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## Foreword



“Contributing to Government Objectives” is part of the mission of any public service body, Met Éireann included. In practice, the operational nature of Met Éireann’s role tends to make our connection with the

Government’s current agenda somewhat indistinct, but there are times when a more direct link can be apparent. Such an opportunity arose in 2007 when the new National Climate Change Strategy was developed and approved by the Government. The submission made by Met Éireann to this exercise was reflected in clear terms in the Strategy, including commitments to the continuation of the climate modelling activity of the Service, as well as to the maintenance of climate observations. The latter was a welcome acknowledgement of the crucial role played by the gathering of directly measured climate data in the study of climate change.

The C4I Climate Prediction Project came to the end of its four year term at the end of 2007, and its contribution to the understanding of climate change in Ireland has been increasingly appreciated. In developing its skills in climate modelling, building upon its core skill of numerical weather prediction, Met Éireann has made a significant contribution to national capacity in the field of climate change studies.

As is always the case, technical innovation was a prominent feature of Met Éireann’s activities during the year. Following an intensive reviewing of tenders, a new Forecaster Workstation was ordered, based on software from IBLSoft. This system, when introduced into operational use in our two forecast offices, promises to be an enhanced tool for the forecasters and to pave the way towards greater efficiency in forecast production. In relation to our observing station network, steady progress was made towards the automation of stations, by the setting up of additional facilities in some locations and by the installation of a new Automatic Weather Station at Gurteen Agricultural College.

A significant development for Met Éireann was the agreement signed with the Irish Centre for High-End Computing (ICHEC) for the operational running of our short-range numerical weather prediction model, HIRLAM. This offers

a cost-effective way for Met Éireann to access a high performance system for this core task and to enable us to introduce more sophisticated models in the future.

For many people, 2007 will be remembered for the pattern of weather experienced during the year, the exceptionally warm and dry April, for example, and the wet and unsettled summer. It will be scant consolation to our citizens to learn that unsettled weather can have the effect of boosting Met Éireann revenues, resulting in record high commercial revenue in 2007!

International activity is always a feature of Met Éireann’s activities, and 2007 was marked by a number of international meetings that were held in Ireland. In July, for example, a meeting of the Met Alliance group, of which Met Éireann is a member, was held in Dublin to debate the future arrangements for meteorology in Europe under the Single European Sky directive. With developments such as combined airspace blocks under consideration in Europe, there are many uncertainties facing the meteorological service providers and Met Éireann is keen to plan for such developments insofar as possible.

A meeting of the Council of EUMETSAT was held in Ireland, in Cork in June. This was the first time that a meeting of the council one of the major European meteorological organisations was held in Ireland. EUMETSAT, the European Organisation for the Exploitation of Meteorological Satellites, plays a crucial role in operational meteorology and it was an honour for Met Éireann to host a very successful meeting of this body in Ireland.

My thanks to all Met Éireann staff whose energy, knowledge and skill have made 2007 another successful year for us.

A handwritten signature in black ink, appearing to read 'Declan Murphy', written in a cursive style.

**Declan Murphy**  
Director



## Mission Statement

“Our Mission is to monitor, analyse and predict Ireland’s weather and climate, and to provide a range of high quality meteorological and related information to our customers.”

## Organisational Structure of Met Éireann (December 2007)



## Review of Weather in Ireland - 2007

### ► JANUARY 2007

*Mild, wet and windy for most of month; becoming cooler and drier*

Low pressure dominated Ireland's weather during the first three weeks of the month, as some deep depressions passing to the northwest of the country brought very unsettled conditions. Gales were recorded on many days during this period, giving some damaging gusts, while the predominantly southwesterly airstream kept temperatures well above normal for January. There was a change during the final third of the month to calmer but colder weather, as an anticyclone to the west of Ireland brought clearer conditions in a mainly northwesterly flow.

Mean air temperatures for the month as a whole were well above normal everywhere and were close to two degrees higher than normal at most stations. Despite being much warmer than normal, however, there were no long-term records of mean temperature broken this month, following a very mild January in both 2002 and 2005. Like the previous month, there was no air frost recorded at most coastal stations, while at the majority of inland stations there was a total of between 1 and 4 air frosts, compared with between 7 and 11 in an average January.

There was a wide variation in rainfall totals over the country, with heaviest falls recorded in northern and western areas. Percentage of normal rainfall values for the month varied between 49% at Rosslare and 145% at Malin Head; while it was the wettest January since 1995 at Malin Head, it was the driest since 2000 at Valentia Observatory. More than 20 wetdays (days with 1mm or more rainfall) were measured at stations in the north and west, with some rainfall in this area on each day during the period 1st to 23rd.

Sunshine totals were highest over the eastern half of the country. Many stations had their sunniest day of the month on the 25th, when values of around 8 hours were measured in places; Birr's value of 7.7 hours on this day was its highest daily sunshine on record for January.

### ► FEBRUARY 2007

*Mild and mostly sunny; wet in south*

Despite a week of cold weather early in the month, February was mild overall with mean air temperatures over one degree above normal generally, continuing the pattern of warmer than normal weather during the winter months.

At most stations it was the warmest February since 2002. Air frost was widely recorded in the period 2nd to 7th, but was infrequent during the remainder of the month. There were between 8 and 11 air frosts during the month at inland stations, around normal for February, but no air frost was recorded at either Rosslare or Valentia Observatory.

February rainfall totals were above normal over the south of the country, but it was a relatively dry month in the north. Although little rain was recorded before the 7th of the month, the total number of wetdays (days with 1mm or more rainfall) was above normal everywhere; most stations had between 14 and 16 wetdays during the month compared with the normal range for February of 11 to 15, while 20 wetdays were recorded at Valentia Observatory. Much of the precipitation which fell in the period 7th to 10th was wintry, with widespread falls of sleet or snow on the 7th and 8th, followed by hail or snow showers.

Sunshine totals for the month were above normal except in parts of the southwest. Most stations had their sunniest days during the first week.

### ► MARCH 2007

*Mild for most of month but with frequent ground frost; sunny with rainfall near normal*

The weather during most of March was mild, but there were also short colder spells with wintry showers of hail and snow. Clear conditions on many days brought sunshine totals for the month above normal, but also allowed frequent ground frost to develop, particularly at inland stations. Mean monthly air temperatures were above normal everywhere, especially in the west, but while mean maximum temperatures for the month were around a degree higher than normal everywhere, mean minimum values were below normal in the east and midlands. There was a total of between 19 and 26 ground frosts at most inland stations compared with between 12 and 14 in an average March; Kilkenny's total of 26 ground frosts during the month was its highest for March since the station opened in 1957, while the mean minimum temperature there of 1.9°C was its lowest for March since 1987.

Rainfall totals for the month were close to normal generally, with percentage of normal values between 70% at Malin Head and 112% at Kilkenny. Most rain fell during the early part of





the month, with many stations recording their wettest day on either the 5th or 11th. There were between 11 and 19 wetdays during the month over most of the country (days with 1mm or more rainfall), close to normal for March, but only 8 wetdays were recorded at Rosslare.

It was a sunny month everywhere, with sunshine totals between 15% and 45% higher than normal generally. The period between the 24th and 31st was particularly sunny, especially over the western half of the country. Shannon Airport's value of 11 hours on the 29th was the highest daily sunshine for March at the station since 1970.

#### ► APRIL 2007

##### *Warmest and sunniest April on record; dry for most of month*

High pressure centred near or over the country during almost all of April gave an exceptionally sunny, warm and dry month everywhere. Mean monthly air temperatures varied between 10°C and 11.5°C and were around three degrees higher than normal generally; this range of temperatures is more typical of that for an average May.

It was the warmest April on record almost everywhere, including the long-term stations of Birr, Malin Head and Dublin (Phoenix Park), where records began more than a century ago. The mean temperature at Phoenix Park of 11.2°C was a full degree higher than its previous highest mean April value of 10.2°C, recorded in both 1987 and 1865. Despite the very high monthly values, however, minimum temperatures fell sharply on several nights under clear skies and there were between 12 and 18 ground frosts recorded at inland stations, around a third more than normal for April.

Monthly rainfall totals were well below normal except in the northwest. Following mostly dry weather during the last week of March, some stations recorded no measureable rainfall until the 22nd of this month. It was the driest April on record at both Shannon Airport and Casement Aerodrome, while at many other stations it was the driest for between 10 and 27 years. There were only between 2 and 6 wetdays measured (days with 1mm or more rainfall), with almost all of the month's rainfall recorded between the 21st and 25th. Soil moisture deficits increased significantly during the month; the very dry conditions led to outbreaks of gorse fires in many parts of the country.

For the second successive April, sunshine totals were exceptionally high. It was the sunniest April

on record almost everywhere, with monthly totals around 50% higher than normal generally.

#### ► MAY 2007

##### *Warm and sunny everywhere; drier than normal over most of the country*

The exceptionally dry, warm and sunny weather of April continued into the early part of this month, but conditions became more unsettled after the first week. Rainfall totals for the month were below normal generally, however, while in common with the previous months of spring, it was sunnier and warmer than normal at all stations.

Mean air temperatures for May were around half a degree above normal in parts of the midlands, but were closer to two degrees higher than normal in the southeast. It was the warmest May for between 6 and 9 years in many places. Daytime temperatures rose above 20°C in midland and western areas between the 1st and 4th, while the month's warmest weather was recorded on the 17th, when maxima of over 25°C were measured in the south; Rosslare recorded 22.3°C on this day, the highest May value at the station since it opened in 1956. In contrast, Birr recorded an unusually late air frost on the 29th of the month, while there were between 9 and 13 ground frosts observed at inland stations, twice the average number for May.

Rainfall totals were between 60% and 90% of normal over most of Leinster and Munster, but totals were above normal in parts of the north and west. There were no very high daily falls, but over 50mm of rain was measured at Malin Head in the 5-day period from the 16th to the 20th. Between 10 and 17 wetdays were recorded during the month (days with 1mm or more rainfall), slightly fewer than normal for May.

Sunshine totals were high at all stations and it was the sunniest May generally for 6 or 7 years. Over ten hours of daily sunshine were widely recorded in the periods 1st to 4th, 19th to 21st and 27th to 29th.

#### ► JUNE 2007

##### *Very wet in east and south; warmest and sunniest in west*

Despite a week of dry, warm and very sunny weather everywhere between the 4th and 11th, June overall was a very wet month in most places with sunshine totals below normal, while mean temperatures were highest in western areas. More than twice the normal June rainfall was recorded in the east and south, while at Kilkenny it was the

wettest June since records began there in 1957, with more than three times its average total recorded. Heavy daily falls, some in association with thunder, led to localised flooding on a number of days. Kilkenny's fall of 31mm on the 15th was its highest on record for June, while Dublin (Phoenix Park)'s daily fall of 53mm on the 22nd included a 90-minute fall of 26mm during a thunderstorm. Mullingar recorded a 60-minute fall of 29mm on the 13th; such an event would be expected only once every 50 years. There were 10 wetdays during the month at Malin Head (days with 1mm or more rainfall), but the majority of stations recorded between 13 and 19 wetdays, compared with the normal range for June of between 11 and 14.

Mean monthly air temperatures varied between 13°C and 15°C and were around a degree higher than normal generally. The first half of the month was warm, especially in the west, but temperatures were near or below normal throughout most of the second half. Daytime temperatures rose above 20°C each day in many midland and western areas during the period 5th to 12th; Belmullet's mean temperature for the month of 14.6°C was its highest for June since records began there in 1956. In contrast, cold nights near the end of the month allowed ground frost to develop at Mullingar.

Sunshine totals were very variable across the country, with highest totals measured in the north and west; while it was the sunniest June at Malin Head since 1996, it was the duller at several other stations for between 5 and 10 years.

### ► JULY 2007

*Another very wet month in east and south; mostly cool but sunny*

After the very wet weather of most of June in the east and south of the country, rainfall totals for July were again exceptionally high in the same areas. Like the previous month, high pressure remained well to the south of the country, allowing an uninterrupted succession of depressions with their associated frontal systems to move over Ireland until near the end of the month. These produced spells of rain or showers each day, with some locally heavy falls causing flooding, while there were severe thunderstorms and reports of tornadoes on a number of days. At least 1mm or rain was measured on each day at one or more stations in the period between June 11th and July 29th- a total of 49 days.

Summer rainfall totals so far (June and July) are more than 250% of normal over parts of Leinster;

Dublin (Phoenix Park) two-monthly total of 297mm is the highest for this period in its 170-year-old record. Totals for this month were more than three times the July normal in parts of Dublin and it was the wettest July for between 19 and 47 years in many places. There were between 14 and 25 wetdays recorded (days with 1mm or more rainfall) compared with the normal range for July of between 9 and 14. Mean air temperatures overall were near or a little below normal generally and it was the first month since March 2006 that temperatures were not above the 1961-90 normals at all stations.

There was little variation in temperatures during the month; they were near or below normal throughout almost all of July, with daily maxima only very rarely rising above 20°C.

Despite the frequent spells of rain, sunshine totals were above normal everywhere and it was a very sunny month in coastal counties of the west and north. Malin Head's total of 212 hours was its highest for July since 1955. The sunniest weather of the month was during the last three days.

### ► AUGUST 2007

Like the preceding two summer months, rainfall totals for August were above normal over the eastern half of the country, with highest values relative to normal at stations in Leinster. The pattern of Atlantic frontal systems crossing the country, which dominated most of this summer's weather, was broken during the final third of the month, however, when a large anticyclone became established west of Ireland, resulting in mostly dry conditions. It was the wettest August for between 6 and 10 years at a number of stations, but the number of raindays recorded during the month (days with 0.2mm or more rainfall) was in the normal range for August of between 13 and 20. Heavy falls associated with thunderstorms resulted in flooding in some places around mid-month.

