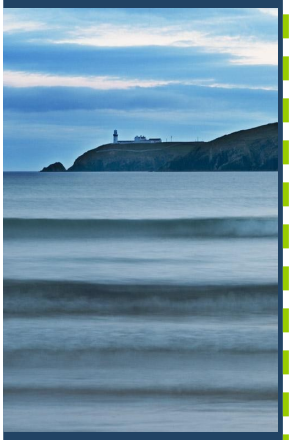
Closing date: December 15th 2010.

L.W. Pollak and Meteorology in Ireland

By Dr Thomas C. O'Connor, School of Physics, NUI Galway

"Sunny Days"

Photograph taken by Eimear Murphy



"Galley Head, Red Strand, Clonakilty, Co Cork."

Photograph taken by Tom Hayes

Leo Wenzel Pollak (1888-1964) was an important figure in meteorology in Ireland in the 1940s and 1950s, first as a member of the recently formed Irish Meteorological Service and from 1947 as a senior professor in the School of Cosmic Physics in the Dublin Institute for Advanced Studies. He had a distinguished scientific career that deserves to be better known in Ireland today.

He was born in Prague on the 23rd of September 1888. After a distinguished school and college career, he was appointed to the staff of the Institute of Cosmic Physics in the German University, Prague in 1912. He served as a meteorologist in the Austrian army in Tyrol in World War I [1]. In 1919 he rejoined the university and became professor of meteorology in 1927, and in 1929 director of the Observatories of Prague and Donnersberg. In the 1920s he did pioneering work in climatology, introducing the Hollerith punch card system and in using Fuhrich's autocorrelation system for investigating periodicities[2]. Around the mid 1930s Pollak and colleagues in Prague began the development of photoelectric instruments using the turbidity of liquids to determine the intensity of ultraviolet radiation[3]. Political developments in Germany caused him to flee from Prague but he was able to take with him some of his personal belongings, books and scientific equipment, including some photoelectric cells. In March 1939 he arrived in London and sat in on David Brunt's lectures for trainee meteorologists to improve his English[1]. He moved to Ireland in December 1939 to take up a position in the newly formed Irish Meteorological Service, first as a training officer at Foynes and later as head of the Climatology Division in Dublin[1].

Development of Photoelectric Condensation Nucleus Counters in the Irish Meteorological Service

Pollak was interested in determining the concentration of particles in air over the Atlantic Ocean and their variation with altitude. Early in 1940, with the assistance of W.A. Morgan, he began the development of a type of nucleus counter capable of relatively accurate, rapid readings and automatic recording[4]. This was achieved by measuring photoelectrically the decrease in the intensity of a beam of light after passing through a fog formed artificially inside a closed chamber. Their first simple counter consisted of a brass tube, 5.7 cm diameter and 22.9 cm long, lined with damp blotting paper and sealed at each end by a glass plate mounted in a wooden end piece. The end pieces were held together by long bolts. A low power bulb fitted at the focus of a parabolic reflector threw a beam of light through the tube onto a barrier layer photocell at the other end. The output of the photocell was read by a sensitive galvanometer. The fog tube was fitted with three taps for the introduction of the air sample and for connection with a pump.

The fog in the chamber was produced by the adiabatic expansion of the moist air in the sample causing it to become supersaturated. If I_0 is the output of the photocell with no fog in the chamber and I is the value after the fog has been formed, the extinction $E = (I_0 - I)/I_0$ is a measure of the concentration of nuclei in the sample. The relationship between the extinction E and the particle concentration was roughly logarithmic. They investigated the relationship between the extinction and the path length of the beam of light through the fog, with tubes of different lengths in the direct beam model. They also constructed a 'Multiflex' model with a rectangular-shaped fog chamber in which the length of the beam of light through the fog chamber could be varied by means of multiple reflection from mirrors on opposite sides.

Both counters worked to give relative values of the extinctions by the fog for various particle concentrations. Efforts were made to obtain absolute concentrations using an Aitken condensation nucleus counter from Casella in London. This may have been the instrument currently on display in Valentia Observatory. A paper by Pollak and Morgan on these experiments and a diagram showing how a counter might be mounted and operated in an aircraft was submitted to the Department of Industry and Commerce in 1944 for publication as a Geophysical Publication but it was not subsequently published[4].

"Winter in Mount Juliet" - photograph taken by Harry Reid.

Development of Photoelectric Condensation Nucleus Counters in University College Dublin

Professor J.J. Nolan and his brother, Dr. P.J. Nolan, in UCD were interested in the work of Pollak and Morgan and aware of the limited facilities for research available to them in the Meteorological Service. Therefore, in 1942 they offered them the facilities of the Department of Physics in UCD to continue their work and to collaborate with them. Pollak arranged to spend some of his 'official' time at the UCD laboratory. The services of the mechanical workshop and the chief technician, Jack Hughes, were available to the project. P.J. Nolan got deeply involved, particularly in the calibration and theoretical aspects. Pollak brought his experience and equipment for photoelectric measurements. The main constraint to progress was the scarcity of some materials in neutral Dublin at the height of World War II.

The direct beam model of the counter was adopted as the most feasible. At the suggestion of Nolan, it was used vertically to minimise the effect of the droplets falling out of the beam under gravity. Pollak's preliminary experiments suggested that a tube of about 60 cm in length was probably the best compromise between convenience in use and sensitivity in measuring low concentrations of particles. Among the bits of brass tubing in the UCD stock there was one of 58.74 cm which was used for the prototype counter and has remained as standard in all replications of it.

For much of 1943 Nolan and Pollak collaborated on optimising the photoelectric counter and most of 1944 was spent on calibrating it. The calibration consisted of two parts: an intrinsic or relative calibration (which was obtained from the extinction obtained for a certain nucleus concentration and for half that concentration obtained by the use of a 'tube bridge') and an absolute calibration (obtained by measuring extinctions for various concentrations obtained using an Aitken pocket nucleus counter). The calibrations were performed at four different overpressures, and anomalies in the calibration curves were extensively studied. Much of 1945 was spent writing up the results and the seminal paper "The Calibration of a Photoelectric Nucleus Counter" was published in the Proceedings of the Royal Irish Academy, volume 51A2, pp 9-31, in July 1946[5].

"Prevailing Wind, Glendalough" - photograph taken by Melissa Doran.

As the wartime shortage of materials eased, four replicas of the final calibrated counter were built in the UCD workshops. Two went to the Meteorological Service, one of which was put to use in Valentia Observatory for regular monitoring of atmospheric nucleus concentrations from 1950[6]. The other two were used by P.J. Nolan and his graduate students as convenient instruments to investigate many aspects of aerosol physics at UCD[7].

During the 1940s Pollak was also busy developing his interests in climatology and providing tools to search for periodicities in data. He published (with C. Heilfron) tables for "Harmonic analysis and synthesis schedules for three to one hundred equidistant values of empirical functions", Dublin (1947) as Geophysical Publications volume I, Department of Industry and Commerce, Meteorological Service and ibidem volume II (with U.N. Egan) in 1949.

"Red Boat" - photograph taken by Alan Hopps.

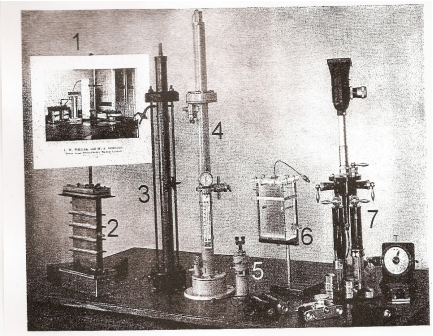
He was also involved in expanding the second edition of his book, with V. Conrad of Harvard, on Methods in Climatology and advising Mr. De Valera on the need for geophysical research and training in Ireland. This resulted in the establishment of the School of Cosmic Physics (SCP) in the Dublin Institute for Advanced Studies in 1947, which embraced Astronomy, Cosmic Rays, Meteorology and Geophysics. Pollak was appointed a senior professor and shortly afterwards Director of the School at 5 Merrion Square. Here he installed a platform for meteorological observations on the roof and brought in Tom Morley to establish a climatological observatory in Dublin city. His early research work was mainly paper studies. These included an important study on "The prediction of the yield and sugar content of sugar beet in Ireland" which stimulated economic interest in the application of meteorology to agriculture[8].

Early in 1949 Rev. P.G. Tedde, S.J. in the SCP undertook a study of "Condensation nuclei and meteorological elements in Dublin" using two UCD photoelectric counters[9]. This led Jeremiah Daly, the technician in the Cosmic Rays section of the School, to build two nucleus counters of improved engineering design, but keeping the dimensions of the calibrated Nolan -Pollak counter, for use in a mobile laboratory. To pursue his interests in the meteorology of condensation nuclei in the free atmosphere, Pollak acquired a Ford V8 van as a gift from A. Guinness and Co. and, assisted by Tom Murphy, he used this to make measurements of nuclei around Dublin and the Wicklow mountains and on traverses across the country to Strandhill in Co. Sligo and Quilty in Co. Clare to study air from the Atlantic ocean[10]. Here, near the shore at low tide in July 1951, he measured rapid changes in the nucleus concentration of several orders of magnitude in a few minutes. Like Aitken in 1888, this stimulated him to seek a portable counter but with photographic recording and Daly built such a counter, which was demonstrated in November 1951. Pollak and Daly subsequently improved the counter culminating in "An improved model of the condensation nucleus counter with stereophotomicrographic recording" in 1958 [11].

Pollak and the Guinness van at Quilty, Co. Clare, July 1951.

However, Pollak was not satisfied that two photoelectric counters of apparently identical construction could on occasions differ by 20% in measuring the same air sample. This led him, with the collaboration of T. Murphy, T.C. O'Connor and A.L. Metnieks, to a long series of improvements to the counters, including the use of electrically heated glass endplates and ceramic lining of the fog tube[12]. These culminated with the recalibration of the 1957 model, using the absolute counter with stereophotomicrographic recording in 1959 [13]. This calibration has been accepted by many laboratories around the world and by several manufacturers of commercial counters.

In April 1955 Pollak organised the first international symposium on condensation nuclei in Dublin at which 34 participants heard 26 papers over 3 days. This initiated a series of conferences that continues today with the 9th in Galway in 1977 and the 17th also in Galway in 2007.



CONDENSATION NUCLEUS COUNTERS AND THEIR ACCESSORIES
exhibited in the School of Cosmic Physics, Dublin during Symposium

The photograph of the collection of counters on display at the symposium in 1955 shows the Pollak-Morgan multiflex counter (2), the original UCD photoelectric counter 1946 (3), the SCP counter of 1953 (4) and the first photographic counter of 1952 (7).

Pollak eventually retired aged 75 in 1963 but not to be idle. He spent a while at the State University of New York, participating in their summer school on Whiteface Mountain and consulting on counters with the General Electrical Company at Schenectady, NY. He died at home in Dublin on November 24, 1964 and is buried in St Fintan's cemetery in Sutton.

This short summary of his achievements shows that he is worthy of remembrance in the history of meteorology in Ireland.

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Participants at the first international symposium in condensation nuclei organised by Pollak in the School of Cosmic Physics in April 1955. It contains some of the people mentioned in the article. These include L.W. Pollak, T. Murphy and J Daly in the front row on the right between J.W. Megaw and A.C. Chamberlain of Harwell AERE, V. Guerrini, F. Dixon, A. Morgan and S. McWilliams of the Irish Met. Service and ETS Walton of TCD up the middle and P.J. Nolan, E. Kuffel and Fr. Burke from UCD, Thomas C. O'Connor and C. O'Brolchain UCG top left. Other names from atmospheric physics included are J.Chalmers (UK), R. Siskna (Sweden), H. Israel (Germany), H.Dessens (France), F Verzar (Switzerland) and T. Rich (USA).

Kingdom of Meteorology

Irish Met Society Field Trip 2010

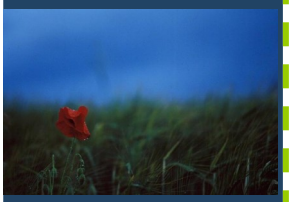
By Dr Emily Gleeson, Secretary, Irish Met Society

Valentia Observatory October 2010

Words and imagery cannot fully describe the events of October 8th-10th 2010 when the town of Cahersiveen, Co. Kerry was swarmed by a group of weather enthusiasts. People of varied backgrounds, from ages 4 to 90, made their way from all corners of Ireland to the meteorological mecca of Valentia Observatory. So how did all of this come about? ….

