December 2010: Looking Back and Looking Forward

For most people, the freeze of December 2010 will be one they want to forget, but nevertheless one which will likely become etched in the folk memory of Ireland. By any standards it was an exceptional month, and last month certainly will rank as the coldest December on record in Ireland, probably as far back as the mid 19th century. Although few long term temperature records were broken, historic lows were closely approached. In many parts of the Midlands, for example, the nights dipped below -14^{o}C, an astonishingly low value for an island that normally epitomises mild, oceanic winter conditions. Temperature observations provide only a sample of conditions being experienced, but still confirm the extreme lows reached. In Ballyhaise, Co Cavan for example the mercury fell to -14.8^{o}C, while across the Border in Castlederg, Co. Tyrone it got as low as -18.6^{o}C on 23rd December, a new record low for Northern Ireland. It has of course been colder elsewhere in the island. The low temperature record for Ireland as a whole for the 20th Century is -18.8^{o}C recorded in Lullymore in Co. Kildare in January 1979 and the 'all time record' is -19.1^{o}C in January 1881 from Markree Castle, Co. Sligo. But what was most remarkable about this recent cold spell was firstly its occurrence so early in the winter, and secondly the coldness of the daytimes. On 21st December in Co. Cavan the temperature never got above -9.4^{o}C making it the coldest ever day recorded in Ireland.

As climatologists we need to place this winter in a longer term context. We have had very snowy winter events in the past. January 1982 and the winter of 1962-63 come to mind. But perhaps the worst event, at least in living memory, was in 1947, the year of the Big Snow. This was a year when the snow lingered on the ground from January to March and was compounded by a major blizzard starting on the 24th February that lasted continuously for over two days. Indeed for the 50 days from January 24th to St. Patrick's Day 1947 it snowed on 30 of them.

It was a natural disaster happening in an Ireland already suffering from the aftermath of war-time deprivations. Every road and railway was blocked, every canal frozen solid. Power lines were cut and food and fuel had to be rationed. People were rationed to 6lb of bread, half a pound of sugar, half an ounce of tea and 2 ozs of butter, if supplies were available. By the end of February, half the houses in Dublin City had no turf for their fires and people began to take an axe to their furniture. Many trees and hedges were also were cut down. Elderly people were especially vulnerable to the cold in houses that almost universally lacked any form of central heating or insulation. Significant increases in strokes, respiratory problems and heart attacks were reported. The frozen ground meant that burials became impossible for a time. Some involved transporting the coffin on a barn door used as part of an improvised horse drawn sleigh.

A large proportion of the country's cattle and sheep perished beneath the snowdrifts. Absolute numbers are not known, but in the UK a quarter of the sheep flock was lost and a similar figure probably applied here also. Some farmers lost their entire herd. Yet, even in the midst of this adversity there were some imaginative individuals. The bakers and milkmen of Boyle, Co. Roscommon for example constructed horse-drawn sleighs for their bread and milk deliveries. In Ardmore, Co. Waterford, typical of many towns cut off, the locals formed a 'meithil' to start clearing the 3m high drifts and there was great rejoicing when the bread van from Youghal finally reached the village. In Co. Sligo the local youths took the shoes off their horses so they could walk better on the snow and ice, loaded up their carts with sawdust from the corn mill in Ballymote, and set up a stage on Bellinascarrow Lake with poles and battery powered lights for music and dancing. The schools of course were shut. But most children walked to school in those days, so the main reason was actually that the ink had frozen solid in the inkwells. So there was no way of writing anything!