Mean air temperatures for the month were around half a degree higher than normal at most stations, but it was nevertheless the coolest August for between 6 and 13 years generally. Daytime temperatures were below normal for much of the period of very unsettled weather around the middle of the month, but nighttime values were near or above normal throughout. All stations recorded their highest temperatures of the month on either the 3rd or in the period between the 22nd and 25th, but values in excess of 20°C were observed on only around 5 days at most stations. Sunshine totals were near normal everywhere,





with most stations measuring their highest daily values on either the 7th or 22nd.

### ► SEPTEMBER 2007

***Drier than normal everywhere; mainly warm and sunny***

After the very wet weather of the summer months, rainfall totals for September were below normal everywhere. High pressure was the dominant influence throughout the first half of the month and again during the final week, bringing predominantly dry weather with lighter than normal winds. Rainfall totals were just over half of normal in many places, but at no station were they as low as the exceptionally dry September of 2002. Most of the month's rainfall was recorded between the 16th and 24th, with some heavy falls in places on the 16th and 21st. The number of wetdays during the month (days with 1mm or more rainfall) varied between 6 and 12 in most places, around half of the normal number for September.

Although mean air temperatures for the month were above normal everywhere, by around half a degree generally, it was still the coolest September for between 5 and 13 years at most stations. As shown by the charts of daily temperatures on page 2, the first half of the month was warm, but both daytime and nighttime values fell sharply during the second half, especially during the final week. Unusually for September, there was widespread ground frost on the 18th and in the period 26th to 27th; air and ground temperatures of  $-1.1^{\circ}\text{C}$  and  $-6.6^{\circ}\text{C}$  respectively at Birr on the 27th were the lowest on record for September at the station.

Sunshine totals were near normal in the east, but they were higher than normal generally, especially in the southwest; it was the sunniest September for between 5 and 11 years at a number of stations. Both Mullingar and Shannon Airport had their sunniest September day in over 50 years of record on the 7th.

### ► OCTOBER 2007

***Driest October in over 30 years in places; warm and mostly sunny***

High pressure was the dominant influence over Ireland's weather during October, giving mainly dry conditions with light winds. These winds were generally southerly in direction, bringing warm air over the country for much of the time. Short spells of wet weather gave heaviest falls in western and southwestern areas, but rainfall totals for the month were below normal everywhere. Less than half of the normal October rainfall was

recorded over the eastern half of the country and it was the driest October for between 35 and 38 years at a number of stations. The number of wetdays recorded during the month (days with 1mm or more rainfall) was also below normal everywhere: most stations had between 5 and 9 wetdays, but between 12 and 14 wetdays were measured at Atlantic coastal stations.

Mean air temperatures for the month were between one and two degrees higher than normal over most of the country.

Mean values of between  $11^{\circ}\text{C}$  and  $13^{\circ}\text{C}$  for October were similar to those of some recent years, but at Belmullet the mean air temperature of  $13.1^{\circ}\text{C}$  was the highest for October since records began there in 1956. Air frost was confined to the period 24th/25th, but most coastal stations recorded neither air nor ground frost during the month.

Sunshine totals were above normal almost everywhere, but it was a relatively dull month over south Munster. The sunniest period of the month was between the 4th and 6th; Rosslare's value of 10.5 hours of sunshine on the 4th was its highest such value for October since the station opened in 1956.

### ► NOVEMBER 2007

***Very mild and dry; dull except in south***

Like the previous two autumn months, most of November's weather was dominated by areas of high pressure close to or over Ireland, giving mainly dry conditions with light winds. There were also short spells of wet and windy weather around mid-month and also during the last few days, while overall it was a cloudy month, especially in the north and east. Mean air temperatures for the month of between  $8^{\circ}\text{C}$  and  $11^{\circ}\text{C}$  were around two degrees higher than normal generally and close to three degrees above normal in places. It was the warmest November for between 5 and 13 years generally and the warmest on record at Belmullet, where observations commenced in 1956. The month began with exceptionally warm weather, and record high November maxima were recorded at both Kilkenny and Clones on the 1st. There were 2 or 3 air frosts recorded during the month at most inland stations, but none in coastal areas.

Rainfall totals were below normal almost everywhere, with only between 50% and 75% of average amounts at many stations. Little rain was measured in most places between the 1st and 16th and again between the 20th and 27th, but

there were some heavy falls at other times. The wettest days of the month were in the period 17th/18th. The number of wetdays (days with 1mm or more rainfall) during the month was well below normal for November; only between 9 and 12 wetdays were recorded generally, compared with the normal range of between 13 and 20.

Sunshine totals for the month were very variable across the country. While Cork Airport measured 12% more sunshine than normal, Malin Head's total of only 15 hours represented just 33% of normal and was its lowest November total since sunshine measurements began there in 1915.

#### ► DECEMBER 2007

*Mild, especially in the southwest; wetter but sunnier than normal generally*

December began and ended with unsettled conditions, caused by depressions off the northwest coast, but high pressure near the country around the middle of the month brought mainly fair weather. Strong winds were recorded at most stations during the first week and again between the 26th and 29th, but the period around mid-month was relatively calm. Rainfall

totals were highest over the western half of the country, with heavy falls at times between the 1st and 9th, occasionally accompanied by thunder, and also between the 23rd and 28th. Little or no rain was measured at many stations between the 10th and 21st, however, and the total number of wetdays during the month (days with 1mm or more rainfall) was close to the normal range for December of between 13 and 20.

Most of the month was mild, especially the first week, but minimum temperatures fell close to or below normal between the 17th and 25th, bringing widespread ground frost. There was no air frost during the month in most coastal locations, while the total number of air frosts recorded at the majority of inland stations of between 4 and 6 was only around half of the normal number for December. An exception was Mullingar, where 10 air frosts were measured.

Sunshine totals were above normal in most places, especially in the east; Dublin Airport's total of 71 hours was more than twice the amount recorded in parts of the west and north.



## Summary of Weather in Ireland - 2007

*Warmest year on record in places; sunnier than normal everywhere and dry in south*

Mean air temperatures for the year were more than one degree above normal for the 1961-90 period. This was despite a relatively cool summer, especially over the eastern half of the country. It was the warmest year on record at the long-term stations of Valentia Observatory and Malin Head, where comparable records began in 1892 and 1885 respectively. It was also the warmest year on record at Belmullet, Rosslare and Kilkenny, where records commenced in the mid-1950s, and the warmest since 1949 at Birr. April was the warmest on record at most stations, while the autumn months between September and November were also exceptionally warm. July was the only month when mean temperatures were below normal over most of the country. The highest temperatures were recorded relatively early in the year: during the period June 9th to 11th in many places and on May 17th near the south and southeast coasts. The lowest air and ground temperatures of the year at almost all stations were recorded during a spell of very cold weather between February 5th and 8th.

Annual rainfall totals were above normal over most of Leinster, but were well below normal near southern and southeastern coasts. The distribution of rainfall over the year was very uneven. The summer period of June, July and August was exceptionally wet, especially over the eastern half of the country, where more than twice the normal summer rainfall was recorded at some stations. In contrast, the subsequent months of autumn were very dry and it was the driest autumn for more than 30 years in many places. April was also a very dry month, with monthly totals of less than 10mm in some eastern areas. The heaviest daily falls of the year at most stations were associated with thunderstorms during the summer months, particularly in June and August. The annual number of raindays (days with 1mm or more rainfall) was near or below normal generally, varying between 153 at Rosslare and 260 at Knock Airport. Annual sunshine totals were above normal everywhere and both Malin Head and Belmullet had their sunniest year since 1968. The spring months of March, April and May were the sunniest relative to normal, while June and November were relatively dull. Mean windspeeds for the year were exceptionally low and were the lowest on record at Rosslare. Belmullet recorded the highest gust of the year, 81 knots (150km/h) on January 20th, while Dublin Airport's gust of 80 knots (148km/h) on January 18th was the highest at the station since it opened in 1941.

County/ Station	Rainfall (mm)			Temperature (°C)			Sunshine (Hours)			No. of days with						
	Total	% of average	Most in a day Amount date(s)	Mean	different from average	Extremes highest lowest	Total	% of average	Most in a day Amount date(s)	Rain	Snow	Air frost	Hail	Thunder	Fog	Gale gusts
Co. Clare Shannon Airport	921.5	99	33.6 6 Dec	11.3	+1.2	25.0 -3.6	4.02	100	14.8 7 Jun	207	2	13	18	6	31	61
Co. Cork Cork Airport	1057.4	86	31.7 19 Feb	10.7	+1.3	23.5 -1.5	4.47	86	14.8 30 Jul	200	3	7	5	2	83	67
Co. Donegal Malin Head	1071.6	103	29.0 27 Oct	10.7	+1.4	20.5 -2.0	4.02	103	15.6 6 Jun	235	11	2	28	3	16	145
Co. Dublin Dublin Airport Casement Aerodrome	761.0 811.3	 111	30.1 3 Jun 35.1 3 Jun	10.3 10.5	 +1.2	22.8 -4.8 23.2 -6.4	4.27 3.98	101 111	14.6 9 Jun 15.2 29 May	189 190	5 5	23 24	6 9	9 10	25 17	71 72
Co. Kerry Valentia Observatory	1351.7	97	46.9 2 Jun	11.8	+1.4	23.3 -0.5	3.98	97	15.4 4 Jun	233	1	1	18	3	18	70
Co. Kilkenny Kilkenny	879.5	107	30.9 15 Jun	10.8	+1.5	25.2 -5.8	4.19	107	14.7 7 Jun	189	-	33	-	-	-	35
Co. Mayo Belmullet Knock Airport	1140.6 1346.0	104	28.3 18 Nov 30.6 16 Sep	11.4 9.5	+1.5	25.1 -2.5 23.5 -3.3	4.15 3.65	104	15.2 4 Jun 15.6 4 Jun	253 260	6 13	5 10	32 9	7 5	23 132	127 70
Co. Monaghan Clones	912.4	99	19.8 17 Nov	10.1	+1.3	25.9 -6.5	3.71	99	14.0 1 May	217	-	25	-	-	-	39
Co. Offaly Birr	862.9	106	41.1 11 Aug	10.6	+1.3	25.6 -5.6	3.75	106	14.8 7 Jun	209	-	31	-	-	-	33
Co. Westmeath Mullingar II	977.1	105	28.7 13 Jun	10.0	+1.2	24.0 -6.2	3.99	106	15.1 29 May	213	-	40	-	-	-	27
Co. Wexford Rosslare	756.9	86	31.0 3 Jun	11.3	+1.2	22.3 0.4	4.91	85	15.2 6 Jun	153	-	0	-	-	-	102

# Review of Global Weather 2007

## Global Temperatures

The global annual temperature for combined land and ocean surfaces in 2007 was +0.55°C above the 20th century average, ranking 5th warmest in the period of record. The effect of continued presence of La Niña conditions on the December global surface temperature resulted in a slightly lower ranking for the year as a whole. Globally averaged land temperatures were 1.02°C while the ocean temperatures were 0.38°C above average, ranking as the warmest and ninth warmest, respectively. The land and ocean surface temperatures for the Northern and Southern Hemisphere ranked second and tenth warmest, respectively. As discussed in the Temperature Trends section below, seven of the eight warmest years on record have occurred since 2001, part of a rise in temperatures of more than 0.6°C since 1900. Within the past three decades, the rate of warming in global temperatures has been approximately three times greater than the century scale trend.

Global Top 10 Warm Years	Anomaly (°C)
2005	0.60
1998	0.58
2002	0.56
2003	0.56
2007	0.55
2006	0.54
2004	0.53
2001	0.49
1997	0.46
1995	0.40

2007 began with a weak warm phase (El Niño) ENSO which had developed during late 2006, but immediately began its transition to a neutral phase during February 2007, persisting as a neutral phase until the boreal summer. During August, sea surface temperatures (SST) anomalies were cooler-than-average in the Niño 1+2 and 3 regions indicating the first signs of a developing cold event (La Niña). By October, La Niña conditions strengthened when SST anomalies continued to decrease in the Niño 3.4. By the end of December, moderate-strength La Niña conditions were present across the equatorial Pacific Ocean. This La Niña event is likely to

persist into early 2008, according to the latest information from NOAA's Climate Prediction Center.

January - December	Anomaly	Rank	Warmest (or Next Warmest) Year on Record
<b>GLOBAL</b>			
Land	+1.02°C	warmest	2005 (+0.97°C)
Ocean	+0.38°C	9th warmest	2003 (+0.48°C)
Land & Ocean	+0.55°C	5th warmest	2005 (+0.60°C)
<b>NORTHERN HEMISPHERE</b>			
Land	+1.19°C	warmest	2005 (+1.03°C)
Ocean	+0.42°C	7th warmest	2005 (+0.54°C)
Land & Ocean	+0.71°C	2nd warmest	2005 (+0.72°C)
<b>SOUTHERN HEMISPHERE</b>			
Land	+0.50°C	8th warmest	2005 (+0.82°C)
Ocean	+0.35°C	10th warmest	1998 (+0.50°C)
Land & Ocean	+0.37°C	10th warmest	1998 (+0.53°C)

The 1901-2000 average combined land and ocean annual temperature is 13.9°C, the annually averaged land temperature for the same period is 8.5°C, and the long-term annually averaged sea surface temperature is 16.1°C.