Evelyn Cusack came up with the idea for the field trip in October 2009 when she realised, while reading Brendan McWilliams' Weather Eye book, that 2010 marked the 150th anniversary of weather observing in Valentia. The Society was delighted when the director of Met Éireann, Liam Campbell, and the Head of Instrumentation and Environmental Monitoring, Eoin Moran, gave them the go ahead to bring a group to Valentia Observatory, which is not normally open to the public. Within days of advertising this event, it became clear that it was going to be special.

The Irish Met Society spent 6 months organising the field trip but of course it would not have been possible without the help of a lot of people, in particular the staff of Valentia Observatory who were truly outstanding. Not only did they guide the guests through a weather balloon launch and scientific tour of the Observatory, they also ensured that the Observatory grounds were in perfect condition and helped with traffic and crowd control.



"Just after the Rain"

Photograph taken by Paul Whiteley

"St. John's Point Lighthouse"

Photograph taken by Carol Ann Peters

Group photo at the weather balloon launch, Valentia Observatory. Photograph taken by Alan Landers.

The Met Society is extremely grateful for all of this extra work carried out by Mike Crean, Mike Donegan, Andrew Garvey, Mike Gill, Noelle Gillespie, Feilim Hanniffy, Keith Lambkin, Bing Li, Leo McCarthy, John Murphy, Aoife ní Bhrion, John O'Connor, Mary O'Sullivan, Shane Ryan, Robert Slattery, Claudia Stroie and Brian Walsh - it was clear to everyone how proud they are of Valentia Observatory.

Friday October 8th 2010

8am on Friday October 8th marked the 150th anniversary of the first weather observation recorded in Valentia and gradually throughout the day people began arriving in Cahersiveen for their weekend of meteorology. The registration desk was busy from late afternoon, and Créidhe O'Sullivan and Dean McCarthy, NUI Maynooth, kept guests entertained with their physics tricks, including cloud in a jar, tornado in a bottle and inseparable books!

The table quiz kicked off shortly after 8pm and it was overwhelming to see over 100 people taking part, even though it clashed with a Republic of Ireland soccer match. Sinéad Duffy, Evelyn Cusack and Emily Gleeson were quiz masters for the night. Dominic Foley and Kieran Commins

Top left: Kieran Commins and Dominic Foley (quiz adjudicators). **Top right:** Young weather enthusiasts, Rebecca and Laura Coyle, with their mother Maureen. **Middle left:** Suzanne Mulholland, Ciara McTeigue, Teresa Comiskey, Jessie Butler and Teresa's son Shaun. **Middle right:** Emily Gleeson, Morgan Geraghty and Sinéad Duffy organising the table quiz. **Bottom left:** Irish Met Society table quiz winners: Sarah McMonagle, Dermot McMonagle, Evelyn Cusack (IMS), Patricia Hamilton and Phyllis McMonagle (the McMonagles are voluntary weather observers from Cavan). **Bottom right:** Winners of the novelty weather round: Richard Griffith, Stephen Burt, Marie Doyle, Colette McCarthy and Clare Norris.

were busy as bees with all the correcting and Morgan Geraghty, who compiled the quiz, oversaw the event. The McMonagle family (Phyllis, Dermot and Sarah) from Co. Cavan, together with Patricia Hamilton, Met Éireann, took the overall prize and seemed pleased with their Galileo thermometers and Met Society membership certificates. Marie Doyle, Colette McCarthy and Clare Norris, along with Stephen Burt and Richard Griffith from the Royal Met Society, won the novelty weather round. It was ironic that Stephen actually won a book which he co-edited!!.

Saturday October 9th

RTÉ's CountryWide team kindly accepted an invitation to broadcast their show from Caherciveen to coincide with the Met Society field trip. Guests on the show included Mike Crean, Evelyn Cusack, Mick O'Connell (footballer), John Falvey (coast guard), John O'Sullivan (Valentia Island) and local musicians. By 8am a considerable crowd had gathered to watch a radio show in the making.

Damien O'Reilly, CountryWide, with Evelyn Cusack, John Falvey, Mick O'Connell and John O'Sullivan.

At the same time, Ken Bond, an entomologist (insect expert) had attracted attention outside the Ring of Kerry hotel as he emptied the contents of his moth traps.

Ken Bond, UCC, with his moth trappings.

There was a great buzz about the place and Aodhagán Roddy, President of the Irish Met Society got the main meteorological proceedings underway at 10am. Mike Crean set the scene with an historical overview of Valentia Observatory and Keith Lambkin followed with an introduction to all of the scientific programmes in Valentia and the site's importance on the world stage.

Dr Aodhagán Roddy, President, Irish Met Society.

Valentia Field Trip participants seated in the Ring of Kerry Hotel.

Mike Crean, Chief Operations Officer, Valentia Observatory.

Keith Lambkin, Chief Scientist, Valentia Observatory.

Shortly before midday all participants made their way to the Observatory, for the first time, to see the midday weather balloon launch. Keith Lambkin did a wonderful job in setting the scene and ensuring that the participants knew the significance of what they were about to see. The easterly wind and turbulent atmosphere meant that the balloon almost hit the ground a few times before embarking on its 10 km journey through the atmosphere.

Midday balloon launch at Valentia Observatory, October 9th 2010.

Top left: Máire Murphy holding a seismograph trace. **Top right:** A group in the phenological garden, Valentia Observatory. **Bottom left**: Groups scattered around Valentia Observatory. **Bottom right**: Noelle Gillespie with a half-inflated ozone balloon.

One of the highlights of the field trip was the tour of Valentia Observatory on Saturday afternoon. There were 11 stages to the tour, each one manned by a Met Éireann scientist. Participants were split into groups, each with a group leader, and they found out about seismology, phenology, weather observing and ozone as well as many other interesting topics. Guests left the Observatory in high spirits but hungry for more. The Met Society would like to thank all group leaders, in particular Dónal Black, James Brady, Ruth Coughlan, Colm Faherty, Jim Hamilton, Emilia Main, Dean McCarthy, Aoife Murray. Créidhe O'Sullivan and Michael Walsh.

On their return from the Observatory guests were welcomed by Liam Campbell, director of Met Éireann. Evelyn Cusack took to the floor shortly after that to take the audience on a weather tour which started with the Big Bang and looked to the future.

The Irish Met Society was delighted to have 15 children taking part in the field trip. Each child received a booklet of weather puzzles, including a quiz to complete during the Observatory tour. The prize ceremony for this quiz followed Evelyn's lecture, with Liam Conaghan, Calum Nolan, Rebecca Coyle, Ciarán Clifford and Ronan Clifford taking the spoils.

Left: Calum Nolan, Ronan Clifford, Ciarán Clifford, Emily Gleeson, Liam Conaghan and Rebecca Coyle - Valentia Observatory quiz prize winners. **Right:** Ronan Clifford and Rebecca Coyle with Evelyn Cusack.

After a day of lectures and tours, 130 participants joined the Society for a meal in the Ring of Kerry hotel and the party lasted well into the night. The manager of the hotel, Maura McCarthy, and all of the staff were absolutely brilliant throughout the entire weekend. Their organisation and helpfulness really added to the occasion.

Sunday October 10th

After a very late night it was amazing to find a crowd of 110 people waiting to board 2 coaches to Valentia Island at 9.30am on Sunday morning. The Society is extremely grateful to Tom Horgan (Met Éireann retired) for recruiting Sheila Burns, Eithne Garvey and Pat O'Shea and himself (Iveragh heritage group) as tour guides on Valentia Island. It was fantastic to learn about the history of Valentia Island and the Telegraph Cable from them.

The tour also encompassed the Skellig Experience museum (John O'Sullivan kindly accepted the Met Society's booking and opened especially for the occasion) and the Valentia Island Heritage Centre. The Heritage Centre is run by 5 volunteers: Anita Guiney, Marie and Richard Williams and Pam and Michael Twentyman. They kindly offered to open their museum for several hours, and guests were treated to a wonderful lecture by geologist David Howard. The Heritage Centre houses a replica of the Tetrapod Trackway (footprints of a Tetrapod, an amphibian which survived in the area 390 million years ago) as well as impressive displays on all aspects of Valentia Island including the first transatlantic cable, the slate quarry and meteorological observing. Valentia native, Michael Egan, also provided invaluable help and guidance to the Met Society and recruited Micheál Lyne and Richard Williams to speak about the Slate Quarry and Protestant Church while he himself enlightened the groups on the Altazamuth. It would not have made sense to leave Valentia Island without seeing the ruins of Revenue House, the original meteorological observatory. John Lyne, site owner, hopped onto each bus in turn to set the scene.

300 people took part in the Met Society's 2010 field trip and each helped to make this field trip a success. Hundreds more had to be turned down such was the popularity of the event. Valentia is special and the Irish Met Society is proud to have been involved in the 150th anniversary. Here's to the 200th anniversary!

Quote of the weekend:

"Do not worry if your job is small and your rewards are few. Just remember that the mighty oak was once a nut like you"

Top left: A group at the Altazamuth Stone, Valentia Island. **Top right:** Dominic Foley, Créidhe O'Sullivan and Dean McCarthy at the Tetrapod Trackway, Valentia Island. **Bottom left:** Anita Guiney, Pam Twentyman, Evelyn Cusack, Marie Williams and David Howard at the Valentia Island Heritage Centre. **Bottom right:** Dermot McMonagle and Emily Gleeson at the Telegraph Field, Valentia Island.

What you said….

"Thanks again for organising the very interesting weekend in Caherciveen." J.J. Keating

"Just another thank you to yourself, Morgan, Sinead (the organisers I met) and all the others for a very informative and well organised weekend. All the lectures were fantastic and Evelyn was brilliant and it was great seeing the Observatory. I would like to thank ye all for the help ye gave my mother too during the weekend - it was very good." Hannah Cronin

"Just want to say a big thank you for a great weekend. I live quite close to Valentia Observatory and didn't realise it was of such important significance plus we learned so much about it and the hugely important work that these wonderful people do. Thank you for organising this great event and for keeping us informed and updated with the details and arrangements. I'm sure everyone had a great weekend as it was organised so well. Well done. " Eileen O'Driscoll

"Thank you and the co-organisers and all the contributors for an absolutely great weekend. We all both benefited greatly from it and enjoyed ourselves as well." Prof. Michael O'Connell, NUI Galway

"It was a simply marvellous, marvellous weekend and a great celebration! With much appreciated friendly, warm and enthusiastic atmosphere throughout the proceedings, thanks to you and your colleagues. I think the new Director of Met Eireann is very fortunate to come in to head such a wonderful, efficient and enthusiastic team who all obviously enjoy and take a great interest in what they do. I certainly feel very lucky to have been among you all at this momentous event!" Antoinette Madden

"I am sure you know how much we appreciated all you did to make the week-end such a success. It was a huge task and everything worked like clockwork. We really enjoyed it all and learned a lot. A big thank you from David, Ivan, Mary & myself." Valerie Freeman

"It was a fantastic weekend. well done! " Noirin Sheldon

"Just a quick line to say well done on the Valentia Field Trip. The organization was spot on and everything ran smoothly – at least from the view point of the participants! Both myself and Liam really enjoyed it and he was delighted with his prize of the weather station – I caught him in the process of assembling it at 10pm Sunday night! " Karen Molloy

"Thanks so much for arranging the event, I thought the organisation was first-class and I enjoyed meeting lots of friendly people (always the case in Ireland, of course). Once again, many thanks for a memorable event." Stephen Burt, Royal Met Society

"Just to say thank you (and to all on the committee) for organising what was a fantastic weekend. Both I and the students really enjoyed the outing. I hope there will be a repeat next year!" Rowan Fealy

"The weekend was very good. A great effort was put in by all concerned and all events were very well put together and enjoyable. The weather played its part too!" Kevin Barton

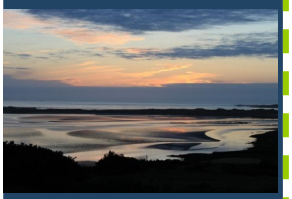
"just a note to say congratulations and thanks for a very professional, interesting, informative and enjoyable meeting/field trip in Cahirciveen last weekend." John Treacy

"Just want to thank you for all your hard work in organising and overseeing the weekend in Cahirciveen. We thoroughly enjoyed it and the detailed organisation was obvious! We found the talks very interesting and whetted our appetites for more!" Phyllis McMonagle

"We thoroughly enjoyed the quiz, the lectures, the tours, further lectures, dinner and the Valentia tour. Everyone we met was also in agreement that it was a great success organizationally.....SO WELL DONE" Brigid Liddy

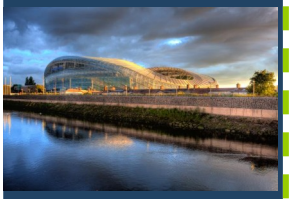
Irish Weather for the Irish Pilot

By Fergal Tierney, Pilot



"Sheppard's Delight"

Photograph taken by Eibhlín O'Leary



"A Ray of Sunlight"

Photograph taken by Shane Murphy

"Fertile Landscape"

Photograph taken by Jennifer Martin

Living, as we do, at a temperate latitude, on the eastern edge of a large ocean, our best laid out plans can often fall foul of the weather, be it the Big Wedding Day, or even just a walk around the block with the dog. Frustrating as this can be, the consequences are rarely worse than having to have the wedding photos taken indoors, or having to put up with the stench of a wet dog in the house! For some activities, however, the consequences can be more serious, and none more so than flying, where poor pre-flight planning can land you (excuse the pun) in more trouble than you'd like. That is why the first and last thing a pilot does before walking out to his/her aircraft is to check the weather, and making that final go/no-go decision based on what he/she sees.

Since earning my Private Pilot Licence (PPL) in 2009, I have been lucky enough to enjoy a unique view of our weather from several thousand feet above our green landscape. This enjoyment is enhanced through knowing that the weather is unlikely to pull a fast one on me up there, as I will have done my planning, and will have a very good idea of what to expect on each leg of the flight. Barring some technical problem, the flight should go to plan, and conditions at my destination should be more or less as anticipated.

So what does this planning involve? A couple of days before a flight, I will study the general weather pattern and how this should evolve towards the time of my flight, using many of the 'freely available' charts on the internet, as well as the www.met.ie forecasts! If it's obvious at that stage that things are looking bad, then I'll think about rescheduling for another time. Things to watch out for are low visibilities and ceilings, moderate to severe low-level turbulence, and the possibility of deep convection or thunderstorms.

As I do not hold an Instrument Rating (which would allow me to fly in clouds), I am only allowed to fly VFR (Visual Flight Rules) in VMC (Visual Meteorological Conditions), which means a minimum of 3km flight visibility for speeds below 140 knots, and 1.5km horizontal/300m (1,000ft) vertical separation from cloud (or clear of cloud and in sight of the surface for uncontrolled airspace).

Aeriel view of Meath, July 2010. Photograph taken by Fergal Tierney.

The arrival of one of our typical frontal depressions can bring the weather down to these limits, with the warm front yielding low ceilings, poor visibility, and low-level turbulence, and the cold front bringing more convective hazards and heavier precipitation, including hail. Behind the cold front we usually get an unstable northwesterly polar maritime flow, which generates the showery conditions for which we are famous. In wintertime, the western half of the country can be affected by these showers at any time of the day, as the warm sea surface temperatures generate enough instability to sustain convection, even through the night. From late spring to early autumn, eastern parts generally get the brunt of the showers, as solar radiation heats the land, and showers build in strength on their west-to-east track across the country. In those cases, morning flights are preferred, before the sun has a chance to get things fired up. For a thunderstorm, it is advised to avoid it by at least 20 miles, especially if flying near its northeast part, where turbulence from outflow is greatest.

Within 24 hours of the flight, the amount of information available to the pilot increases substantially, with TAFs (Terminal Area Forecasts) being issued by the Met Éireann Aviation Services Division at Shannon Airport. These are text forecasts for the individual airports, issued four times a day, describing the conditions expected within a 5 nautical mile radius of the airport for a period of 24 hours. Met Éireann issue 24hr TAFs for Dublin, Shannon, Cork and Ireland West (Knock) airports, as well as 9hr TAFs for Casement Aerodrome. They also issue Local Area Forecasts for the Regional Airports (Donegal, Sligo, Galway, Kerry and Waterford), which are similar to TAFs, but give cloud bases in feet above mean sea level (amsl), as opposed to the TAFs, which give them as feet above ground level (agl).

EIDW 041100Z 0412/0512 19015KT 9999 SCT020

BECMG 0413/0415 18022G34KT BKN015 OVC030

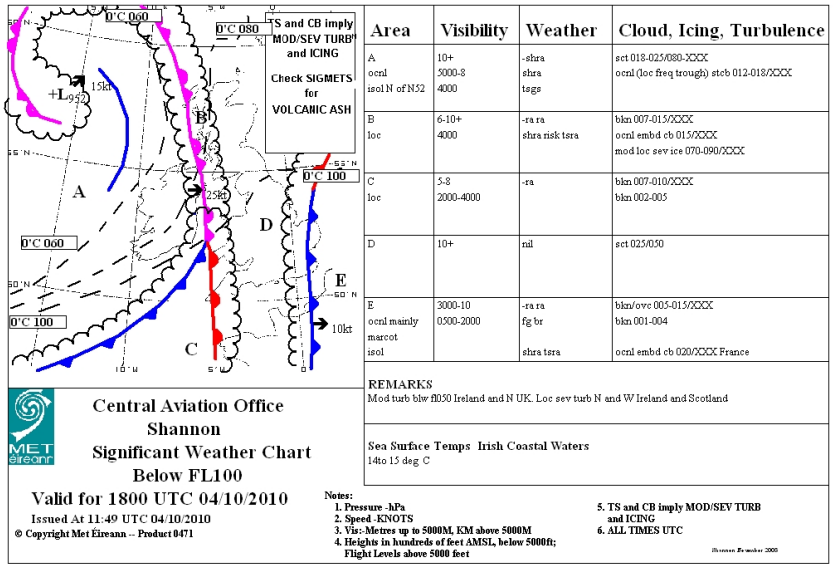
TEMPO 0415/0418 19026G40KT 5000 -RA BKN010

BECMG 0417/0419 23015KT

TEMPO 0418/0421 24018G30KT -SHRA SCT020CB

This code represents a typical TAF for Dublin Airport (EIDW), forecasting southerly winds of 26 knots, gusting to 40 knots, with 5000m visibility in light rain (-RA), a broken cloud at 100ft agl, from 15-18UTC on the 4th.

The meteorologists at Shannon Airport also generate graphical Low-Level Significant Weather Charts four times a day, which contain the positions of fronts, troughs, and freezing levels, outlining different areas of distinct weather below Flight Level 100 (10,000ft). There is a table describing in detail the conditions expected in each of these areas, including visibility, weather type (light/moderate/heavy rain/showers, snow, thunderstorms, mist, fog, etc), cloud genus, cloud base and tops, icing, turbulence, and any other information important to a pilot - for example the presence of mountain waves, etc. They also generate Spot Wind charts for the same times, giving wind direction, speed, and temperature at different levels (2,000ft, FL050, FL100, FL180, FL240 and FL300) for various latitude/longitude gridpoints.



Sample Met Éireann aviation chart.

These two charts are invaluable to a pilot, as they are specific to Ireland and are generated by knowledgeable forecasters who are in tune with the peculiarities of Irish weather. They are also generated less than 6 hours in advance, and so benefit from the latest information at hand. The Spot Wind chart is important in flight planning calculations, where the air temperature is used to calculate True Air Speed (TAS - the actual speed of the aircraft through the air), and wind data are used to calculate Ground Speed (the actual speed over the ground - this is less than TAS if flying into a headwind, greater if flying with a tailwind). For each leg of the flight, the distance is divided by this ground speed to give the flight time, and hence the fuel required for that leg. It's obviously important to get this calculation right and err on the side of caution, as there is a famous saying in aviation - "There's nothing more useless than fuel left in the fuel truck!"

Actual airport observations are given in METAR (METeorological Aviation Report) format every 30 minutes. These are similar to the TAFs, including wind direction and speed, visibility, weather, cloud bases, temperature and dewpoint, QNH (Question Nil Height), and any other information, such as runway conditions, windshear reports, etc. It is important to compare these reports with the TAFs to see if conditions are better or worse than expected, which can be a factor in making a final decision. These reports are also important in calculating aircraft performance data, including runway distance required for takeoff and landing. The warmer and more humid (less dense) the air, the lower the engine power generated, and the longer the runway required. A stiff headwind will reduce the groundspeed and hence runway required, which is why aircraft always take off and land into the wind, where possible.

EIDW 041430Z 19019G32KT 160V220 9999 SCT030 16/09 Q0990 NOSIG

The above is a typical METAR for the same time as the TAF on the previous page, showing actual conditions at 1430UTC: southerly wind of 19 knots, gusting 32 knots, >10km visibility, temperature 16°C, dewpoint 9°C, QNH 990hPa, with no significant change predicted before the next report. All of the above meteorological data, plus more, such as all of the regular www.met.ie hourly observations in Psuedo METAR format, are available on Met Éireann's Met Self Briefing System (http://briefing.met.ie), a free service for pilots of all levels, from microlight to A330 Captain! It has been available online for the last couple of years, and is a welcome addition to the vast ocean of resources available.

Once the charts have been studied, the TAFs and METARs consulted, the performance data calculated, the latest radar and satellite loops checked, and the 'GO' decision made, that does not mean my job is done regarding the weather. Far from it. The most important weather picture is the one I get out of the windscreen, so I am always on the lookout for signs of deterioration along the route. Is that warm front moving in earlier than forecast? Are the cloud bases lower than what the TAFs and Sig Weather chart said they would be? What about the wind? Is that headwind stronger than forecast? If so, then I need to recalculate my fuel requirements now, and decide whether I'll need to make an unscheduled fuel stop along the way. There is no point in waiting until the last minute, adding unnecessary pressure on myself when I should be concentrating on flying. That's when accidents happen.

In Ireland, as with any other country, no forecast is ever 100% certain, and things will sometimes turn out to be slightly different than forecast, especially the upper level winds. But ninety nine times out of a hundred, if proper pre-flight planning is done, and a continuous watch from the cockpit is adhered to, the trip will be an enjoyable one without any hitches. Flying has given me the opportunity to incorporate the two passions of my life - meteorology and aviation. We live in a beautiful country, and are lucky to not suffer from the many severe weather events that other countries play host to. There is nothing quite like flying up the Wicklow coast on a fine day, heading towards the city, and along the Liffey to Weston. Or making a final approach over the Atlantic to land on Runway 11 at Sligo. There are many more trips I plan to make around our island, but with "plan" being the operative word.

As the saying goes - Poor Planning Provides for Poor Performance!

"Unusual Cloud Formation" - photograph taken by Karen Whyte.

An Evening with Dr Aidan Nulty

By Dr Emily Gleeson, IMS Committee and Met Éireann

Dr Aidan Nulty spent 32 years working as a weather forecaster in Met Éireann before putting down his 4B pencil in April 2010. The Irish Met Society was delighted when Aidan offered to give an evening lecture. The idea for an interview type lecture soon took hold and Gerald Fleming, Head of Forecasting in Met Éireann, kindly agreed to interview Dr Nulty.

Before a full house of 140 people, Aidan described his days in UCD as a physics student and was delighted to see 3 of his former lectures in the audience (Dr Tony Scott, Dr Ann Breslin and Professor Alex Montwill). From tales of Phosphorus combusting, he went on to describe his early days in Met Éireann (based on O'Connell Street then) when it took 3 days for weather data to arrive by post.

He gave interesting accounts of forecasting failures including the Big Snow of 1982 and the August Bank Holiday weekend of 1997, and kept the audience entertained with tales of a mouse running across the table during a broadcast, meeting "fans" at the Ploughing Championships and almost missing a radio broadcast.