## Temperature Trends

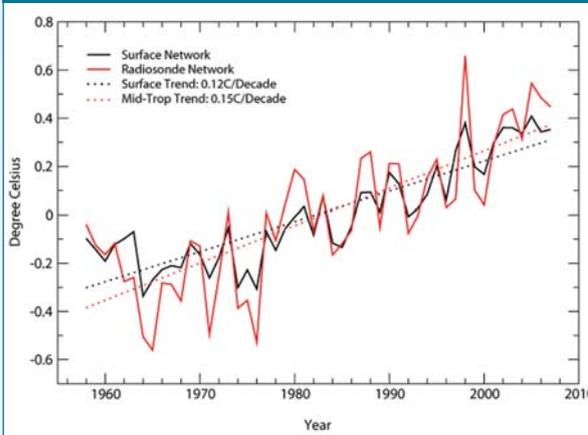
During the past century, global surface temperatures have increased at a rate near 0.05°C/decade, but this trend has increased to a rate of approximately 0.15°C/decade during the past 25 to 30 years. There have been two sustained periods of warming, one beginning around 1910 and ending around 1945, and the most recent beginning about 1976. Temperatures during the latter period of warming have increased at a rate comparable to the rates of warming projected to occur during the next century with continued increases of anthropogenic greenhouse gases.

Temperature measurements have also been made above the Earth's surface over the past 50 to 60 years using balloon-borne instruments (radiosondes) and for the past 29 years using satellites. These measurements support the analysis



of trends and variability in the troposphere (surface to 10-16 km) and stratosphere (10-50 km above the earth's surface).

### Global in Situ Anomalies and Trends Surface and Mid-Troposphere (Jan-Dec)



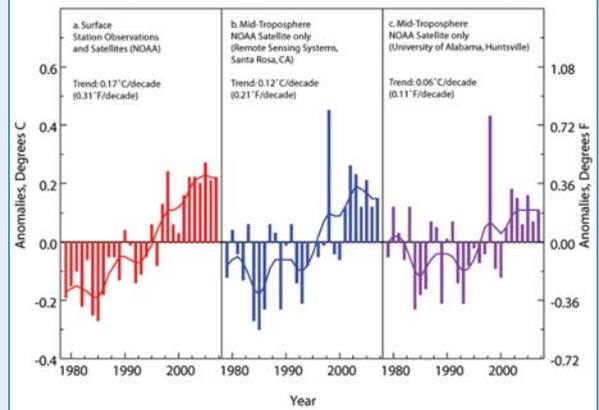
RATPAC Upper Air and Surface plot

The best source of upper air in-situ measurements for studying global temperature trends above the surface is the Radiosonde Atmospheric Temperature Products for Assessing Climate (RATPAC) dataset.

Data collected and averaged between the 850-300 mb levels (approximately 5000 to 30,000 feet above the surface) indicate that 1958-2007 global temperature trends in the middle troposphere are similar to trends in surface temperature;  $0.12^{\circ}\text{C}/\text{decade}$  for surface and  $0.15^{\circ}\text{C}/\text{decade}$  for mid-troposphere. Since 1976, mid-troposphere temperatures have increased at a rate of  $0.18^{\circ}\text{C}/\text{decade}$ . For the January-December 2007 period, global mid-troposphere temperatures were  $0.45^{\circ}\text{C}$  above the 1971-2000 mean and the 4th warmest.

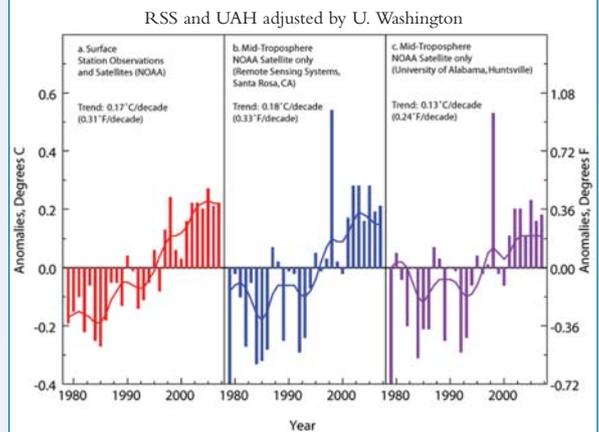
Since 1979, NOAA's polar orbiting satellite measurements have also been used to measure temperatures in the troposphere and stratosphere. Microwave Sounding Unit (MSU) data are analyzed for NOAA by the University of Alabama in Huntsville (UAH), Remote Sensing Systems (RSS, Santa Rosa, California) and the University of Washington (UW). These observations show that the global average temperature in the middle troposphere (the layer which is centered at an altitude of 2 to 6 miles, but which includes the lower stratosphere) has increased, though differing analysis techniques have yielded similar but different trends (see above right).

### Annual Temperature Anomalies: Middle Troposphere and Surface



MSU Upper Air and Surface Temperatures

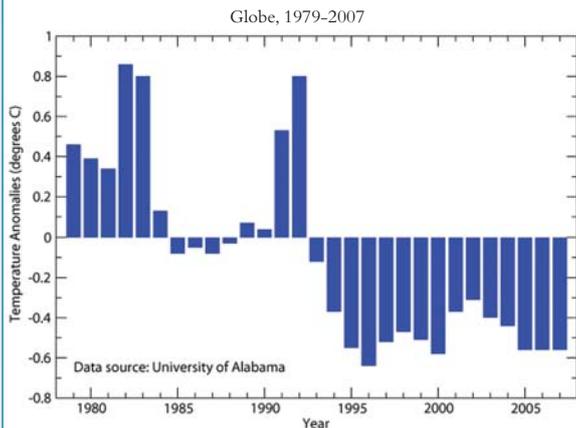
### Annual Temperature Anomalies: Middle Troposphere and Surface



UW MSU Upper Air and Surface Temperatures

In all cases these trends are positive. The analysis performed by RSS reveals a trend of  $0.12^{\circ}\text{C}/\text{decade}$  while the UAH analysis reveals a much lower trend of  $0.06^{\circ}\text{C}/\text{decade}$ . When adjusted by University of Washington scientists to remove the stratospheric influences from the RSS and UAH mid-troposphere average, the trends increase to  $0.18^{\circ}\text{C}/\text{decade}$  and  $0.13^{\circ}\text{C}$ , respectively. (A journal article is available that describes the University of Washington adjustments to remove the stratospheric influence from mid-troposphere averages.) Trends in these MSU time series are similar to the trend in global surface temperatures, which increased at a rate near  $0.17^{\circ}\text{C}/\text{decade}$  during the same 29-year period.

## Annual Lower Stratospheric Temperature Anomalies



### Annual Global Stratospheric Temperatures

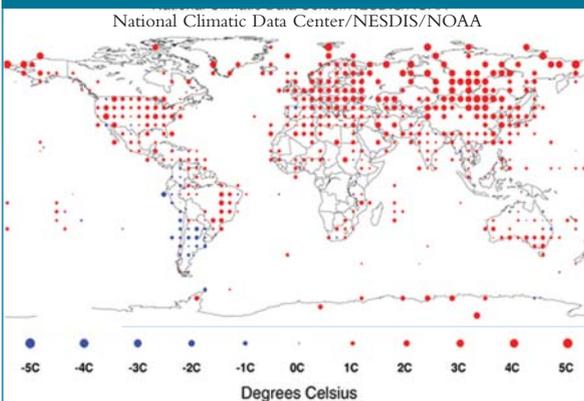
While middle tropospheric temperatures reveal an increasing trend over the last three decades, stratospheric temperatures (14 to 22 km / 9 to 14 miles above the surface) have been below average since the warming effects from the 1991 Mt. Pinatubo eruption dissipated in 1993. The below average stratospheric temperatures are consistent with the depletion of ozone in the lower stratosphere and the effects of increasing greenhouse gas concentrations. The large temperature increase in 1982 was caused by the volcanic eruption of El Chichon, and the increase in 1991 was caused by the eruption of Mt. Pinatubo in the Philippines.

### Regional Temperatures

Warmer-than-average temperatures occurred throughout the year in most land areas of the world, with the exception of cooler-than-average anomalies in the southern parts of South America. The largest warmer-than-average

## Temperature Anomalies Jan-Dec 2007

(with respect to a 1961-1990 base period)

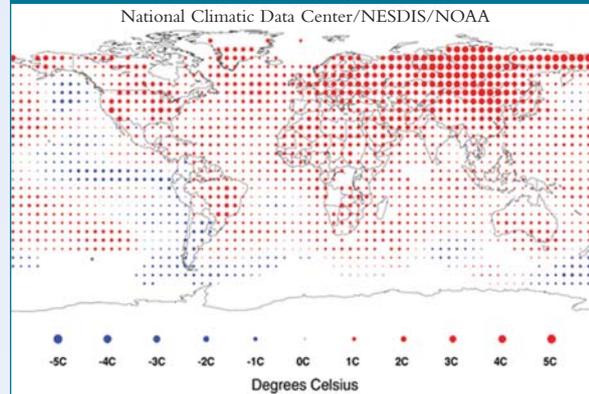


### Annual Land Surface Temperature Anomalies in degrees Celsius

anomalies were present throughout high latitude regions of the Northern Hemisphere including much of North America, Europe, and Asia. Temperature anomalies in these regions ranged from 2-4°C above the 1961-1990 average.

## Temperature Anomalies Jan-Dec 2007

(with respect to a 1961-1990 base period)



### Annual Blended Land and Sea Surface Temperature Anomalies in degrees Celsius

The map, below left, is created using data from the Global Historical Climatology Network (GHCN), a network of more than 7,000 land surface observing stations. The map, above, is a product of a merged land surface and sea surface temperature anomaly analysis developed by Smith and Reynolds (2005). Temperature anomalies with respect to the 1961-1990 mean for land and ocean are analyzed separately and then merged to form the global analysis. Additional information on this product is available.

Notable temperature extremes in 2007 included a heat wave that affected a large portion of the United States throughout the month of August. The Central and Southeastern U.S. were particularly affected, with over 50 deaths attributed to soaring high temperatures. The anomalous warmth exacerbated drought conditions in the southeastern region and also contributed for 29 all-time record high maximum temperatures and 35 all-time record high minimum temperatures.

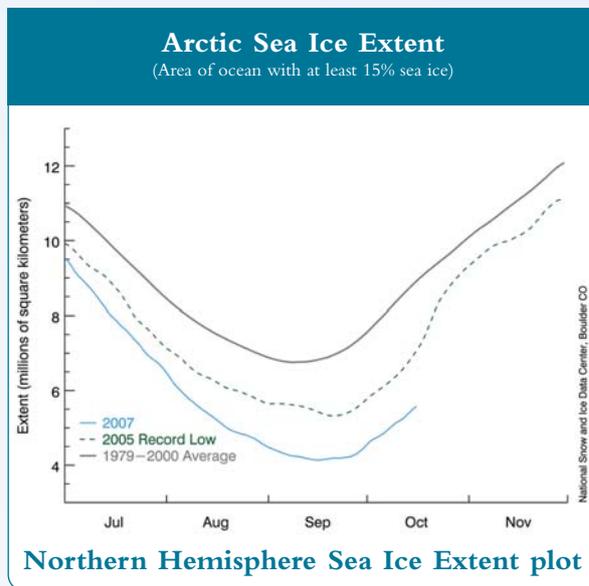
Hot weather also enveloped much of the western and central parts of Russia as well as the southeastern Europe during May and June-July, respectively. Moscow, Russia recorded its highest temperature in May since 1891 and this was the first time in 128 years that the Russian capital experienced sustained 30°C or higher temperatures. Meanwhile in southeastern Europe, temperatures were well over 40°C in many areas prompting electricity demands to soar record



levels. The warm conditions contributed to over 130 fires and over 500 fatalities.

In South Africa, a cold front which affected much of the country led to 21 fatalities and 54 weather records during May 21-22. Most of the records were for lowest maximum and minimum daily temperatures. In Argentina, the last week of May experienced unseasonably cold temperatures which led to electricity and natural gas shortages. In April, a devastating cold wave affected much of the central Plains, Midwest, and the Southeast region of the contiguous U.S. Temperatures dipped well below freezing in many areas prompting nearly 1,240 broken daily minimum temperature records and producing significant crop damages.

### Sea Ice Extent



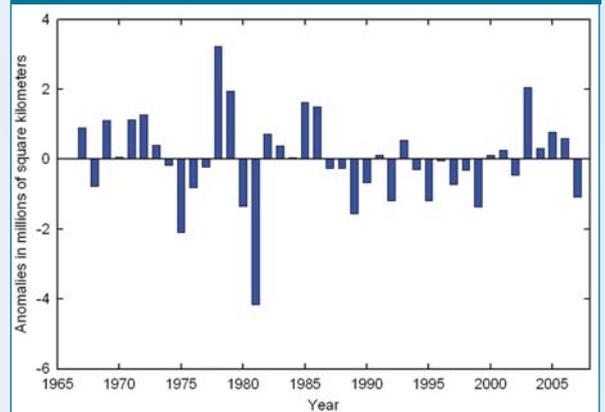
According to the National Snow and Ice Data Center, the Northern Hemisphere sea ice extent, which is measured from passive microwave instruments onboard NOAA satellites, reached the least sea ice extent on record during the month of September with 4.28 million square kilometers (39 percent below the 1979-2000 mean). The anomalous warmth that covered much of the Northern Hemisphere during January-September 2007, contributed to the sea ice extent being well below the record set in 2005 by a remarkable 23%. For further information on Northern Hemisphere snow and ice conditions, please see the NSIDC News page, provided by the NOAA's National Snow and Ice Data Center (NSIDC).