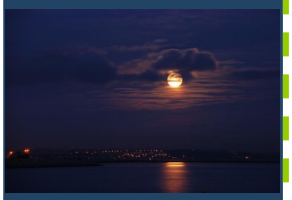
After the formal interview part of the evening, the audience took over the question session, with some of the questions even directed at Gerald Fleming. Aidan was asked whether he could forecast the winner of the Grand National, if he misses Met Éireann and with the country being battered by stormy weather, it was inevitable that questions about severe weather and flood forecasting arose.

It was wonderful to see a large group of present and past Met Éireann staff in the audience. He is truly missed from the workplace but promises to be a regular at Irish Met Society events.

Happy retirement Aidan!

"Ominous Sky"

Photograph taken by Seán Rooney



"Moon Rise over Salthill"

Photograph taken by Andrea Zipoli

Top left: Aidan Nulty, Evelyn Cusack and Aodhagán Roddy. **Top right:** Gerald Fleming, Ann Breslin, Aidan Nulty, Evelyn Cusack, Alex Montwill, Ray Bates, Tony Scott, Tom Keane, Declan Murphy, Michael McAuliffe, Eamon Murphy, Séamus Walsh. **Bottom:** Some of the current and retired Met Éireann staff.

Working for the Environment with An Taisce's Green Schools

By Mieke Scholte, Green-Schools

A Green-School at work

It is Friday morning and the entire school community, students and staff, move into one big classroom. It is time for the weekly Green-Schools meeting. In this school all 65 children are members of the Green-Schools Committee and together they decide how they want to carry out the Green-Schools programme in their school. Everyone (from junior infants to 6th class) has a voice and a vote. The younger children might not fully understand what it is all about initially but will learn by osmosis and quickly pick up the ethos of the environmental programme. Before long, innovative ideas are born and enthusiasm levels are high. The 6th class chairman leads the meeting and delegates reporting to the committees.

The Litter and Waste Committee, in charge of keeping the school litter free, reports that there is no more litter in the schoolyard because the secondary school next door now also has started the Green-Schools programme.

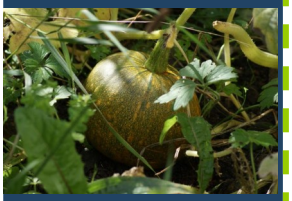
The Energy Committee calculated the electricity and oil used this week after reading the electricity meter and the oil gauge. One committee member is concerned as the oil usage this week has gone up; was it colder outside or were doors and windows left open?

The Water Committee is happy; after reading the water meter they calculated that the weekly water usage has gone down further. The dripping taps have been fixed and everyone remembers to turn off the taps after washing their hands.

Finally, the Travel Committee reports that almost all children took part in this week's WOW (Walk on Wednesday) day, meaning they walked to school the whole way or took part in Park&Stride (drive part of the way and walk the rest).

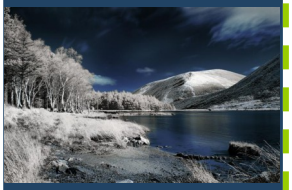
Following the reporting, pupils exhibit the useful items and creations they have made out of recycled materials and discuss what they will do for their Action Day. They decide to investigate the possibility of all students and staff bringing their bikes and having a cycle through the town for the older children. Also, cycling games are planned for the younger students. This means finding out about a safe route, asking the gardaí on bikes to accompany them on their cycle and inviting parents, former teachers, cycling enthusiasts, town councillors and the press. Afterwards they are hoping to have a healthy picnic

Water Workshop with Lorraine Flangan (Development Officer with An Taisce).



"Almost Ready"

Photograph taken by Anthony Groome



"Glentanassig Woods"

Photograph taken by Brian Carlin

St Francis Boys school exploring Clara Co. Offaly by bike.

in the school garden. It sounds like fun! They divide up the tasks and promise to report to the meeting the following week.

What is Green-Schools?

It might or might not happen this way as every school will design the Green-Schools programme to their own needs. So what is this Green-Schools programme that was initiated by the Environmental Education Unit of An Taisce - The National Trust for Ireland and carried out in partnership with Local Authorities?

The introduction on the Green-Schools website www.greenschoolsireland.org says:

"Green-Schools, known internationally as Eco-Schools, is an international environmental education programme, environmental management system and award scheme that promotes and acknowledges long-term, whole school action for the environment.

Unlike a once-off project, it is a long-term programme that introduces participants (students, teachers, parents and the wider community) to the concept of an environmental management system. However, Green-Schools is far more than just an environmental management system. It fosters a strong sense of citizenship and leadership among participants that spreads far among teachers, students and the wider community to reach a common high level goal. It flattens and democratises school management structures. It brings children into the decision-making process and makes them responsible for their decisions and actions. In fact it could be best described as being 'more than the sum of its parts'.

The aim of Green-Schools is to increase student and participant awareness of environmental issues through classroom studies and to transfer this knowledge into positive environmental action in the school and also in the wider community. Schools that have successfully completed all the elements of the programme are awarded the Green-Flag. This award has now become a well-recognised Eco-Label. The award has to be renewed every two years.

Green-Schools (Eco-Schools) is an initiative of, and co-ordinated on an international level by, FEE (Foundation for Environmental Education). Currently, the Programme is being implemented by 46 delegations in 43 countries around the world, involving 27,000 schools, 6,000,000 students, 400,000 teachers and 4,000 local authorities."

How does being a Green-School work?

The Green-Schools programme takes a themed approach to environmental education. New schools start with the first theme of Litter & Waste. A Seven Steps approach assists them in implementing the programme over 2 years. This approach (or you could say the seven steps) involves appointing a Green-Schools Committee, carrying out an environmental review, developing an action plan, monitoring of progress and making adjustments if needed, learning more through relevant curriculum work and involving the wider community and developing a code to act as the School's Environmental Mission Statement.

After a successful Green-School assessment, the Green Flag is awarded and the school moves on to the next theme, while maintaining the previous one.

This means that a school working on the fourth theme towards more sustainable travel has been in the Green-Schools programme for at least six years and been working on Litter & Waste, Energy and Water. Some schools have now started to move to the fifth theme of Biodiversity.

The successes of the Green-Schools programme

More than 2,000 Green Flags have been awarded to date and many children have become enthusiastic campaigners for the environment. It is not unusual that children moving to secondary level initiate the programme in their new school. Last February brought another achievement when University College Cork received a Green Flag as the first third level institution in the world to receive the award. Students and staff worked together in a unique partnership on the Green Campus programme. Since then more third level institutions including the Templemore Garda Training College have signed up for the programme.

Also, the economic benefits of the programme are substantial. Recent research on the economic value of the Green-Schools programme to schools in Ireland has revealed a saving of a minimum €2 million in waste, electricity, water and fuel costs this year. The results reveal a minimum of 12 tonnes of waste diverted from landfills in Ireland every school day by schools undertaking the programme, 3.7 million units of electricity saved this year in addition to 200 million litres of drinking water plus 500,000 litres of transport fuel. Because the programme also involves the wider community, the overall savings are undoubtedly substantially more.

Want to find out more?

If you are interested in the programme but not connected to a school, you could get involved in the Green Homes programme or the National Spring Clean with your community. You will find information on these programmes and more on the Green-Schools website www.greenschoolsireland.org.

You can also contact An Taisce's Environmental Education Unit in Dublin by telephone on 01 4002202 or e-mail greenschools@antaisce.org .

One step, two step
Use your feet
Three step, four step
walk the street.
Off to school,
work or the shop.
Don't take the car
run, jump or hop

Scoil Muire Banrion Edenderry's chant on their first WOW-Walk on Wednesday.

Green-Schools green flag.

Evening Lectures 2011

By Dr Emily Gleeson, IMS Committee and Met Éireann

We have held 5 lectures so far this season (2 in Dublin and 3 in Caherciveen). We will hold 4 evening lectures after Christmas, as well as a conference event in Maynooth, Co. Kildare on March 26th (see page 30 for details).

Some dates for your diary:

January 20th 2011:

"Solar Disinfection of Drinking Water - Saving Lives with Sunlight"

By Dr Kevin McGuigan, RCSI (joint lecture with the Institute of Physics)

Venue and Time: Royal College of Surgeons, Dublin, 7pm

February 10th 2011:

"Commissioners of Irish Lights and Lighthouses of Ireland"

By Eoghan Lehane, Commissioners of Irish Lights

Venue and Time: Custom House, Dublin, 6.15pm

April 14th 2011:

"Numerical Weather Prediction"

By Prof. Fedor Mesinger, University of Maryland

Venue and Time: Custom House, Dublin, 6.15pm

May 12th 2011 (IMS 30th Anniversary Lecture):

"The Greenhouse Effect & Global Warming"

By Prof. Ray Bates, UCD Meteorology and Climate Centre

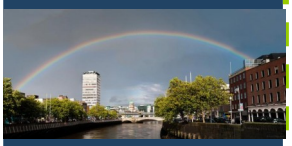
(Ray Bates founded the Irish Met Society in 1981)

Venue and Time: RDS, Dublin, 7pm

A Summer of Atmospheric Studies in Dublin

By Paul Alexander, School of Geography, UCD

An overview of a joint partnership, between the UCD School of Geography and the NUIM Department of Geography, on pursing the effects of Dublin's urban canopy on the atmosphere, is given in this article. The research partnership is co-ordinated by Dr Rowan Fealy and Dr Gerald Mills.



"Dublin—September 2010"

Photograph taken by Noel Hills

This study, led by Paul Alexander (UCD) can be broadly viewed as a revisit of Dublin's Urban Heat Island (UHI). The UHI is essentially a pool of warmer air originating from the city. It is primarily due to the modification of the land surface by urban development (increased surface absorption), with anthropogenic "waste heat" generated by energy usage (heating, cooling and combustion) as a secondary factor. When this was first studied in Dublin by Sweeney (1987), it was discovered that UHI intensity favoured built-up areas within the inner-city and was strongest at night. This was verified by Graham (1993) where a difference in summer of 4-8°C was reported between the inner city and surrounding outer suburbs. Traditionally, this has been the method for studying urban heat island intensity, where UHI peak intensity is approximately equal to the maximum difference in "urban" temperature and "rural" temperature.

This method, while showing some appreciation for spatial variations, grossly oversimplifies the complex relationship between the urban canopy and the atmosphere. For instance, in the traditional view of "urban" and "rural" we can see an immediate problem, namely that Dublin's inner "urban" area is far from homogeneous. Graham attempted to solve this problem by further classifying Dublin areas as either "open" or "built up" spaces.

The method employed in this study involves further dividing Dublin into "local climate zones (LCZ)" (Stewart and Oke, 2009) in which an appreciation is given to:

1. The underlying land surface properties (permeable, non-permeable, albedo, presence of water bodies, vegetation etc.)

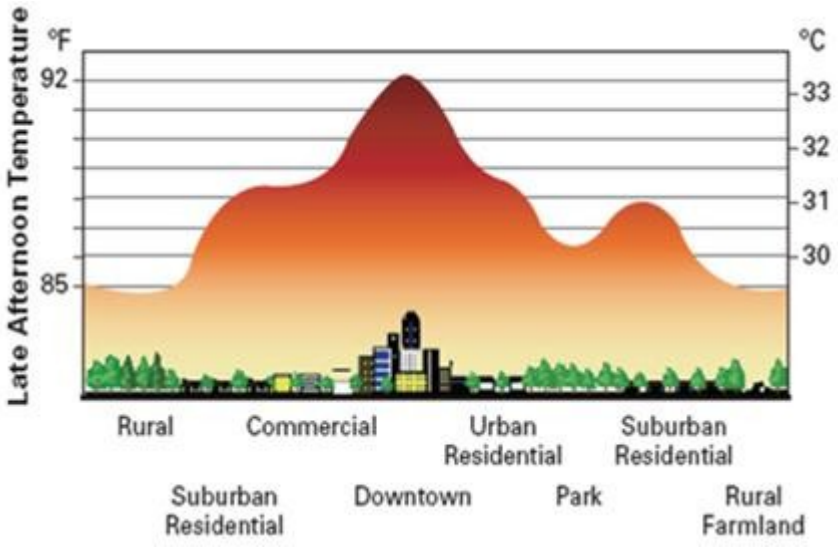
2. The built environment (building density, height, width, material etc.)

3. The impact of (1) and (2) on the local atmosphere within the canopy layer.

[See figure below and top figure on page 29]

This method is the first attempt at an holistic view, and should illustrate the degree of climatic modification experienced by the atmosphere.

Davis Vantage Vue weather station positioned at 15 sites around Dublin.



Example of late afternoon temperature as a function of Local Climate Zone (LCZ).

Perhaps the return to the work done by Sweeney in the midst of the depression during the 80s is strangely fitting. Now two decades later, it may be possible to see the impact of the development of the IFSC for example. To quantify this, meteorological stations were placed within the LCZ in mid-July and the data are currently available on-line (see initial results below; contact IMS for author details and access to the data).

In the IMS Spring Newsletter, it was reported that one such station had been given to St. Pius X Girls National School, Terenure. However, this is only 1 of 14 new stations that are currently deployed around the city in primary school locations within different LCZ.

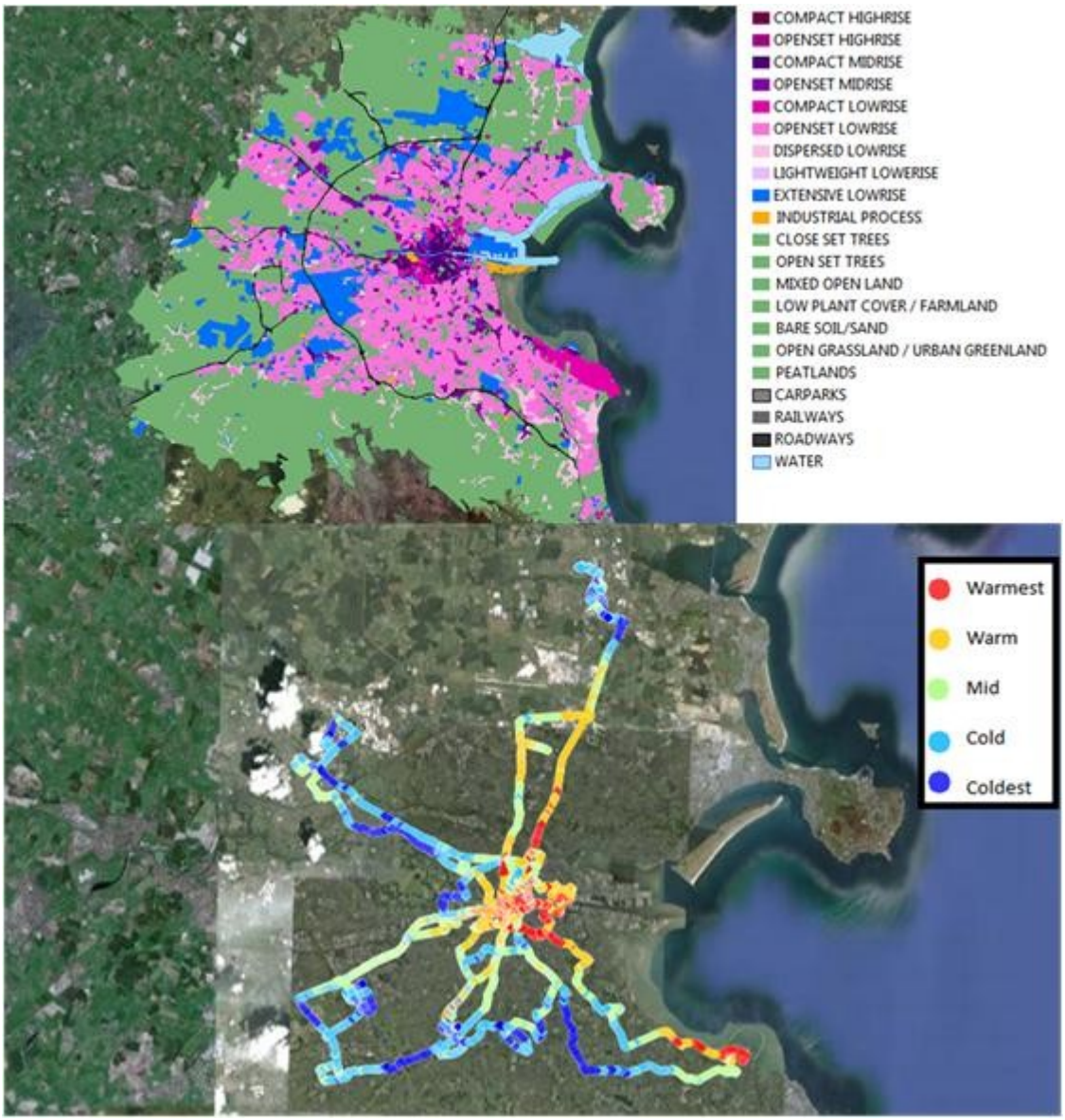
With such an array of uniform stations, strategically placed across the city, the range of further research possibilities is endless (spatial variation of precipitation across Dublin for example) and the author hopes to keep IMS informed of progress.

References

Graham, E. (1993): The Urban Heat Island of Dublin City during the Summer Months, Irish Geography, 26, pp. 43-57.

Stewart, I.D. and Oke, T.R. (2009) 'Local Climate Zone Classification System', The seventh International Conference on Urban Climate, Yokohama, Japan.

Sweeney, J. (1987) 'The Urban Heat Island of Dublin City', Irish Geography, 20, pp.1-10.



Top: Local Climate Zones of Dublin **Bottom:** Initial results of new UHI study.

Irish Met Society Conference 2011

By Dr Emily Gleeson, IMS Committee and Met Éireann

BOOKING OPEN NOW

We were delighted with the turnout and feedback from our conference in the National Botanic Gardens last March so we have decided to arrange another conference for March 2011. It will be held in the newly built Iontas Theatre in NUI Maynooth, Co. Kildare.

Chris Bean will give a lecture on volcanoes, Katie Howard will describe a day in the life of a weather forecaster, Peter Lynch will focus on "Weather Conditions and the Course of History" while John Sweeney and Duncan Stewart will discuss climate change topics.

As well as the lectures, there will be an opportunity to visit the National Science Museum of Ireland (located on the south campus of NUI Maynooth) and to take a guided tour of the historical old campus.

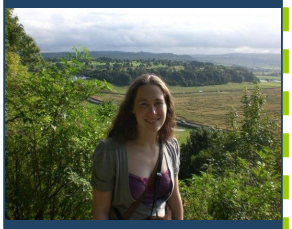
Registration is now open. The members' rate is just €7.50 (and includes lectures, tours, tea breaks and conference booklet). The rate for non-members is €15 while entry for anyone presenting a research poster is free. You may contact us at info@irishmetsociety.org for further information or to register to present a poster.

You may register for the event through our website www.irishmetsociety.org or by posting a cheque to:

Irish Met Society
c/o Met Éireann,
Glasnevin Hill,
Dublin 9.

Interview with Katie Howard

By Morgan Geraghty, IMS Committee and Met Éireann



Katie Howard

When did you first become interested in meteorology?

When I was studying physics at Sheffield University, I wasn't sure what to do and researched career options; it seemed interesting!

What is your job title and can you give us a synopsis of what your job entails?

Aviation/Commercial Forecaster – I produce weather forecasts for both Aviation (Pilots, Balloonists, Gliders etc) and Commercial (BBC scripts, utility companies, construction etc) for the Met Office. I also answer ad hoc enquiries and have been mentoring new trainees.

Have you an opinion on climate change and the current challenges to climate science?

Well I would say that the climate is changing and one of the main challenges is getting a consensus on what we should do and what to believe. It's all mixed up with the argument on pollution and fossil fuels so it's confusing with conflicting ideas.

What weather proverb would you stake your reputation on?

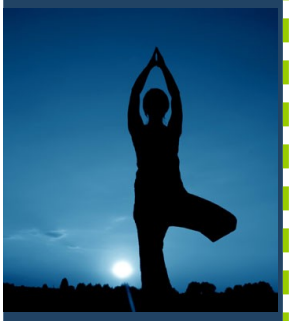
I wouldn't stake my reputation on it but I quite like "Cold is the night when the stars shine bright."

What type of weather most interests you?

I enjoy most of it, but visibility such as fog is very challenging and I quite like thunderstorms!

What is your favourite anecdote/joke about the weather?

We had a guy call us once asking what the winds at 200ft had been the day before, the direction and all kinds of really fine detail. When asked why, he said that he'd been doing some aerial photography, with his camera attached to a balloon on a rope, the rope had snapped and he want to try and work out where it would've landed! The best bit was the wind was going out to sea and he was on the coast...



What other interests do you have outside Meteorology?

I like lots of things. Currently I'm learning Italian, enjoy yoga, do quite a lot of travelling, am doing a form of self defence called Krav Maga and sky-diving.

Who would you like to have at your dream dinner party?

All my friends from around the world that I don't get to see very often. I don't really care about celebrities or famous historical characters.

What changes do you see happening in the UK Met office over the next 10 years?

I'm not sure. I don't think we'll be moving from Exeter any time soon. I think we'll increasingly have to compete with private companies.

Ireland's National Biodiversity Data Centre

By Stefanie Fleischer, National Biodiversity Data Centre

National Biodiversity Data Centre, Waterford

Photograph taken by Stefanie Fleischer

The National Biodiversity Data Centre is based in Carriganore, Waterford on the West Campus of Waterford Institute of Technology. It was launched in January 2007 and is dedicated to the collation, management, analysis and dissemination of data and information on Ireland's biological diversity.

Data on biodiversity are becoming increasingly important for biodiversity/ habitat protection, land use and aspects relating to climate change. To date the database of biological records holds more than 1.4 million records for 8887 species in Ireland. These databases (both fauna and flora) are updated regularly and the Centre promotes free and universal access to biodiversity information available on their website at www.biodiversityireland.ie.

Whilst the Centre acts as a collection point for biological records, it has also adopted a thematic approach to data collection. In relation to climate change, the National Biodiversity Data Centre has established a number of projects. The Invasive Species database holds records showing the distribution of such species and acts as an early warning system with species alerts. This database is updated on a regular basis.

The National Vegetation database will be used as a baseline for monitoring changes in the future and will give an indication of how Irish plant-life is changing over time. It will also assist in the implementation of the Habitats Directive.

Under the Convention of Biological Diversity, the European Environment Agency recommended a set of biodiversity indicators to monitor biodiversity. One of these indicators is the butterfly, chosen because it is not only a food source for birds and other animals, but also because it is an important pollinator.

Peacock butterfly (Photograph by Stefanie Fleischer).

Butterflies have short life cycles and are sensitive to climate and environmental change and are thus ideal biodiversity indicators. The Irish Butterfly Monitoring Scheme was established in 2007 with the support of Butterfly Conservation in the UK and Butterfly Conservation Europe. To date 15 countries in the EU have adopted a national butterfly monitoring scheme involving the transect method.

Monitoring butterflies by the transect method involves a fixed-route walk with recordings being taken on a weekly basis from April to September. It is essential that the walk is a fixed route, as this enables direct comparisons and trends of butterfly occurrences on a year to year basis. These data, together with information on the sites and weather variables (temperature, sunshine amount, wind speed and wind direction) at the time of recording, are used for analyses and trend projection.

The Irish Butterfly Monitoring Scheme started off with just 7 sites in 2007, this increased to 69 sites in 2009 and to date there are in excess of 130 sites registered for this year. During 2009, data were collected from 69 transect sites around Ireland and over 31,300 butterflies were recorded for 30 of the 33 species in Ireland.

Butterfly populations can vary from year to year, but the summer of 2009 will be remembered by nature enthusiasts for the record numbers of painted lady. This mass migration from Morocco was triggered by a series of events: heavy winter rainfall in Morocco resulted in abundant food plants in mid-February for thousands of Painted Lady caterpillars to devour. Favourable anti-cyclonic winds then facilitated the mass migration of newly emerged butterflies first of all to Spain in April, followed a couple of weeks later to France, then the UK and finally to Irish shores on warm south to south-easterly winds during the last May weekend.

Painted Lady caterpillar (Photograph taken by Stefanie Fleischer).