Arctic sea ice conditions are inherently variable from year to year in response to wind, temperature and oceanic forcings. Quite often a

"low" ice year is followed by recovery the next year. But increasing surface temperatures in high latitudes have contributed to progressively more summer melt and less ice growth in the fall and winter. While natural variability is responsible for year-to-year variations in sea ice extent, three extreme minimum extent years along with evidence of thinning of the ice pack suggest that the sea ice system is experiencing changes which may not be solely related to natural variability.

### Northern Hemisphere Snow Cover Extent

Winter (Dec 2006 - Feb 2007)

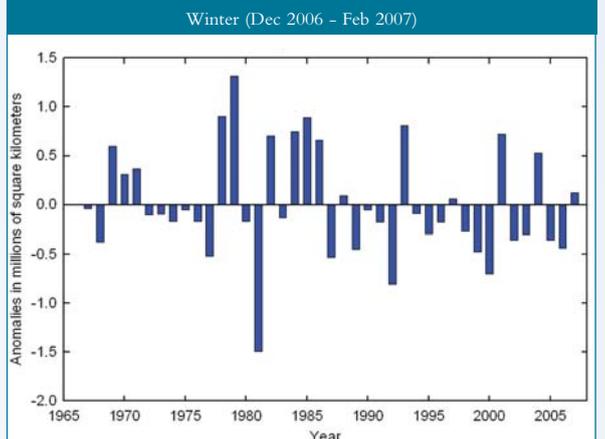


### Northern Hemisphere Snow Cover Extent for Winter 2007

As shown in the time series above, mean Northern Hemisphere snow cover extent during the boreal winter (December 2006-February 2007) was below average. Much of this was due to anomalously warm conditions across Asia, Europe, Canada, and the northeast half of the U.S. The boreal winter 2007 snow cover extent over the Northern Hemisphere was the 8th lowest extent in the historical record. Mean Northern Hemisphere winter snow cover extent for the 1967-2007 period of record was 45.4 million square kilometers.

### North America Snow Cover Extent

Winter (Dec 2006 - Feb 2007)



### North America Snow Cover Extent for Winter 2007

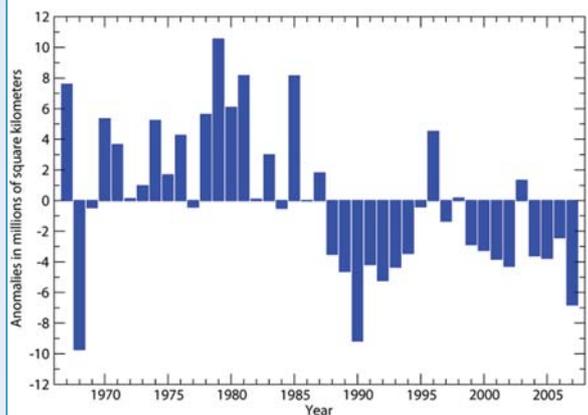


Snow cover for the boreal winter 2007 across North America was above average and was the 13th largest extent over the 41-year historical record. This was in part due to a series of snow and ice storms that struck the U.S. during the month of February. Average North America boreal winter snow cover extent is 17.0 million square kilometers for the 1967-2007 period of record.

Snow cover for boreal spring across North America was below average, giving March-May 2007 a rank of 8th lowest extent on record. Mean North America boreal spring snow cover extent is 38.7 million square kilometers for the 1967-2007 period of record.

*Data were provided by the Global Snow Laboratory, Rutgers University*

### Northern Hemisphere Snow Cover Anomalies Spring (1967 - 2007)

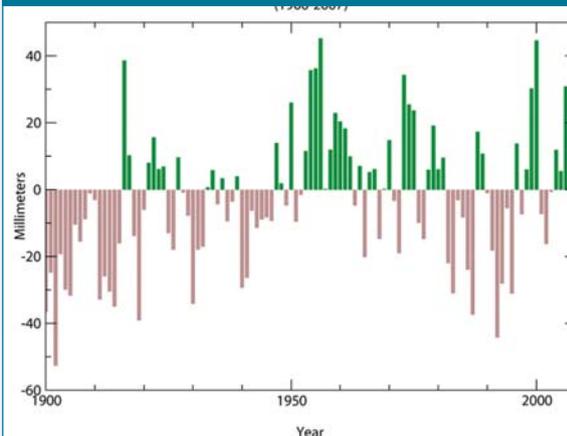


**Northern Hemisphere Snow Cover Extent for Spring 2007**

Mean Northern Hemisphere snow cover extent during boreal spring (March-May) 2007 was below average. Much of this was due to anomalously warm conditions across Asia, Europe, and most of the contiguous U.S. Spring 2007 snow cover extent on the Northern Hemisphere was the 3rd lowest extent on record. Mean Northern Hemisphere spring snow cover extent for the 1967-2007 period of record is 92.6 million square kilometers.

### Global Precipitation

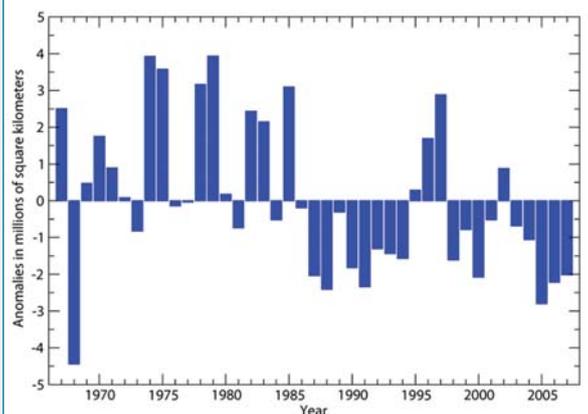
#### Annual Global Precipitation Anomalies (1900 - 2007)



**Annual Global Precipitation Anomalies**

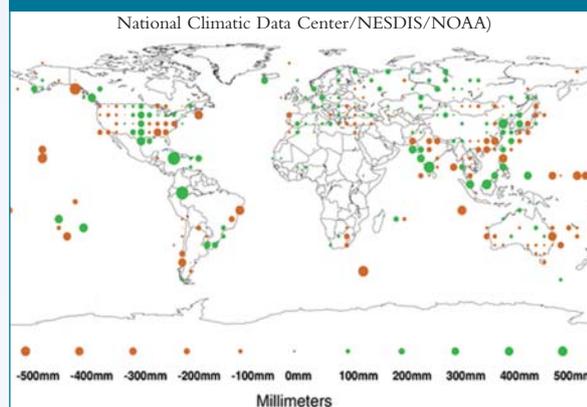
Global precipitation in 2007 was above the 1961-1990 average. Precipitation throughout the year was variable in many areas. Regionally drier than average conditions were widespread across the southeastern and western contiguous U.S., northern India, the eastern coast of Brazil, the southern and eastern parts of Australia, and parts of eastern Asia. Meanwhile the central U.S. and parts of Europe and Asia experienced wetter than average conditions.

### North America Snow Cover Anomalies Spring (1967 - 2007)



**Northern Hemisphere Snow Cover Extent for Spring 2007**

#### Precipitation Anomalies Jan-Dec 2007 (with respect to a 1961-1990 base period)



**2007 Annual Precipitation Anomalies**



In Australia, a six-year drought affected the Murray-Darling Basin in April. It was described as the worst drought in the nation's history. Precipitation in China was variable throughout the country with periods of heavy rain and in some areas extreme drought. The province of Gansu suffered its worst drought since 1940 during May. While in July, severe storms produced torrential rain that caused floods that affected nearly 500,000 people. In the province of Chongqing, a 24-hour rainfall record was broken when 227 mm (9 inches) of rain fell from July 16-17.

During January-February, heavy rain fell in Bolivia producing floods that affected nearly 200,000 people and 70,000 hectares (173,000 acres) of cropland. In early May, Uruguay was hit by the worst flooding since 1959 which affected more than 110,000 people and severely damaged crops and buildings.

In Costa Rica, heavy rain that fell during October 10-11 caused widespread floods that washed away over 800 homes and prompted a

deadly mudslide on the 11th. The mudslide, according to reports, is the worst weather disaster for Costa Rica in years, claiming 14 lives and burying hundreds of homes in the town of Atenas. In Nicaragua, the heavy rain affected 10,000 people and destroyed homes and crops. According to reports, 600 mm (24 inches) of rain fell in a period of four days.

In November torrential rain, which commenced in late October, fell over the state of Tabasco, Mexico causing devastating floods. The heavy rain triggered widespread floods, prompted deadly landslides, and caused rivers to flow over their banks, leading to the worst flooding in more than 5 decades. Approximately 80% of the state was under water, homes and crops were destroyed, and about half a million people were left homeless. On December 17, heavy rainfall triggered floods across southern Thailand which affected thousands of villagers and caused 8 districts to be declared as disaster zones. The flooding was characterized as the most severe to strike the region in 10 years.

## ICHEC / Met Éireann Collaboration



*Signing of the ICHEC / Met Éireann collaboration agreement. From left to right: Dennis Jennings (chairman ICHEC Oversight Board), Dr. J.-C. Desplat (ICHEC Director), Mr Declan Murphy (Met Éireann Director), and Prof. Iognáid Ó Muircheartaigh (NUI Galway President).*

In April 2007 the Irish Centre for High-End Computing (ICHEC) and Met Éireann embarked on a new scientific collaboration in the areas of weather forecasting and climate modelling. As part of this collaboration ICHEC provides computational facilities and support to Met Éireann to enable it to run its operational high-resolution forecast models on ICHEC's flagship supercomputer, Walton.

Both partners contribute to the international HIRLAM (High Resolution Limited Area Model) project dedicated to the development of a state-of-the-art numerical short-range weather forecasting system for operational use. In particular, research efforts are currently targeted on the development of the next generation model: a non-hydrostatic mesoscale system that will resolve weather features on a kilometre scale over Ireland. The large computing facilities available through ICHEC greatly facilitate model development as extensive resources are required for a realistic testing and debugging of the complex code. ICHEC expertise is also invaluable in optimising the performance of the model on distributed computer systems. This is a particularly important issue for a model that is run in an operational environment where there are tight deadlines for the generation of weather products; the complexity or level of detail that

the model can handle is usually configured to fit a fixed run-time.

The collaboration will also facilitate the expansion of Ireland's involvement in climate research, particularly in the modelling area. Since 2003 Met Éireann, in collaboration with UCD, has been running the C4I (Community Climate Change Consortium for Ireland) project, using a regional climate model to dynamically downscale the outputs from global climate models to produce regional information on future climate change. The new collaboration will see the partners linking up with the EC-EARTH project, an international effort to develop a new European Earth System Model based on a global coupled atmosphere-ocean system, with dynamic vegetation, atmospheric chemistry, carbon cycle and ocean biogeochemistry components. Climate simulations with this model will be run at ICHEC.

ICHEC (see <http://www.ichec.ie>) is funded by Science Foundation Ireland (SFI) with contributions from the Higher Education Authority (HEA) through the CosmoGrid project; it is hosted by the National University of Ireland, Galway. Further details regarding the C4I project are available at <http://www.c4i.ie> or through the Met Éireann website (<http://www.met.ie>).

## Passing of Noted Irish Meteorologists



**Brendan McWilliams**

*7 August 1944 to 22 October 2007*

Brendan McWilliams was born into the world of meteorology. His father, Seán McWilliams was one of the group of meteorologists recruited for the fledgling Irish Meteorological Service in 1939. Brendan was born in Dublin but grew up in Waterville, Co. Kerry as his father was Head of Valentia Observatory in nearby Cahirciveen.

On his graduation from University College, Cork Brendan chose to follow in his father's footsteps and joined the Meteorological Service in 1965. Following his training at Rosslare, he served for a period at Shannon Airport before moving to the Central Analysis and Forecast Office [CAFO] in 1975. He was a member of the team presenting the daily weather forecast on RTÉ television.

Brendan progressed to senior management in 1978 when he was appointed Head of the Dublin Airport office. He later became Head of Administration & Training before being appointed Assistant Director in 1990. Along the way, he had acquired an MBA from the National University, Dublin in 1987.

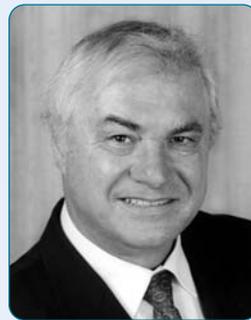
Brendan played a very active part in the work of international meteorological organisations and chaired many groups and committees, where his consensus-building ability and his communications skills were much in evidence.

In 1998, Brendan took leave of absence from Met Éireann to take up the full-time post of Director of Administration of EUMETSAT in Darmstadt, Germany. He served in this capacity until his retirement in 2004.

On completion of his MBA in 1987, Brendan's drive and energy had led him to seek further outlets and he commenced writing the daily "Weather Eye" column in the Irish Times. This quickly became one of the most popular features of the newspaper. For the last year of his life he

made a weekly live contribution to "Today with Pat Kenny" on RTÉ's Radio 1.

Mr McWilliams was a fellow of the Royal Meteorological Society (UK), an honorary life member of the Royal Dublin Society, and an honorary member of the Irish Meteorological Society.



**Dr. Anthony (Tony) Hollingsworth**

*6 July 1943 to 29 July 2007*

Dr. Anthony (Tony) Hollingsworth began his career working as a forecaster in the Irish Meteorological Service, now Met Éireann, from which he took leave to carry out Ph.D. studies at M.I.T. He returned to Europe to take up a research position in the UK Universities' Atmospheric Modelling Group at the University of Reading. He joined ECMWF on 1st March 1975, and was, at the time of his passing, the Centre's longest serving Staff Member. In his time with ECMWF he worked on virtually every aspect of numerical weather prediction, heading in turn the Physical Aspects Section and the Data and Model Divisions of the Research Department. He was appointed Head of Research in 1991 and Deputy Director in 1995. He stepped down from these latter positions on reaching his sixtieth birthday, but eschewed retirement to lead the Europe-wide GEMS environmental monitoring project, an activity he pursued with vision and dedication to the very end.