Environmental and climate changes not only affect populations of native species, but can also have an effect on the way new, foreign species invade an area and become established. These new species may adapt in a changing world, bringing with them the possibility of added risks to health (human and animal) and agriculture. To this purpose the National Biodiversity Data Centre is collating data for a number of species, such as mosquitoes, fleas, leatherjackets and micro-moths, that may pose health and agricultural risks in the future.

For example: the Asian tiger mosquito, a native of Southeast Asia, has already become established in Europe and has adapted very well to cooler conditions. It can transmit several disease pathogens (Chikungunya virus, West Nile virus) and its spread across Europe is being monitored by the European Centre for Disease Control.

Asian tiger mosquito (Wikipedia).

Leatherjackets are the larvae of craneflies. Whilst the adults are harmless, the caterpillars are an agricultural pest and not only are they one of the three main pests that affect barley, but they also eat roots and seedlings of grasses, tubers and vegetables. The damage they inflict on crops is compounded by a preceding mild and wet spring.

Leatherjacket (Wikipedia).

Another way to monitor nature, and thus the effect of climate change, is to record the dates of early/late sightings of species. The phenology group at Trinity College Dublin are running a website (hosted by the National Biodiversity Data Centre) that encourages the public to submit their records on early/late sightings for a selection of various plants/insects/birds (see page 34).

The National Biodiversity Data Centre also hosts regular workshops from April to September, which are open to anyone interested in the various aspects of biodiversity. As this year was International Year of Biodiversity, the Centre initiated Biodiversity Bingo, a new fun event to encourage people to record species in the locality and submit the records to the Centre. Biodiversity Day (22. May) was celebrated by holding a BioBlitz at six locations around the country to see which site could find the most species within a 24 -hour period. To see the results of the site that won, as well as the other sites and details of the workshops and Bingo, please visit our website!

To conclude, it would be remiss not to mention the annual Recorder's Event hosted by the National Biodiversity Data Centre. This event takes place at the end of August with a different theme each year. To commemorate International Year of Biodiversity, the theme this year was ' Biodiversity Knowledge Quest'. A group of eminent scientists presented their views on the current state of Ireland's biodiversity, focusing on knowledge gaps and how these can be remedied in the future by means of strategic biodiversity management.

Nature Watch: Rising Spring Temperatures throwing Nature out of Step

By Dr Bridget O'Neill, Centre for the Environment, Trinity College Dublin

Nature Watch is a phenology monitoring website for Ireland - a place where you can report when you see the first leaves in spring, the first bumble bee in your garden, hear the first cuckoo or see the last leaf fall from your birch tree in Autumn.

Photo courtesy of Sannse (barn swallow), Wikipedia.

Irish trees, birds, and insects have been affected by rising spring temperatures over the past 30 years according to a study by a group of EPA-funded researchers in Trinity College Dublin. Led by Dr Alison Donnelly, the phenology research group is looking at changes in the phenology of Irish species in response to climate change.

Phenology is the study of life cycle events, such as animal migration and plant leafing and flowering. The group's research shows that trees, such as beech and poplar, have been leafing earlier in recent years than they were 30 years ago, that birds such as the swallow and cuckoo are arriving to Ireland earlier in spring and that insects such as the brimstone moth and flame carpet moth are not only appearing earlier, but are also exhibiting longer flight periods. The research has shown that the earlier occurrence of these events is related to rising spring temperature which is associated with global warming.

An exciting new website called Nature Watch has been developed in collaboration with the National Biodiversity Data Centre. This website (http://phenology.biodiversityireland.ie/) invites members of the general public to participate in a national search for phenological data.

This Citizen Science project requests interested parties to record the date on which they see the first bird, the first insect, leaf fall and other phenological events in their surrounding environment throughout the year. The results of this research will give us a national view of when the seasons are occurring, and over the years will enable us to determine if advances in seasonal events between interdependent organisms, such as birds and their insect food resources, are remaining in sync.

Photo courtesy of Tim Lenz (northern wheatear, non-breeding plummage), Wikipedia.

Nature Watch is part of a growing number of websites across the world which relies on nature lovers to contribute to scientific research. Throughout the USA, UK, Sweden and the Netherlands citizen scientists record phenological events throughout the year. We hope to shortly extend our website to display the data live on interactive maps!

Please visit the site http://phenology.biodiversityireland.ie/, or contact Dr Alison Donnelly if you have any questions Alison.Donnelly@tcd.ie.

From Dublin to Svalbard: A Glaciologist's Story

By Jonathon McGovern, Swansea University, Wales

"New Energy in an Old Land"

Photograph taken by Ian Michael

I completed a masters degree in Meteorology in UCD in 2007-2008. It was at just about the right level and there was a good atmosphere within the group. I am currently in my third year of a Ph.D. in geography, within the glaciology group, at Swansea University, UK.

I am working in the GLIMPSE group, which was set up to understand the dynamics and evolution of the Greenland ice sheet and its outlet glaciers in order to predict its contribution to sea level rise. The estimated sea level equivalent of Greenland is 7 metres. Current atmospheric-oceanographic models do not take sea level rise due to ice sheets into account.

My research deals with the sensitivity of the whole of the Greenland ice sheet through numerical modelling. The equations used in ice sheet models are based on continuum mechanics and are of the same format as those in dynamical meteorology.

The aim of my project is to explore the sensitivities of the volume of the ice sheet to various parameters, in particular the geothermal heat flux and sliding at the base, and to see which areas of the ice sheet are data poor. The adjoint method is another method that has been extensively used in coupled atmospheric and oceanographic models, but not so in ice sheet models, apart from a few (for example the SICOPOLIS model). I have done preliminary sensitivity tests by running the Glimmer finite difference ice sheet model, which is coded in Fortran. My research has shifted to using the adjoint model to get sensitivities. A motivation for using this method is that it requires less computer power than finite differences. I have coded a simple thermo-mechanical ice sheet model that takes basal sliding into account. Special automatic differentiation tools are used to get the adjoint of a certain code. I am currently modifying the code so that it can be used with a tool that is used to get the adjoint method. Once I have it, I will apply it to the Greenland ice sheet and test its applicability to the original finite difference sensitivity tests. If time permits, I will see which areas are devoid of data.

Because of the modelling nature of my project, I do not do any field work in Greenland. Nevertheless, I have had the opportunity to travel. In my first year, I spent two months in Svalbard taking general glaciology courses. The field trips to various calving glaciers on snow scouters, the northern lights and the freezing conditions of the Arctic made it a place I will never forget. I have also worked as a research field assistant on Storglacierian, in the Swedish arctic for three weeks. We were doing ground penetrating radar, in order to establish the water content differences within the glacier. I have also attended a summer ice sheet modelling school in Portland, and have worked with someone who uses adjoint tools in Massachusetts Institute of Technology (MIT).

Photography 2010

By Dr Emily Gleeson, IMS Committee and Met Éireann

For the second year running, the Irish Met Society held a photography competition. This year IMS was delighted to receive 446 entries.

Like last year, the standard was extremely high which made it difficult for judge Brendan Noonan to whittle the entries down to the final 10 and eventually the top 3.

This year's winning entry is a beautiful depiction of the McGillycuddy reeks in Co. Kerry taken by Robert Riddell from Galway. The combination of snow-capped mountain tops, cloud formation and colour contrast ensured that this image achieved first place.

Sean Tomkins' "Early Morning" photograph was a close runner-up. Another of Sean's images achieved 5th place.

The third place entry also involved Kerry mountains as Noel O'Neill captured the "10th Cross on Mount Brandon" on a snowy New Year's Day 2010.

The Irish Met Society would like to thank all participants. Many of the images appear in this newsletter and the full collection can be viewed in the image gallery on our website:

www.irishmetsociety.org.

Winner: "McGillycuddys" by Robert Riddell.
(location: Co. Kerry)

2nd Place: "Early Morning" by Sean Tomkins.
(location: Derryclare, Connemara)

3rd place: "10th Cross on Mount Brandon" by Noel O'Neill.
(location: Co. Kerry)

4th place: "Boat, Still & Mist" by Anthony Byrne.
(location: Killarney National Park, Co. Kerry)

5th place: "On the Burren" by Sean Tomkins.
(location: Co. Clare)

6th place: "Winter Landscape From Mount Leinster" by Terry McParland.

7th place: "Wintry One-tree Wonderland" by Paul Gallagher.
(location: Co. Donegal)

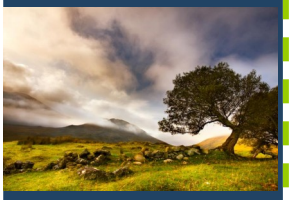
8th place: "Barnaghgera" by Gavin Collis.
(location: Co. Dublin)

9th place: "Evening Tide" by Thomas Quilty.
(location: Garrarus, Tramore, Co. Waterford)

10th place: "Salterstown Evening" by Richard Hatch.
(location: Co. Louth)

"Fields of Gold"

Photograph taken by Alice Daly



"Lough Na Fooey"

Photograph taken by Conor Ledwith

"Sun Set Boora"

Photograph taken by Martin Roberts

APT Satellite Reception (part 1)

By Ron Hahn, IMS member

In the fast-paced, technology-driven world we live in, it is difficult to believe that a technology for the observation of the weather and our earth's climate has been around for nearly three generations.

The automatic picture transmission (APT) system is just one such system. On April 1, 1960, the world's first APT satellite was launched into orbit by the National Oceanic and Atmospheric Administration (NOAA) for the dissemination of atmospheric imagery. Today, using a relatively low-cost aerial, receiver, and personal computer, a receiving station located anywhere in the world can freely receive local imagery several times a day as the satellite passes overhead.

NOAA, an agency of the US Department of Commerce, sponsors the currently active generation of polar weather satellites that pass over Ireland. A typical mid-day satellite pass travels in an arc from the south-eastern horizon to the north-west horizon, and lasts 10-15 minutes depending on the location of the satellite relative to the receiving station. The satellites travel in a polar orbit, circling the earth over the north and south poles. Figure 1 shows the display of pass-prediction software with NOAA 17 approaching the equator on an evening pass.

The reception process is straightforward, requiring just four main components for a complete receiving system: circular-polarised aerial, receiver, personal computer, and data processing software. The aerial is normally located as high up as possible, to ensure maximum coverage at the horizons. Today's fully automatic reception systems use a dedicated receiver, with frequency control and image decoding provided by the host computer.

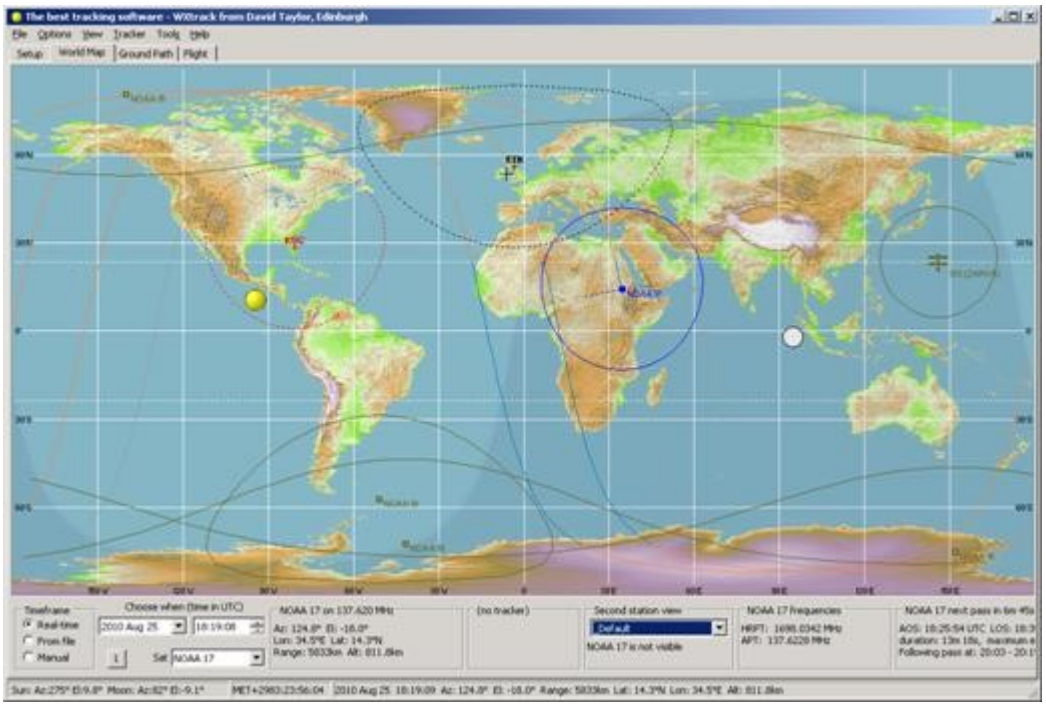


Figure 1. Pass-prediction software with NOAA 17 approaching the equator on an evening

The processing software controls:

- the satellite pass prediction, using Kepler elements
- the receiver channel selection, based on the satellite to be received
- the recording of the incoming images to an audio file
- the decoding of the audio file into a usable "raw" image
- the post-processing to extract useful information from the raw image.

Figure 2(a) shows the raw, unprocessed grey scale image received from a typical satellite pass. The left-hand image is of visible wavelengths, and the right-hand image is of infrared wavelengths. These images were acquired from the noon-time NOAA 19 satellite pass on August 22nd from the author's own receiving station in Rosslare, Co. Wexford.

Figure 2(b) shows a fully processed, false colour image using the combined information contained in the near-infrared (Channel A:2) and the thermal-infrared (Channel B:4) channels. This image was processed using multi-spectral analysis (MSA) to produce the false-colour image. It applies a colour map to the channel 4 (IR) image to colour the sea blue and land green. High clouds appear white, lower clouds grey. Warmer regions appear darker in colour. Some interference can be noted in the image. APT utilises an analogue reception process and therefore is subject to natural and man-made interference just like your broadcast radio. For the observer, interference-free pictures is one of the challenges of receiving APT.

Figure 2(c) is the same false colour image in figure 2(b) with additional processing added to show precipitation. High clouds are coloured to give an approximate indication of the probability and intensity of precipitation. In this particular image, heavy rain cloud lingered off the south-west coast of Ireland for approximately 24 hours before trending north east over the country.

Can we get better general purpose imagery than this? Yes, there are other satellite imagery systems available to the amateur enthusiast but, in the author's view, APT is a great entry-level way to get one's "feet wet" in satellite imaging. It opens a new, relatively inexpensive avenue for the weather observer to see and interpret what's happening in the atmosphere in near-real time. In a subsequent article, I will be delving further into the mechanics of putting together a complete receiving station, collecting the data, and post-processing techniques. Until then, may all your weather observations be rewarding.

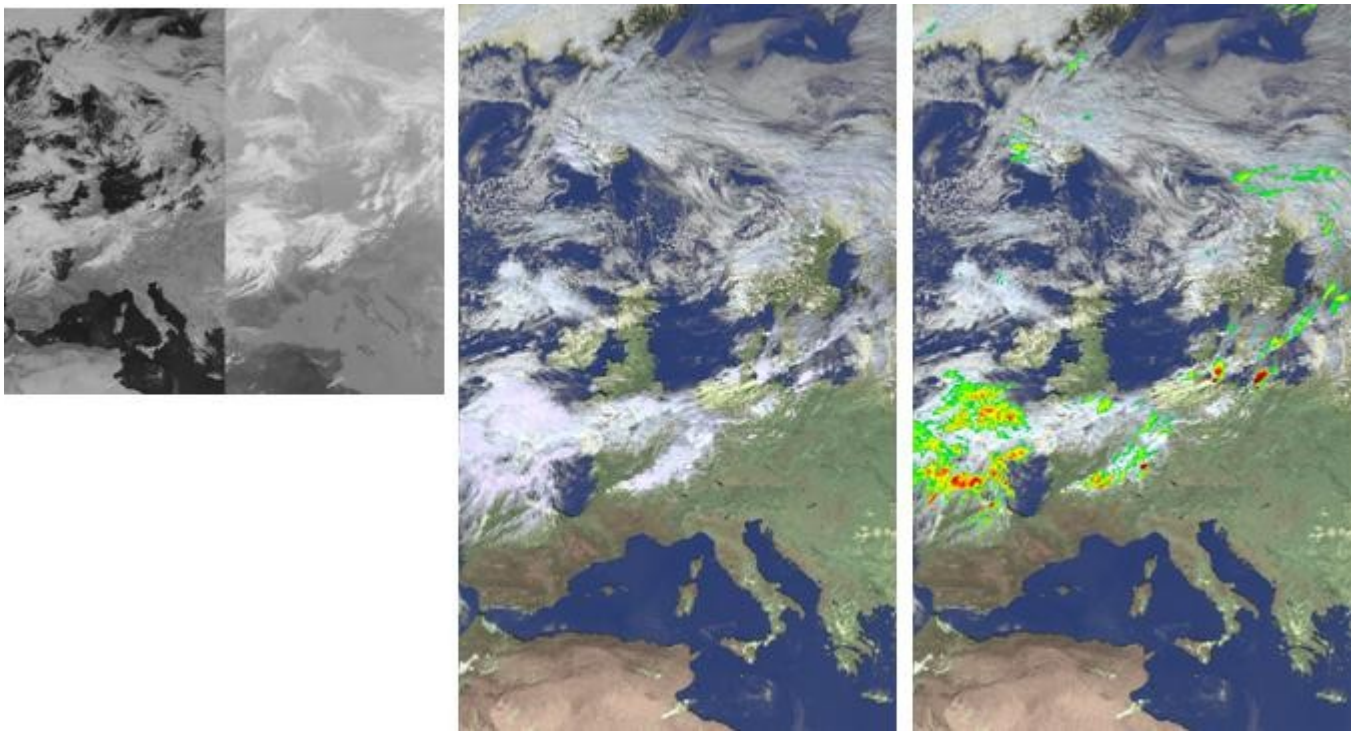


Figure 2. (a) Raw, unprocessed grey scale image received from a typical satellite pass (b) A fully processed, false colour image using the combined information contained in the near-infrared and the thermal-infrared channels (c) The same false colour image as in (b) but with additional processing added to show precipitation.

Deluge

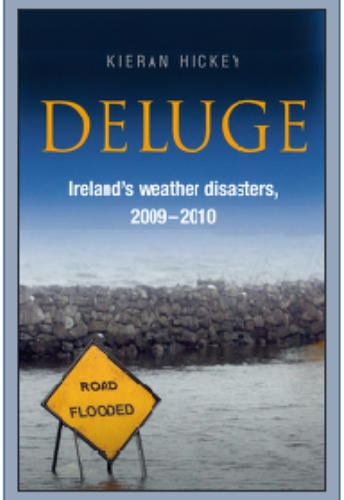
Ireland's Weather Disasters, 2009-2010

By Dr Kieran Hickey, School of Geography and Archaeology, NUI Galway

OÉ Gaillimh
NUI Galway

"In Bandon Town the day after the 2009 Floods"

Photograph taken by Tom Hayes



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DELUGE

Ireland's weather disasters, 2009-2010

by Kieran Hickey

From the summer of 2009 to the summer of 2010, Ireland experienced a remarkable and unexpected sequence of weather disasters not seen for a generation or more. A record-breaking wet summer in 2009 was swiftly followed by a November which was the wettest month in over 200 years in many parts of the country; the accompanying torrential rain led to severe flooding, especially in the west. Vast tracts of countryside and numerous villages and towns were flooded, including many new housing estates. In some places, the floods lasted until February 2010, coinciding with one of the most severe and persistent cold spells ever recorded in Ireland. When the snow and ice finally melted, it re-flooded areas that had only recently dried out from the previous deluges, causing tens of millions of Euro worth of damage.

KEY POINTS:

- Tells of the worst flooding in Ireland in 30 years and the worst cold spell in Ireland since the 1960s, with temperatures below -15°C in certain areas;
- Discusses the failure of the political (zoning) and planning system to prevent building thousands of houses and other buildings in flood risk locations;
- Details the almost total collapse of our road transportation system due to lack of gritting supplies;
- Focuses on the unresponsiveness of National Government to either crises, in contrast to the great work at ground level from local authorities, voluntary organisations and agencies and the army.

How and why did this happen, and what is being done to make sure this never happens again? What lessons have we as a people, and our government, learned from these disasters? What changes in policy have been implemented as a result of what has occurred? What radical measures should be undertaken to ensure that Ireland is at the very least prepared for such disasters again in the future?

Author: Kieran Hickey lectures in geography at NUI Galway. His main research interests are climate change, storms, hurricanes, weather disasters and the climate history of Ireland. The author of *Five minutes to midnight? Ireland and climate change* (2008), he is currently preparing a book on the natural and cultural history of wolves in Ireland (2011).

All Trade orders to: Gill & Macmillan Book Distributors, Hume Avenue, Park West, Dublin 12, Ireland. Tel. (01) 500 9555. For further information, please contact Robert Towers at (01) 280 6532 or via email at rtowers@indigo.ie.

Competition

The Irish Met Society is giving away a copy of "Deluge" to one lucky reader. To be in with a chance to win, email info@irishmetsociety.org and put Deluge in the subject line.

Closing date: December 15th 2010.

Bray Weather Station

By Peter Halpin, owner of Bray Weather Station and Boards.ie Moderator (weather category)

"Lightning strikes, Swiss side of Lake Geneva"

Photograph taken by Peter Halpin

"Bray Weather Station"

Photograph taken by Peter Halpin

www.brayweather.com

"Lightning strikes, Swiss side of Lake Geneva"

Photograph taken by Peter Halpin

From a very young age I have always been interested in the weather but my interest really took off at about the age of 12.

One night in late autumn I decided to look online to see if I could find any indication of a cold and snowy winter, and while I didn't find much in the way of useful long-range forecasts, I did come across one or two weather forums which I joined. From then on, I was completely hooked on weather and soon started learning about some of the processes involved in weather through the forums and also from books.

Many of the members on the forums had their own weather stations and posted their own readings and observations so I soon decided that I wanted to buy a weather station. I began saving up money and in April 2006 I bought a Davis Vantage Pro 2 and set it up in my back garden in Bray.

I also set up the website www.brayweather.com to go with it, which takes data from the station and displays these online along with past data and images.

The main sensors are mounted approximately 2 metres above the ground while the anemometer and wind vane are close to 9 or 10 metres above the ground. The sensors transmit the data to a console which then uploads it to Brayweather.com.

Being by the coast, the sea has quite a big influence and the temperatures recorded at the station are generally a few degrees higher in the winter and lower in the summer compared to the surrounding inland areas. Both the highest and lowest temperatures on record since the station was set up in 2006 were recorded this year, with -3.5°C on the 8th January and 26.9°C on the 26th July. The highest wind speed was recorded on the 3rd December 2006 at 98.2km/h and the heaviest rain fell on the 28th July 2008 - although I'm sure these values don't quite compare to what would have been recorded in 1986 when hurricane Charley flooded the area and caused a lot of damage to boats in the harbour. The lowest pressure recorded was 954.6hPa on the 10th March 2008 and the highest was 1043.4hPa on the 22nd December 2006.

Another interest of mine, which developed as I learned more about the weather, is photography. At first I was happy enough just photographing different types of clouds and weather, but I soon wanted more and yearned to capture a lightning strike on camera. Unfortunately, with the infrequent and benign thunderstorms in Ireland it took quite a while before I even got to attempt a lightning shot. My first chance came on a family holiday in France in 2006, but knowing little at the time about photographing lightning or indeed photography in general, the result was just a blurred mess.

In Switzerland in July 2007 I had my first fruitful result. As a supercell thunderstorm crossed Lake Geneva towards me, I set up my camera and started snapping away. I was blown away by the pictures when I finally loaded them up onto a screen later that night and since then I have managed to get pictures of many more strikes in the Alps and also on the coast of Corsica.

My aim is to now try to capture an Irish strike although my best attempt so far has only just caught the tail end of a strike entering the sea off Bray seafront with most of the strike out of the shot.

I am a moderator of the Boards.ie weather forum and still continue to post on other weather forums also.

I am now 18 and have just started studying physics in Trinity College. I hope to follow this with a masters degree in Meteorology from UCD.