Tony was an important player also on a wider international stage, fostering extensive collaboration with EUMETSAT, ESA and space agencies worldwide, and working in support of the World Climate Research Programme, the Global Climate Observing System, the US National Academy of Sciences and the American Meteorological Society. He was a recipient of the Jule G. Charney Award of that Society, and a D.Sc. from University College, Cork for his contributions to numerical weather prediction.

# Strategic Management - Delivering Met Éireann's High-Level Goals

## Progress in Achieving High-Level Goals

Met Éireann's Strategy Statement lists ten High-Level Goals which together describe the organisation's key objectives and strategies. Progress in achieving these Goals during 2007 is detailed below.

**High-Level Goal 1:** *To make available to the general public of Ireland an excellent service of high quality general weather forecasts, warnings of hazardous weather and other information helpful in the prevention or mitigation of environmental disasters.*

General Forecasting Division (GFD) continued to supply a wide range of forecast and warning services through its offices at Glasnevin and RTÉ, Donnybrook.

During the year a total of 487 Gale Warnings and 951 Small Craft Warnings were issued, along with additional specific warnings of particular weather conditions as outlined in the adjacent table.

Specific Warnings	Number issued
Frost / Low Temperature	48
Rain	49
Snow	2
Thunder	93
Wind	103
Blight Conditions	54

There was a significant increase in the number of enquiries from the media and members of the public in relation to the very wet weather, particularly in the eastern part of the country, during the Summer months.

Customised weather services were delivered to energy utilities, the building industry, local authorities and several other business and commercial interests. In collaboration with the National Roads Authority, winter road maintenance forecasts for over 50 sites were provided to local authorities nationwide.

The Telephone Consultancy Service continued to prove popular with many industrial and

commercial clients and strong demand continued for Weatherdial, Met Éireann's premium-rate telephone weather service.

In association with RTÉ, some of GFD's meteorologists presented weather forecasts from the BT Young Scientist Exhibition in the RDS in January and from the National Ploughing Championships in Tullamore in September.

In October, Met Éireann hosted the Dublin meeting of Meteo Alarm (a consortium of European NMSs who upload severe weather warnings to a website for public access) - GFD staff were responsible for the smooth running of the meeting.

Two new chart plotters were purchased and installed in July and towards the end of the year, significant preparation had been made for the arrival of the new Forecaster Workstation, a significant addition to the operational tools available to the forecasting teams.

## Numerical Weather Prediction (NWP)

Collaboration with the HIRLAM (High-Resolution Limited Area Model)<sup>1</sup> community in NWP research continues. Met Éireann's contribution in recent years has focused on the treatment of the lateral boundary conditions used in the NWP model with the goal of formulating, in a mathematical sense, transparent boundaries that will improve the accuracy of the forecasts. This work is now coming to an end. A three day meeting was held in Dublin in October to formulate a plan for future research in this area; the meeting was attended by scientists from the Royal Meteorological Service of Belgium, and Météo France.

In collaboration with the Irish Centre for High-End Computing (ICHEC) research efforts are currently targeted on the development of the next generation model: a non-hydrostatic meso-scale system that will resolve weather features on a kilometre scale over Ireland.

In late May the HIRLAM Management Group visited Met Éireann to discuss Ireland's scientific contribution to the project and to gather feedback from the users of the operational products.

<sup>1</sup>HIRLAM, which began in 1985, is a cooperative project between the National Meteorological Services of the Nordic countries, Spain, the Netherlands and Ireland. Since 1 January 2006 the programme is in a new phase, HIRLAM-A.



## Operational NWP Forecast System

In April ICHEC and Met Éireann embarked on a new scientific collaboration in the areas of weather forecasting and climate modelling. As part of this collaboration ICHEC provides computational facilities and support to Met Éireann to enable it to run its operational high-resolution forecast models on ICHEC's supercomputers. This necessitated a complete overhaul of the NWP system. At the same time the NWP suite was updated to use the latest versions of the atmospheric and wave models and new components were introduced; the ROMS ocean model was added to produce guidance on storm surges in coastal areas and the atmospheric forecasts were refined, delivering new high-resolution forecasts on a 5 km horizontal grid over Ireland.

For forecasts in the range 3 to 7 days ahead, Met Éireann continues to rely primarily on guidance provided by the European Centre for Medium-Range Weather Forecasts (ECMWF).

**High-Level Goal 2:** *To fulfil the State's obligations to provide meteorological services to aviation and to influence future developments in this area in order to achieve the best long-term result for the State and for the aviation sector.*

Aviation Services Division (ASD) provides services to civil, military and general aviation, in accordance with the standards and recommendations laid down by the International Civil Aviation Organisation, the requirements of the European Union and national procedures. ASD comprises the Central Aviation Office at Shannon Airport, where the Head of the Division is based, together with the Meteorological Offices at Dublin, Cork airports, Ireland West Airport Knock and at Casement Aerodrome. The Division is the focal point for liaison between Met Éireann and the Irish Aviation Authority, the airport authorities and the International Civil Aviation organisation and the Commission for Aeronautical Meteorology of the World Meteorological Organisation. ASD staff also actively contribute to the work of cooperative organisations to ensure the best and most efficient service to users.

The ASD also provides forecast services for the regional airports of Donegal, Sligo, Galway, Kerry and Waterford.

All routine operations continued as normal throughout the year. Terminal Aerodrome

Forecasts (TAFs) were issued for Shannon, Dublin, Cork and Knock Airports and for Casement Aerodrome. Local Aerodrome Warnings were provided for these sites and also for a number of regional airports. A total of 390 SIGMET messages were issued for the Shannon Flight Information Region, while 383 forecasts were provided to assist Search-and-Rescue operations. Self-briefing facilities were made available to pilots at Dublin, Cork and Shannon Airports.

The European Union's Single European Sky (SES) policy aims to make air transport within Europe safer, more efficient and more cost effective. SES seeks to rationalise the organisation of European airspace, reducing the present multiplicity of Flight Information Regions (FIRs) and ultimately creating a single unified airspace in Europe. SES also regulates the provision of services to aviation, including meteorological services.

A particular requirement of the SES regulations is that a meteorological service provider to international civil aviation obtain and maintain an ISO 9001:2000 quality managements system. The ASD retained its certification in 2007 and, additionally, continued as the only certified meteorological service provider in Ireland. This certificate ensures that the Division complies with the requirements laid down by the SES legislative programme and that it provides its services in an efficient, open, transparent and non-discriminatory way.

Forecast / Products	No.	
No of short TAFs issued in 2007	14573	
No of long TAFs issued in 2007	3068	
No of LAFs issued in 2007	7281	
No of Low-Level Significant Weather Charts issued in 2007	1534	
No of tabular Wind Charts issued in 2007	1534	
No of SIGMETs issued	390	
No of Search and Rescue forecasts issued	383	
No of Local Warnings issued	EINN	247
	EIDW	343
	EICK	212
	EIME	251
	EIKN	217
	EISG	81
	EIWF	65
<b>Total</b>	<b>1416</b>	
No of Wind Shear Warnings (included in local warnings total above)	168	

**High-Level Goal 3:** *To provide a comprehensive range of climate services to all sectors based on a high quality, up-to-date national climate archive, and, in collaboration with other centres of expertise, provide an authoritative voice on future climate trends in Ireland.*

Throughout 2007 the Climatology and Observations Division continued its main tasks of maintaining the National Climate Database, managing the observational station networks, operating the Climate Enquiries Office and analysing and commenting on the Irish climate.

The Climate Enquiries Office received approximately 5,250 telephone enquiries and 3,610 requests by email/fax/letter for climatological information or reports. Almost 400 meteorologist reports were provided for legal/insurance cases and expert witnesses attended in court as required.

The Monthly Weather Summary was produced promptly after the end of each month, giving a preliminary assessment of the month's weather. The Monthly Weather Bulletin subsequently provided a more comprehensive description of weather conditions with commentary on significant events, both in Ireland and worldwide.

The Division continued to maintain and collect data from 550 climatological and rainfall stations, assisted by co-operating agencies and private individuals. These data, along with data from Met Éireann's own stations, were quality-controlled and made available in the climatological database. About half of the stations in the observing networks were visited by Met Éireann inspectors during 2007.

Work was completed on the production of rainfall depth-duration-frequencies as gridded datasets in support of the OPW Flood Studies Update.

Migration to a new database server was completed during the year.

**High-Level Goal 4:** *To maintain a high level of expertise and involvement in specialised areas such as agricultural, environmental and marine meteorology and to use this expertise to provide forecast guidance and decision support.*

## **Agricultural and Environmental Unit**

During the year the Agricultural Meteorology Unit began work with the Department of Agriculture, Fisheries and Food on monitoring the risk of Blue Tongue Virus (BTV) in Ireland. The Unit developed a meteorological trajectory model to allow daily assessment of the risk of wind advection of BTV to Ireland from infected locations in Europe and Britain. 2007 also saw the commencement of collaboration with researchers at the Department of Botany in Trinity College, modelling the impact of climate change on farming in Ireland. This project utilises climate projections generated by the C4I project to forecast crop yields in a future climate. In January the Agmet Group, facilitated by Met Éireann, hosted 'Making Science Work on the Farm - A Workshop on Decision Support Systems for Irish Agriculture'. In September the Unit again supported Met Éireann's attendance at the National Ploughing Championship in Tullamore, Co. Offaly; this provided an excellent opportunity for Met Éireann to highlight its services and to obtain feedback from customers.

## **Marine Unit**

During 2007 the Marine Unit handled routine sea and shipping-related meteorological inquiries. The Unit continues to oversee the operational running of numerical wave and surge models which are used to provide forecast guidance on the sea state around Irish coastal areas and the Irish Sea.

During the second half of the year two important changes were made to the operational marine forecasting system: the wave model was upgraded to a more advanced version (ECWAM) and a new storm surge model (ROMS) was introduced. The changes enhance Met Éireann's ability to predict the impact of severe weather in coastal areas. The new system was particularly effective in delivering timely warnings during two periods of exceptionally heavy seas in late November and early December.

New coastal visibility observations from lighthouses became available for operational use following the signing of an MoU between Met Éireann and the Commissioners of Irish Lights. Under this agreement hourly observations from a



selection of lighthouses are now accessible in near real-time by forecasters.

During the year Met Éireann collaborated with the Marine Institute in the testing of a new Data Acquisition System using the Iridium network. The Marine Unit continues to monitor the quality of the data from the fixed buoy network, ensuring that problems are identified and resolved as quickly as possible; the data are an important input for the numerical and general forecasts covering Europe and the Atlantic and for monitoring long term changes in the marine climate.

Met Éireann continued its involvement in the EU-funded PRISM project, established to develop predictive models of the Irish Sea with supporting web-based tools suitable for use in planning and management decisions. A range of output data from the Met Éireann numerical forecast model are used to support PRISM.

In February Met Éireann advertised its marine activities at the 2007 Boat Show in Dublin; its stand attracted considerable interest from the public

### **Climate modelling - Community Climate Change Consortium for Ireland (C4I) Project**

The climate modelling work intensified in 2007: new climate simulations were performed to expand the ensemble of simulations carried out for Ireland to quantify the uncertainty in climate predictions; an additional 150 year (1950-2099) simulation was performed for the European area in support of the international ENSEMBLES project of which Ireland is a partner; storm surge simulations (2 x 30 year periods) using an ocean model driven by downscaled atmospheric data were completed; a study of river catchment flooding was also completed; new studies were performed using the ensemble simulations to quantify the impacts of climate change on future energy demand for heating and the impact on upper level ozone. A high-resolution climate model is currently being used to produce a wind atlas for Ireland to support the wind energy community.

The first phase of this climate modelling work came to an end in December and preparations

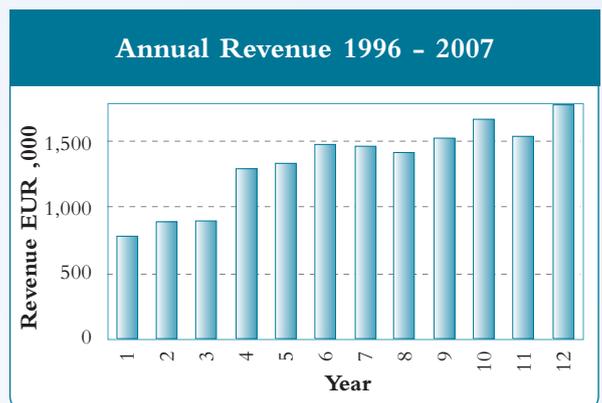
were begun for a comprehensive report summarising the project findings.

Met Éireann became a partner in the EC-EARTH, an international project established to develop a new European Earth System Model based on a global coupled atmosphere-ocean system with dynamic vegetation, atmospheric chemistry, carbon cycle and ocean biogeochemistry components. In December, Met Éireann and UCD jointly hosted a two day workshop meeting of the EC-EARTH group to discuss future research work.

In February, C4I gave a summary presentation to the Oireachtas Joint Committee on Environment and Local Government, debating 'Climate Change in Ireland'.