Detecting and Forecasting Volcano Plumes over Ireland

By Professor Colin O'Dowd
School of Physics and Director of the Centre for Climate and Air Pollution Studies, NUI Galway

The Icelandic volcano, Eyjafjallajökull, erupted in mid April 2010 and resulted in the serious blocking of flights over EU and trans-Atlantic air space. Ireland's capability of volcanic plume detection was tested as plume detection and characterisation is inherently very challenging. There is no one volcanic ash plume detector that you can point at the sky and get a reliable result.

At the Mace Head Atmospheric Research Supersite Station (O'Connor et al., 2008), we were the first to detect the arrival of Eyjafjallajökull volcanic plumes into Irish airspace through the utilisation of a range of sophisticated ground-based remote sensing "dust radars" (LIDAR – light ranging and detection), and a wide range of sophisticated in-situ plume aerosol property characterisation. An example of plume detection at levels of a few km above the surface is shown in Figure 1, where the plume is detected as a backscatter coefficient. The plume eventually subsides into the planetary boundary layer where it is readily mixed to the surface and its characteristics can be determined by surface-based instrumentation.

When the plume reached the surface at Mace Head, a combination of aerosol physical size distribution measurements, from 3 nm to 20 microns in size, were recorded, along with scattering and absorption coefficients, chemical characterisation of non-refractory components (sulfate, nitrate, organics etc), cloud condensation nuclei and total particle concentrations. In addition, filter samples were taken for scanning electron micrographs to determine single particle composition.

The unique location of Mace Head in terms of detecting Icelandic plumes had been previously demonstrated (Ovadnevaite et al., 2009) and the location excels in terms of being able to clearly characterise the volcanic plume with respect to a well characterised marine aerosol signature.

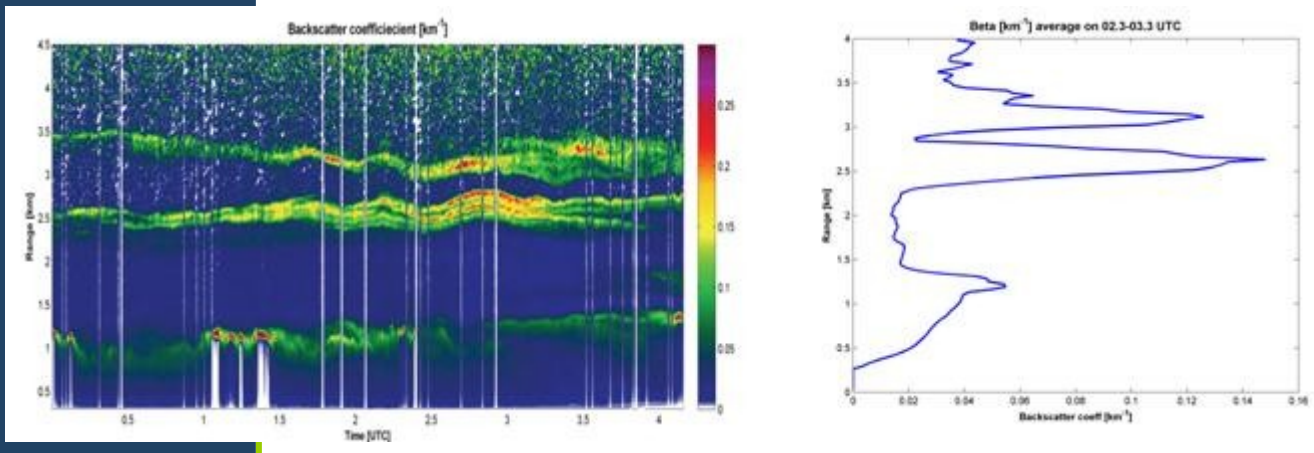

Figure 1. (Left) Aerosol plume backscatter coefficient as a function of altitude above ground level. The lower layer at 1-1.2 km is associated with boundary layer pollution under high humidity conditions. The layers at 2.5km and 3.5km are stratified volcanic ash plumes. (Right) Time average backscatter profile.

An example of the optical, physical and chemical properties of the plume is illustrated in Figure 2. Scattering coefficients are seen to increase to 100 Mm-1, from a background of the order of 10 Mm-1. Sulfate aerosol is more than one order of magnitude higher than polluted European air, while nitrate and organic material remain low. The key characteristics of the plume aerosol are: (1) low concentration (2) high effective radius – resulting in high mass and (3) sulfuric acid dominates the submicron sizes (up to 12 micrograms per m^3) while supermicron sizes are dominated by ash. In the interfacing size range, the two particle species are mixed into the same particle (internally-mixed).

Hundreds of particles were subjected to single particle analysis using X-Ray dispersive analysis and electron microscopy. While different stages of the eruption exhibited different chemical compositions for ash particles, a typical ash particle comprised of silicon dioxide as shown in Figure 3.

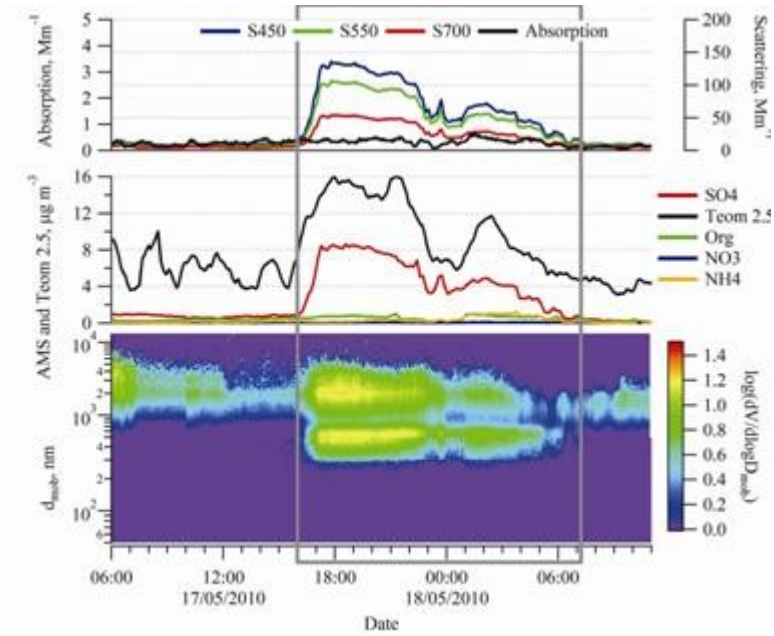

Figure 2. (Top) Scattering and absorption, in units of megametres^{-1}, for surface-sampled aerosol. The ash plume is within the highlighted box and data outside the box correspond to clean background polar marine air masses. (Middle) Aerosol Particulate Mass (less than 2.5 microns diameter), sulfate (SO_4), nitrate (NO_3), organic (Org), and ammonia (NH_4) aerosol mass concentration at sizes less than 1 micron. (Bottom) Volumetric size distribution, in mobility diameter space, of sampled aerosol.

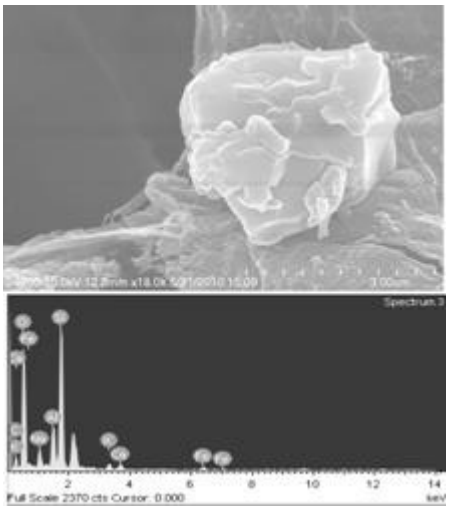

Figure 3. SEM and EDAX analysis of typical ash particles.

After realising that the plume activity was not going away, we diverted our activities from regional climate modeling to plume forecasting by adapting the REMOTE regional climate model (Langmann et al., 2008) to plume forecasting. We produced Ireland's first and only plume forecast twice daily, with the support of Met Éireann. The forecast compared very well with official Volcanic Ash Advisory Centre model predictions and, in particular, the predictions compared very well to in-situ measurements. An example is show in Figure 4.

The future

The volcanic ash crisis demonstrated deficits in Ireland's capability to detect early warning signals and deficits in the prediction of air pollution events whether they be volcanic, terrestrial fires or even nuclear fallout events. While the deficit was highlighted, the capability of a combined effort between Met Éireann and NUI Galway to produce a preliminary operational system was also demonstrated and across Europe the system developed within Ireland, at short notice, was regarded as one of the most sophisticated amongst the member states. Clearly, additional research and operational funding is urgently required to enable Ireland to complete the early-warning and forecasting system of ash cloud, forest fire, and transboundary air pollution triggered by the 2010 Icelandic volcano plumes.

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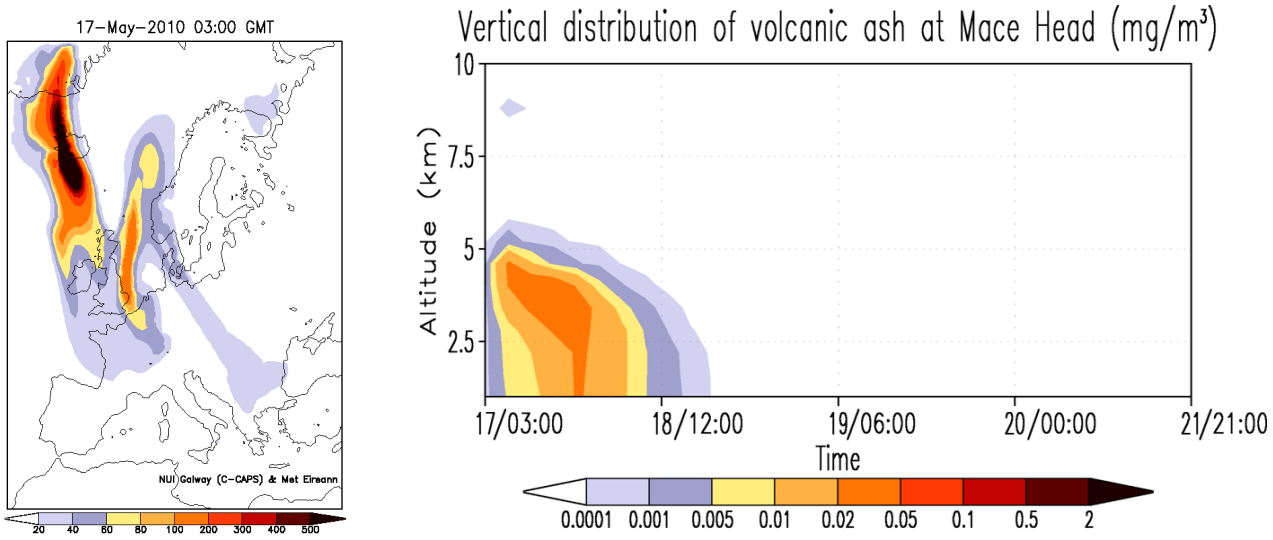

Figure 4. (Left) Spatial distribution of column integrated mass of the ash plume. (Right) Vertical cross-section of plume over Mace Head. The model predicted within 2 hours the descent of the plume to the surface. Predicted mass concentrations agreed very closely with ground-based measurements.

Membership Renewal

By Dr Emily Gleeson, IMS Committee and Met Éireann

We hope that you have enjoyed being a member of the Irish Met Society over the past year and that you have found it worthwhile.

The new membership year begins on January 1st 2011. If you would like to renew your membership you may do so in one of 4 ways:

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Membership Fees

The membership fees for 2011 are as follows:

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- Get automatic membership of the European Met Society (EMS).
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- Advance booking for IMS lectures, and discounts on registration fees for conferences and field trips.

Have your say

If you have any ideas for lecture topics, field trips, conference locations, newsletter articles or events that the Met Society could organise, we would love to hear from you.

"Curley's Donkeys"

Photograph taken by Bernadette Higgins

"Gateway"

Photograph taken by Jess Shiels

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Happy Christmas from the Irish Met Society Committee

Photograph taken by Karl Jordan.