**High-Level Goal 5:** *To undertake commercial meteorological activity in a way that is consistent with competition law and with Met Éireann's other mandates so as to reduce overall costs to the exchequer.*

Year	Amount (€, 000)
1995	719
1996	766
1997	876
1998	883
1999	1,277
2000	1,312
2001	1,463
2002	1,444
2003	1,398
2004	1,501
2005	1,651
2006	1,517
2007	1,865



Met Éireann's principal revenue-earning activities continued to include premium-rate weather forecasts, services to TV and other media, provision of climatological data and reports, and supply of severe weather forecasts (including winter road maintenance) to the National Roads Authority and to local authorities. Revenues from these activities reached a new peak this year.

Customer service continued to benefit from the Customer Relationship Management (CRM) software system which provides instant access to key customer information, prioritises activities and tracks all customer-related communications. Operating in tandem with enhancements to Met Éireann's accounting procedures, the CRM system enables customer requirements to be managed with improved timeliness and efficiency.

Throughout 2007 the Commercial Division maintained on-going liaison with all major customer groups and business partners. Marketing and promotional activities included attendance at a number of shows and exhibitions, most notably the Boat Show in January and the National Ploughing Championships in September.



Met Éireann staff at the National Ploughing Championship

**High-Level Goal 6:** In association with Met Éireann's overall meteorological functions, carry out an appropriate and relevant set of environmental monitoring and geophysical programmes.

## Valentia Observatory

Four upper air radiosonde ascents per day to measure the vertical profile of meteorological elements were carried out at the Observatory,

along with hourly surface weather reports. Measurements of ultraviolet (UV) radiation and surface and total column ozone levels were performed, supplemented by weekly ozonesonde ascents. Upgrades to the telemetry and wind systems and upper air ground station were completed during 2007.

The Observatory participated in national and international monitoring programmes in atmospheric chemistry, geomagnetics, seismology, and phenology. The upgrade of the geomagnetic facilities continued. The seismological facilities were upgraded in cooperation with the Dublin Institute of Advanced Studies (DIAS). A lightning detection system was installed as part of the Met Office global network. A new aerosol optical depth monitoring programme commenced in accordance with Global Atmospheric Watch (GAW) requirements.

Cooperation continued with NUI, Galway, in the area of atmospheric physics and chemistry, following up on the 2005 GAW review. Participation commenced in a new, three year Environmental Research Centre (ERC) project to analyse ozone levels over Ireland.

## Laboratory

Analysis of the chemical composition of air and precipitation samples from selected synoptic stations, primarily Valentia Observatory, continued. Analysis of samples from five Environmental Protection Agency (EPA) sites continued, as part of an ERTDI project to monitor air quality and acidification linked to transboundary pollution. Analysis of air samples from Mace Head commenced in accordance with GAW requirements. Tests associated with the extension of the range of the atmospheric chemistry programme, in accordance with the requirements of EMEP, GAW commenced.

**High-Level Goal 7:** Maintain and enhance a technical infrastructure for Met Éireann that supports the production of its outputs.

## Instrumentation

### Synoptic Network

The longstanding Met Éireann network of synoptic stations, which produce hourly reports of





local weather conditions, comprises a mix of manned and automatic stations. A full programme of observations, 24 hours a day, was maintained throughout the year.

An additional automatic weather station (AWS) was installed in 2007 in the unified climatological and synoptic observations network (TUCSON). This station included intelligent sensors capable of monitoring visibility, weather or cloud conditions (ICAPS). The station was located at Gurteen Agricultural College, Co. Tipperary and will be commissioned early in the New Year. This brings the number of AWSs in this new automated network to 14. In addition, three existing TUCSON AWS sites were ICAPS enabled. Preparation for the installation of a AWS at Johnstown Castle was completed. Planning for the installation of a new AWS to be installed at Malin head in 2008 was completed.

The Met Éireann observational networks are supported by calibration, maintenance and repair programmes. A new facility for calibrating humidity sensors over their full operational range was installed during 2007.

## *Airports*

The new type of ceilometer was deployed at both Cork and Knock airports. The upgrade of the wind sensing system at Casement aerodrome commenced and will be completed early in the New Year. The telemetry system at Dublin airport was moved to a new enclosure and upgraded.

### **Meteorological Radar and Satellite Receiving Systems**

Met Éireann operates two networked weather surveillance radars, located at Dublin and Shannon Airports. Ground station facilities for the reception of data from meteorological satellites are also maintained. These continue to be upgraded to handle the additional types of information becoming available from the new geostationary and polar orbiting satellites.

## *Information and Communications Technology*

Actual IT-related expenditure for 2007 amounted to an overall total of €1,042,782.44 .

A number of planned projects were deferred due to staffing difficulties or to disruption arising from refurbishment work in HQ.

*Among the significant developments were ;-*

- New project area: New project, entitled “Migration to Table Driven Code Formats [MTDCF]”, did not incur capital expenditure in 2007 as the project implementation was postponed to 2009.
- Existing Project: The Forecaster Workstation (FWS) project incurred capital expenditure of €23,171.50 on hardware in 2007. Software expenditure for the project will be for €175k (incl VAT) in 2008.
- Replacements/Enhancements had a saving of €182k as some postponed due to staff shortages and difficulties arising from the refurbishment of 2nd Floor at HQ during 2007.
- ICT Maintenance costs reduced significantly mainly due to the cancellation of a H/W and S/W maintenance contract with IBM for the RS-6000 SP supercomputer that was taken out of service when the routine operational running of the NWP suite was outsourced to the Irish Centre for High-End Computing (ICHEC) from the start of 2007.

## *Normal ICT Operational Support and Maintenance Activities*

During 2007 IT staff enhanced and supported a wide range of computer systems and applications. Family friendly working arrangements, particularly term time leave, impacted the working arrangements for some staff. Two IT Division staff resigned from Met Éireann after undergoing induction training and there were long delays in filling the consequential vacant IT posts in the applications development area.

1. Normal operational output were successfully supported and maintained throughout the reporting period despite the shortage of staff in attendance during the summer period in particular.
2. ICAO AMD 74: In accordance with ICAO recommended Amendment 74 to Annex 3, changes were made to the legends on the

WAFS charts produced in-house by the GIS-Meteo application. The AMD 74 changes were successfully implemented on schedule on 7th November 2007.

3. Met Éireann participated in the annual WMO monitoring of the availability of observation reports [synops, upper air, ships and buoys] on the GTS during the period 1-15 October 2007. The analysis of results were compiled and returned to WMO by the deadline.
4. Met Éireann participated in the regular monitoring of the availability of SIGMET reports during a number of test periods organised and coordinated by ICAO and WMO.

### *NWP Projects*

- NWP-related project successfully completed to replace 5 x SGI servers (Warm, Cold, Mild, Dry, Wet) with two new rack mounted servers (Carbon, Oxygen) supplied by Dell.
- NWP suite successfully ported to ICHEC platform; bandwidth to Internet increased from 2Mbps to 5Mbps to facilitate the operational exchange of High resolution NWP data to/from both organisations.
- ECMWF: New NWP cycle improvements were introduced by ECMWF in November. NWP data reception and processing applications were successfully enhanced and tested to handle the new NWP outputs.

### *Forecaster Workstation project*

A detailed ITT for a Forecaster Workstation System (FWS) was published on the e-Tenders web site and in the OJEU. Eight suppliers responded to the ITT. The contract for the supply of the software, documentation, installation and training was awarded to a Slovak based company, IBLSoft. The supply of the computer hardware was the subject of a separate tender and the contract for the supply of three servers was awarded to Dell.

### *Desktop Systems and Services*

ERGO Smart Business, HP resellers, were awarded a contract for the supply of 12 laptops

under the CMOD Frameworks Agreement. The then new Windows Vista operating system was evaluated in detail and each laptop was customised with the latest anti-virus software before being released to the users.

### *Observation Data Reception and Processing*

Application software for the production of Synoptic reports for international dissemination on the GTS was successfully developed and tested. The new software was installed in July 2007 and since then has been running reliably and generating hourly synoptic reports from the TUCSON data received from the new Johnstown Castle station in Co. Wexford.

- Arrangements were made the CIL to collect visibility readings, via e-mail, from Lighthouses around the Irish coasts
- The format of the Coastal Reports broadcast with each sea area forecast on RTÉ radio was adjusted to remove Rosslare and replace it with reports from the M5 Buoy and the visibility reading from the nearby Tuscar Rock Lighthouse.
- A new interface to the TUCSON+ICAPS metadata database, for use by I&E and ITOPS staff, was successfully developed.

### *IT Division Staffing Movements in 2007:*

- 2 IT Division MO staff resigned from Met Éireann during the year.
- 1 SMO left the Division on promotion to PMO.
- 1 MO and 1 SMO joined the Division during the course of the year.
- There was 1 internal promotion of an MO to SMO in the Division in 2007.
- Despite severe pressures due to staff shortages and availability, particularly during the summer period, all ICT systems were successfully supported and maintained.



## ICT Training

- On-the-job training and mentoring arrangements were put in place for new staff.
- ICT Overview induction module delivered to four newly recruited MOs.
- Expenditure on IT-related training was increased during 2007 with several of the more junior staff availing of recommended formal training courses as organised by the T&O Officer.

## Plotters replaced in the two Forecast Offices

Four new HP T1100 DesignJet plotters, compatible with postscript version 2, were procured from Sord Data System and were successfully deployed to replace the 6-year old HP DesignJet 1050C plotters in both CAFO and CAO in Shannon.

## Infrastructure enhancements

New Remote access facilities, including two new CITRIX servers, were successfully installed to enable teleworking from home for authorised staff and to provide remote access facilities to enable mobile workers on the move to obtain secure access to back office systems and applications via a secure VPN tunnel hosted and managed by Entropy. The Sidewinder Firewall was also upgraded.

## TV Graphics Systems:

Three new Linux workstations were procured from HP and after some teething problems were successfully deployed to run the latest version of the WeatherOne Borealis software at RTÉ and HQ.

## Aviation Services

ICT services to the Aviation Services Division were provided reliably during the reporting period to agreed standards as outlined in the Service Level Agreement.

Following the successful completion and testing of the application software to run a new database of

aviation weather reports and the web browser interface, significant progress was made in building a secure DMZ and supporting infrastructure to facilitate the hosting of the new web-based Met Self Briefing (MSB) service for pilots.

**High-Level Goal 8:** *To position Met Éireann so as to make the most effective contribution to the achievement of Government objectives in the general environmental area.*

## Automation of Observing Network

The installation of TUCSON stations at Johnstown Castle, Oakpark and Ballyhaise was completed in the early part of the year. An agreement was reached with Gurteen Agricultural College for the installation of a TUCSON station on their premises. The installation work was commenced and will be completed early in 2008. This will eventually replace the present Birr station.

A potential site for a TUCSON station in the Belmullet area was identified but planning and environmental considerations meant that little progress was possible by the end of the year. This matter will continue to be followed up in 2008. Work on the preparation of a planning application for the installation of the TUCSON station on the Malin Head site was ongoing at the end of the year.

In July, weather observing operations were transferred from the manned station at Rosslare Harbour to the new automatic site at Johnstown Castle. This was the first in a series of such transfers in the ongoing programme to automate Met Éireann's network of synoptic weather stations.

**High-Level Goal 9:** *Actively seek collaboration with UK and other European meteorological services in order to improve the effectiveness of Met Éireann and to pursue Government objectives in relation to the British-Irish Agreement.*

Throughout 2007 Met Éireann maintained its active involvement in the work of several international organisations including the World Meteorological Organisation, the International Civil Aviation Organisation, the European Centre for Medium-Range Weather Forecasts, the

European Organisation for the Exploitation of Meteorological Satellites, the European Co-operation in Meteorology grouping and the European Meteorological Network. Met Éireann also continued its participation in HIRLAM, a co-operative project in Numerical Weather Prediction between the Nordic countries, Spain, the Netherlands and Ireland.

The European Co-operation in Meteorology grouping (ECOMET) was established in 1995 in response to the development of commercial meteorological activities in Europe. Its primary objectives are to preserve the free and unrestricted exchange of meteorological information between the European National Meteorological Services, and to ensure the widest availability of basic meteorological data and products for commercial applications.

### *EUMETSAT Council Meeting in Cork.*

The 62nd Meeting of the Council of EUMETSAT took place in Cork on 26/27 June, 2007, at the invitation of its Chairman, Declan Murphy, Director of Met Éireann.

EUMETSAT, the European Organisation for the Exploitation of Meteorological Satellites, is an international organisation set up in 1986 and has 21 Member States, including Ireland. It operates a series of geostationary and polar-orbiting weather satellites that provide images and derived products to its Member States and to the international meteorological community.

The meeting in Cork reviewed the status of the various EUMETSAT programmes and had a particular focus on planning for the next series of geostationary satellites (the Meteosat Third Generation) and on the role of EUMETSAT in the European Commission's Global Monitoring for Environment and Security (GMES) programme.



The Council Members paid a courtesy visit to the Lord Mayor of Cork, Mr. Donal Counihan, during which the Director-General of EUMETSAT, Dr. Lars Prahm, made a presentation to the Lord Mayor.

### *EGOWS 2007*

The 2007 meeting of the European Group on Workstation Systems [EGOWS] was hosted by Met Éireann in Dublin. EGOWS is an informal group that meets annually to discuss matters related to Meteorological Workstations and other related topics. Representatives from most Met Services in Europe attended along with ECMWF, Environment Canada and Australian Bureau of Meteorology. Several people from Met Éireann also attended. Most of the presentations featured the latest developments in each country. A feature of EGOWS is a demonstration session where developers display their latest systems and exchanged ideas. The last day features Working groups discussing topics like visualisation and the role of the forecaster.

The meeting was held in the Bedford Hall in Dublin Castle in from the 18th to 21st June.



*Participants at EGOWS 2007 pictured at Dublin Castle.*

### *18th OPERA Meeting*

Met Éireann hosted the 18th OPERA (Operational European Radars) meeting in Dublin Castle in October 2007. OPERA is a EUMETNET group that works on developing operational meteorological radars in Europe and meets twice each year. Since the establishing of GORN in the early 90's and OPERA in 1999 there has been a continual development in establishing standards for radar data exchange. This exchange has culminated in a demonstration European data hub and radar composite which includes almost all radars in Europe. OPERA also investigates new radar technologies, processing





algorithms and maintains databases of radars. Currently OPERA is in its 3rd phase with OPERA III which runs from 2007 to 2011.

The meeting was held in the Bedford Hall in Dublin Castle from the 3rd to 5th October.

**High-Level Goal 10:** *To utilise the Civil Service modernisation programme in all its aspects to improve the efficiency of Met Éireann and to develop the potential of its staff.*

## Administration

Budgetary outturns for 2007 were a little less than estimated, with small under-spends on both the capital and non-capital subheads. Subscriptions to Meteorological International Organisations were also less than anticipated due mainly to a reduced contribution to EUMETSAT, the European Organisation for the Exploitation of Meteorological Satellites. EUMETSAT contributions vary each year depending on the status of its operational programmes.

During the year there were 3 staff resignations and 2 retirements. There were four appointments to the Meteorologist grade and four to the Meteorological Officer grade. Eight staff were serving in temporary contract posts and five were on career breaks at various stages during the year. At the end of 2007 there were the equivalent of 222 staff posts filled in Met Éireann (taking into account work sharing etc.).

Since the launch of the Strategic Management Initiative in the mid-1990s Met Éireann has produced its own Strategy Statements. However in a departure from this practice, the new Departmental Statement of Strategy 2008–2010, published towards the end of the year, incorporates details of Met Éireann's Mission, Values and Objectives. This closer integration of Met Éireann's strategic planning with that of the parent Department is a positive development which should increase opportunities for Met Éireann to coordinate its activities with wider Departmental initiatives. A major refurbishment of Met Éireann's Headquarters offices in Glasnevin began in 2007. The first phase of planned renovations, which will extend over a number of years, was completed in December.

## Partnership

Met Éireann's Partnership Council was restructured and the new Council, comprising 13 members, held its first meeting in March. The Council held seven meetings during 2007.

The Council began a process of inviting each Division in Met Éireann to raise issues relating to the Division, or issues of a more general nature, which they believe could usefully be discussed at Partnership. As a result the Instrumentation & Environmental Monitoring Division and the Information Technology Division made presentations to Partnership during the year.

The Partnership Council continued to monitor developments in regard to the refurbishment of Met Éireann's HQ offices, the operation of the Performance Management and Development System (PMDS), and Health and Safety issues throughout the organisation.

The Council helped formulate Met Éireann's input to Departmental reports for the Civil Service Performance Verification Group (CSPVG), and established an EnviroMet sub-committee to produce a 'Green Policy' for Met Éireann.

## Staff Training and Development

In 2007 training / development activities were largely based on requirements identified on the PMDS Role Profile Forms. In all 185 training events, of which 30 were organised outside Ireland, were delivered to staff. Training topics included weather observing and forecasting, IT, climatology, management and administration. While some staff, because of their particular requirements, attended multiple courses, 100 staff attended at least one training event during the year. 16 staff attended Certificate, Diploma, Degree, Masters and Ph.D. courses under the Refund of Fees Programme. Four staff attended language courses organised by Galeagras and the Civil Service Language Centre.

Two Meteorologists completed their induction training at UCD, gaining an M.Sc. in Meteorology. One newly-recruited Meteorologist began the M.Sc. course in the autumn. Initial training for four Meteorological Officers was provided at Casement Aerodrome, Baldonnell. Met Éireann also provide training for three Regional Airport MET observers.

## *Library & Information Services*

Met Éireann's Librarian post had been vacant since early 2006, but was filled on a contract basis from October 2007. By the end of the year the new Librarian had made good progress in re-establishing the library facilities on a fully operational basis. The Librarian also assisted in the maintenance of Met Éireann's website and in the production of Met Éireann's staff magazine Splanc, one edition of which appeared in 2007.

## *Young Scientist and Technology Exhibition*

In 2007 Met Éireann sponsored a Special Award at the Esat BT Young Scientist and Technology

*Henrik Bresecke being presented with his award by Evelyn Cusack*

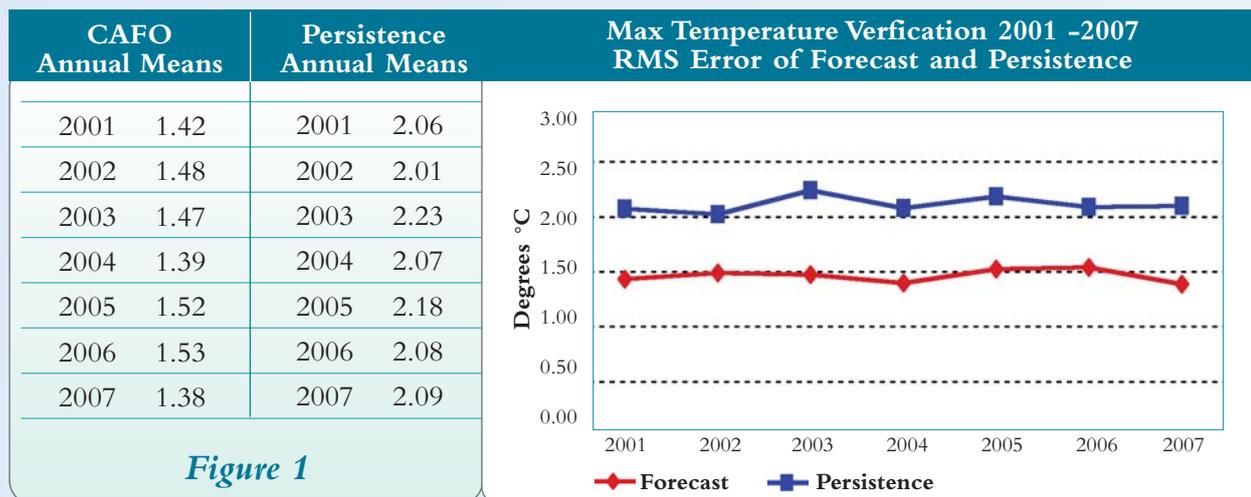


Exhibition for the best project with Irish weather or climate as its central theme. Student, Henrik Bresecke from St. Columba's Comprehensive School, Glenties, Co. Donegal won the award for his project "An Analysis of Weather Patterns in Maritime and Continental Regions"

The project involved monitoring and comparing weather patterns in Ireland and Germany.



## Appendix 1 - Forecast Accuracy

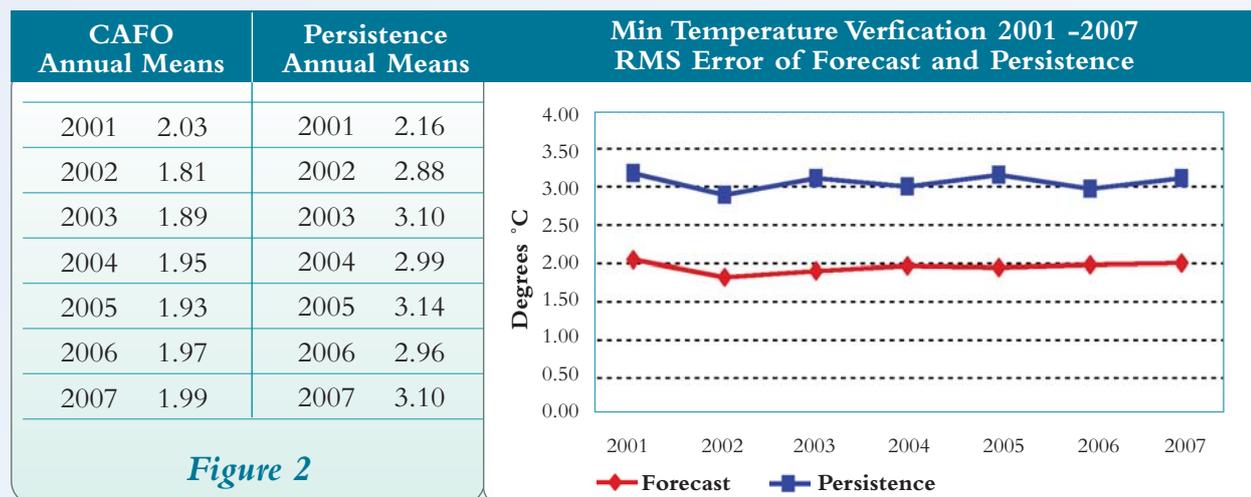


### Verification of Public Weather Forecasts

During 2007 Met Éireann continued the routine verification of predicted daily maximum temperature, minimum temperature and rainfall at four sites (Dublin, Cork, Birr and Belmullet), based on the RTÉ 1 radio forecasts at 7.55 am.

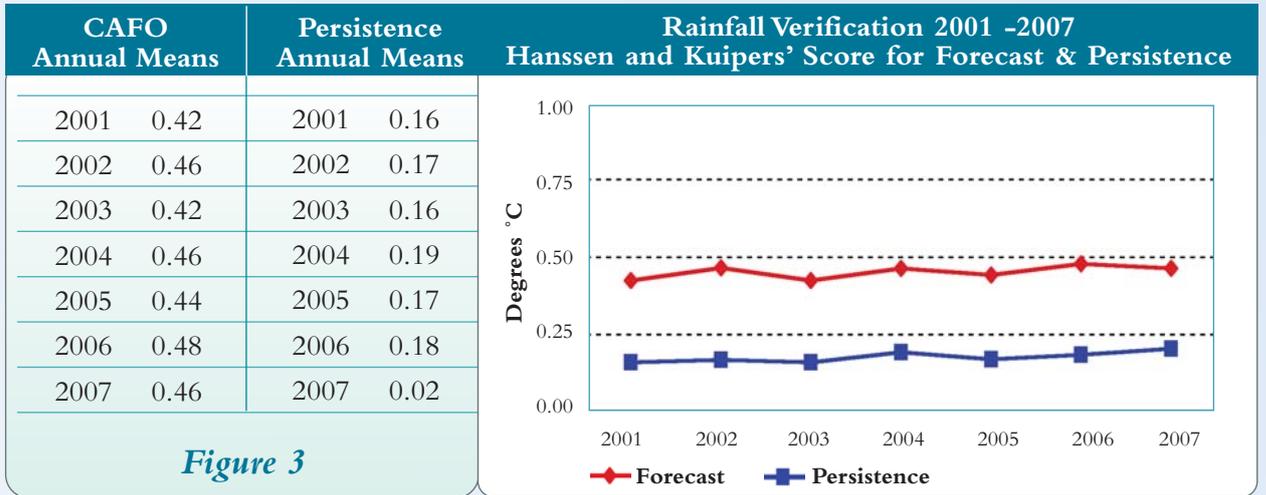
Figures 1 and 2 show the mean annual Root Mean Square (RMS) errors for the maximum and minimum temperature forecasts for the years 2001 - 2007 (the smaller the RMS error, the better the forecast). Figure 3 shows the mean annual verification of rainfall amount by means of Hanssen and Kuipers' Score - this has a value of 1 for a perfect forecast, and zero for a random forecast, i.e. one lacking any skill. The Figures also show corresponding mean annual scores for persistence.

For 2007, the mean Root Mean Square (RMS) error for the maximum temperature forecast is about 1.4°C, and about 2.0°C for the minimum temperature. For rainfall, the average value of the Hanssen and Kuipers' Score is 0.46. All these scores are in line with the corresponding values for 2001-2006.



An indication of the quality of the forecasts can be got by comparing the forecast scores with the values that would be obtained for a 'standard' forecast. Persistence is a commonly-used standard for verification purposes - i.e., a forecast that assumes that tomorrow's weather will be the same as today's. Figures 1 - 3 show that, as would be expected, the annual forecast scores for the years 2001-2007 are in all cases much better than the persistence scores.





### Numerical Weather Prediction

The evolution of the annual verification scores for the HIRLAM forecasts of 2-Metre Temperature and 10-Metre Wind Speed, from 2001 to 2007, is shown in Figures 4 and 5.

Figure 4 gives the Root Mean Square error scores of forecast 2-Metre Temperature for 24 hrs and 48 hrs, verified against actual temperature reports from the network of Irish observing stations. Both scores show an improvement in the 2007 RMS error compared with corresponding values for 2006.

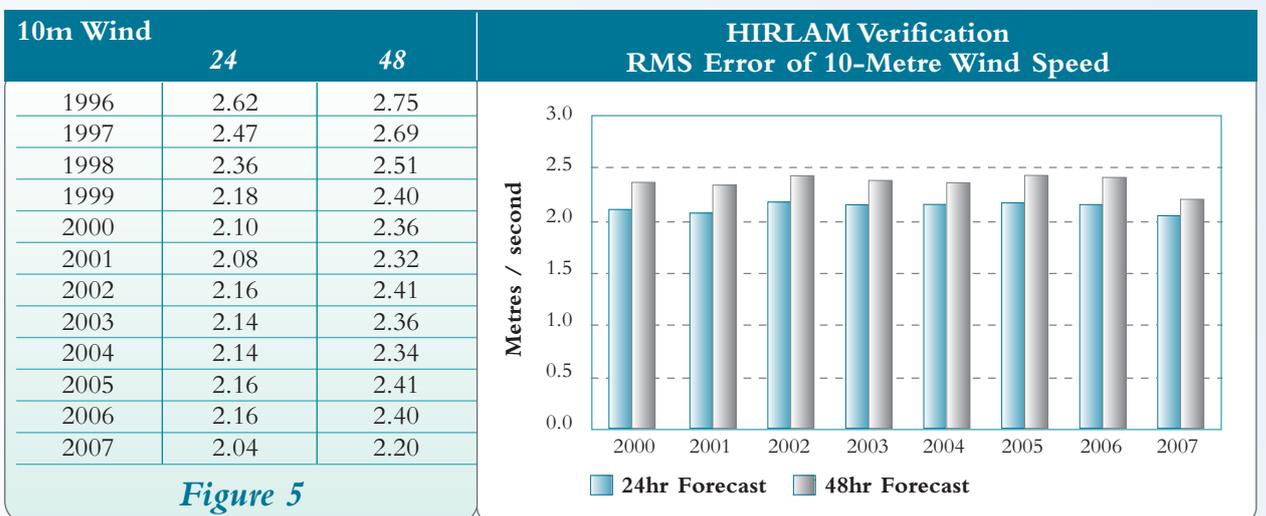
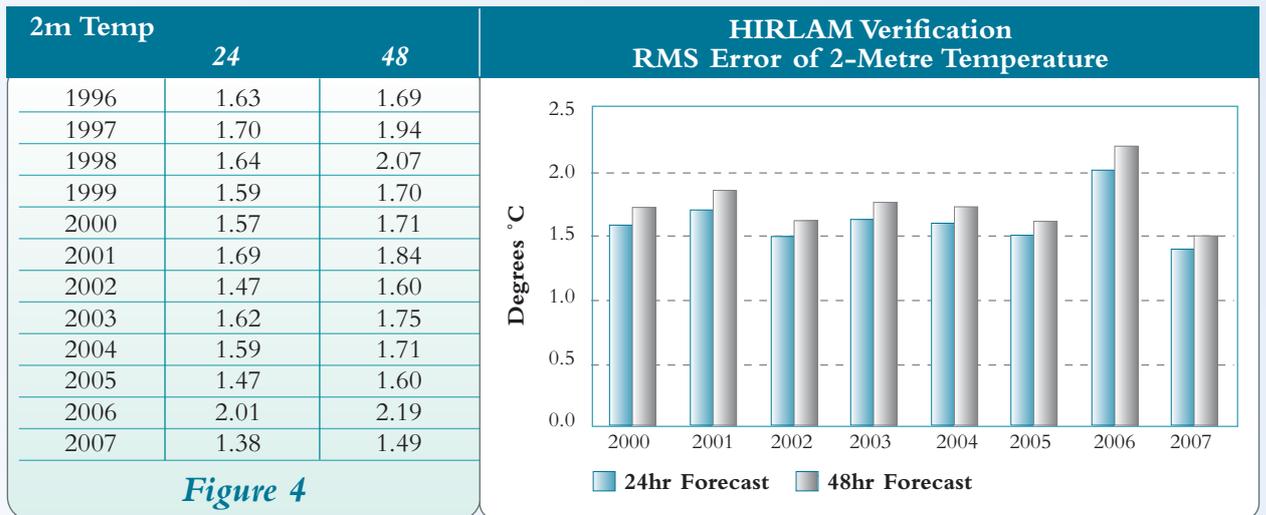


Figure 5 shows the Root Mean Square error scores of forecast 10-Metre Wind Speed for 24 hrs and 48 hrs. In both cases, the 2007 figures show an improvement from those in 2006.

It should be noted that during 2007, Met Éireann changed over to using the ICHEC facilities [see related article on this] for running the model. The enhanced computing capability also provide the opportunity to upgrade from HiRLAM version 5 to version 7 and to increase the number of levels used from 31 to 60.

## Road Surface Temperature

Forecasts of road conditions are provided under contract to the National Roads Authority. Verification of the Road Surface Temperature (RST) minimum forecasts was carried out during the winter 2006/2007 season for the so-called critical nights (nights on which RSTs less than 5°C were observed) for all available sites. Table 1 shows the Hanssen and Kuipers' Score and the RMS Error for the 2006/2007 forecasts, along with the corresponding values for the winter seasons 2005/2006 and 2004/2005,

For 2006/2007 the Hanssen and Kuipers' Score was slightly down in comparison to the previous while the RMS Error, at 1.49°C was the lowest since we started providing this service in the '98/'99 season. However both scores have been quite stable over the past three winter seasons.

Table 1	Hanssen & Kuipers' Score	RMS Error
2006-2007	0.64	1.5°C
2005-2006	0.68	1.7°C
2004-2005	0.66	1.6°C

## Air Temperature Forecasts

Early morning forecasts of maximum and minimum temperatures for Dublin and Cork, for the current day and the subsequent two days, are issued by General Forecasting Division. These forecasts are subsequently verified against observations at Dublin and Cork Airports.

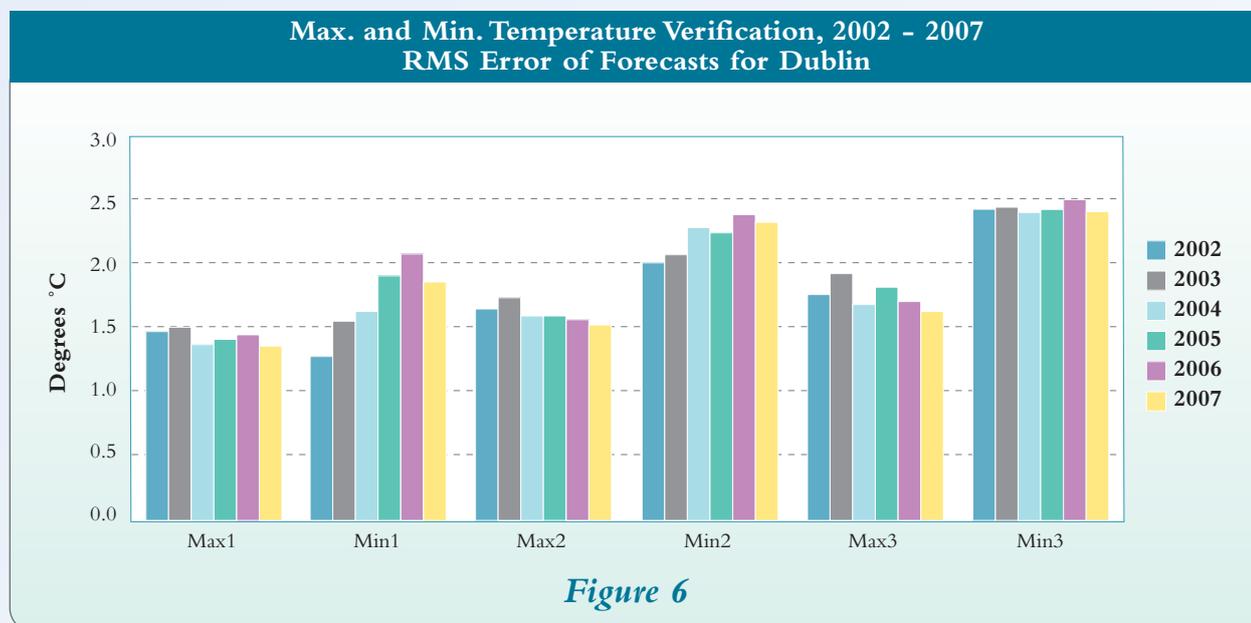


Figure 6 shows the annual RMS error scores for Dublin for the period 2002-2007 (Max1 = max. temperature on current day, Max2 = max. temperature on following day etc). Figure 7 shows the corresponding RMS error scores for Cork.

Max. and Min. Temperature Verification, 2002 - 2007  
RMS Error of Forecasts for Cork

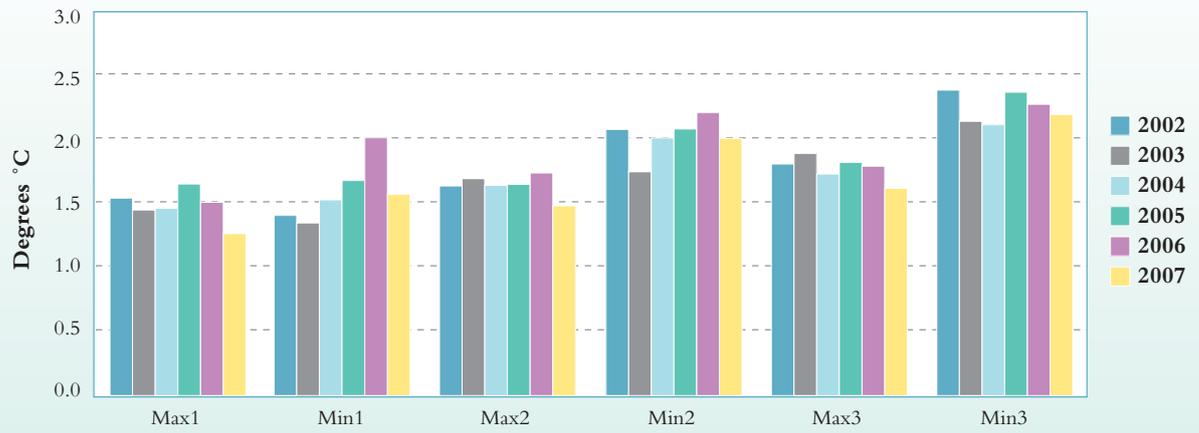


Figure 7

The 2007 RMS scores show an improvement when compared with those of 2006.

*(It should be noted that in previous years, the comparison were based on the 24hrs, 21z to 21z, whereas in this report the comparison are based upon the exact day in question, i.e., 00z to 24z.)*

## Appendix 2 - *Publications*

McDonald, A., 2007: An update into research into transparent boundary conditions. HIRLAM newsletter 52, pp 148-155.

## Appendix 3 - Met Éireann Finances

The figures presented below are approximate and for information only. They do not form part of the official annual accounts of Met Éireann.

<i>Income and Expenditure 2005/2006</i>	<b>2007</b>	<b>2006</b>	<b>2007</b>	<b>2006</b>
	€,000	€,000	€,000	€,000
Salaries and Related Expenses (A1)			15,978	14,954
Other Operating Expenses			2,738	2,756
Capital Expenditure			872	735
Contributions to International Organisations			2,898	3,235
<b>Total</b>			<b>22,486</b>	<b>21,680</b>
Receipts from Eurocontrol (Route Charges)	8,309	7,841		
Receipts from Commercial & Cost Recovery Activities	1,865	1,517		
<b>Total Receipts</b>	<b>10,174</b>	<b>9,358</b>		
<b>Net Cost of Operations</b>			<b>12,312</b>	<b>12,322</b>
<i>Some details of above</i>				
Salaries (A1)			14,957	14,042
Overtime			762	668
Payment to Observers			124	119
Other Allowances			135	125
A2 (Travel & Subsistence)			270	223
A3 (Training/Merit Awards/Cleaning etc.)			625	502
A4 (Communications & Post)			301	263
A5 (Computing Capital)			273	224
A5 (Computing Non-Capital)			552	531
A5 (Instrumentation Capital)			599	511
A5 (Instrumentation Non-Capital)			614	608
A6 (Maintenance/Energy)			367	626
A7 (Consultancy)			9	3
			<b>19,588</b>	<b>18,445</b>
<i>Some details of commercial/cost recovery receipts</i>				
Climatological Information	190	198		
General Forecasting	1,657	1,287		
Miscellaneous	18	32		
	<b>1,865</b>	<b>1,517</b>		

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## Glossary

<b>ALADIN</b>	Limited-area Numerical Weather Prediction model of Météo-France
<b>AWS</b>	Automatic Weather Station
<b>C4I</b>	Community Climate Change Consortium for Ireland
<b>CAFO</b>	Central Analysis and Forecast Office
<b>CRM</b>	Customer Relationship Management
<b>ECMWF</b>	European Centre for Medium-Range Weather Forecasts
<b>ECOMET</b>	European Co-operation in Meteorology
<b>ECPDS</b>	ECMWF Product Distribution System
<b>EGOWS</b>	European Group on Work Stations
<b>EUCOS</b>	EUMETNET Composite Observing System
<b>EUMETCast</b>	EUMETSAT data dissemination system
<b>EUMETNET</b>	Network of European Meteorological Services
<b>EUMETSAT</b>	European Organisation for the Exploitation of Meteorological Satellites
<b>FIR</b>	Flight Information Region
<b>GAW</b>	Global Atmosphere Watch
<b>HIRLAM</b>	High-Resolution Limited Area Model
<b>ICAO</b>	International Civil Aviation Organisation
<b>INTRA</b>	Integrated Training (3rd-level work experience programme)
<b>ISO</b>	International Organization for Standardization
<b>MSG</b>	Meteosat Second Generation
<b>NASA</b>	National Aeronautics and Space Administration
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>OPW</b>	Office of Public Works
<b>PRISM</b>	Predictive Irish Sea Models
<b>PMDS</b>	Performance Management and Development System
<b>QMS</b>	Quality Management System
<b>RMS Error</b>	Root Mean Square Error
<b>RST</b>	Road Surface Temperature
<b>SAF</b>	Satellite Application Facility
<b>SES</b>	Single European Sky
<b>SIGMET</b>	Information on occurrence of specified aviation weather phenomena
<b>SMS</b>	Short Message Service
<b>SYNOP</b>	WMO Code for Surface Synoptic Observations
<b>TAF</b>	Terminal Aerodrome Forecast
<b>TUCSON</b>	The Unified Climate and Synoptic Observation Network
<b>WAFS</b>	World Area Forecast System
<b>WAM</b>	Wave Forecast Model
<b>WAN</b>	Wide Area Network
<b>WMO</b>	World Meteorological Organisation

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