To place climatic extremes such as this winter truly into context it is important to stress the need for reliable and lengthy records. In Ireland we have one of the finest and longest sets of meteorological observations in the world. Most European countries started recording the weather as the Industrial Revolution gathered pace. This was especially important in the crowded coalfield cities of Europe where

bad health due to air pollution and bad sanitation became a big problem. Knowledge of what water supply could be relied on was vital in developing reservoirs and transmission networks. Later on, the importance of knowing what the climate of a place was for agriculture, engineering structures, water supplies etc. became appreciated and as new instruments became available the observing network expanded. Weather observations also tended to be made as part of the growing interest in astronomy. So, early Irish weather measurements emerged from Armagh Observatory at the end of the 18th Century, a superb record now spanning over 210 years, and similar locations such as Dunsink, Birr, Valentia etc. Comparing present-day temperatures with early readings however is a difficult task. Many thermometers were simply slung on a wall (sometimes a north facing wall). Others were of dubious accuracy. There was also a multiplicity of scales. We take for granted the hundred divisions between freezing and boiling which the Swede Anders Celsius devised, or the 180 divisions of the German physicist Daniel Fahrenheit. But how many divisions one opts for is an arbitrary choice, and there wasn't any standardising authority in the early days. The quality of thermometers was also not consistent. Fahrenheit's real claim to fame was not his mercury thermometer, but rather his skills as a glass maker.

Here in Ireland Met Eireann's network of synoptic stations date from the 1940s and 50s, with hourly observations made by trained observers. Some valuable older records also exist from places such as Valentia, Birr, and Markree Castle. Increasingly, the observations are made automatically, which is not always ideal. But it is vital to safeguard this valuable network, even in harsh economic times. We need to protect especially the environs of weather stations from developments which could compromise them. This is vital so we can truly measure climate change and put extremes, such as the recent cold spell into a proper historical context.

The events of December are all connected by the rather strange behaviour of the jetstreams, a fast flowing current of air some 7-10kms above us. This is rather like a kind of curtain rail which determines where anticyclones and depressions will form and how they will move. Normally the jetstreams flow by the shortest route around the northern hemisphere from a west to east direction, with relatively minor meanders north and south. This brings us our wet and wind, but mild oceanic climate in Ireland. But this year like a meandering river, they have for long periods swung several thousand kilometres from north to south in great wavelike motions. The heatwave of summer in Russia, the floods in autumn in Pakistan, even our own cold spell in January are all attributable to the erratic jetstreams. For much of December they swung far to the north into western Greenland, bringing mild southern air northwards there. Temperatures were over 10^{o}C above normal over parts of northern Canada and Greenland. Then they swung south from their normal course close to Ireland and in fact swung right into the northern Sahara, allowing cold Continental Polar air to invade much of Europe. Our normal winter temperatures were being experienced in western Greenland, and our normal December depressions were heading into the Mediterranean. We got Siberian air instead. Fortunately we didn't get quite as cold as the heart of Siberia where temperatures got down to -55^{o}C! That wouldn't happen here ever. But as that cold Siberian air travelled over the relatively warm Irish Sea it was warmed from below and induced to rise. Even in the middle of our cold spell the sea around us was 20^{o}C warmer that the air over us. So the cold air, warmed from below, rose up and triggered the snow showers along our coasts. It was strange looking at the radar at the snow showers developing off the Leinster coast and heading into eastern Ireland over Christmas. Dublin Bay seemed their favourite destination! On exposed coasts in the west and south the same thing happened when the wind turned northerly towards the end of the episode. Some snow showers penetrated inland, but most dissipated when the warm ocean heat and moisture source was removed.

These events are part and parcel of our normal climate, viewed over a timescale of decades or a few centuries. Although the last few decades have been dominated by less pronounced blocking, giving us a run of fairly mild winters, such occasions have occurred in the past. The key question is whether the current disruption to the westerlies might have been influenced by our human interference with climate. Some recent research suggests that the warming up of the Arctic, helped by the huge losses of summer sea ice, may have had an influence on the jetstream strength. If this is so, then we could be in for some

climate surprises as global warming proceeds. Other work though suggests a possible influence from solar cycle changes. The jury will be out on this for some time, however, as we can't attribute individual extreme events to climate change, only when their frequency is seen to change. A lot more research is needed to sort this out.

It would however be a big mistake to think that a cold winter for Ireland heralds the end of global warming concerns. We must not imagine a cold snap in our little corner of the world is representative of global conditions. As mentioned earlier, for every place the waves in the jetstreams are bringing cold weather, there is another place where the opposite is applying. At this stage it seems certain that 2010 will rank as one of the three hottest years on record globally. Were the same synoptic conditions which brought us our cold spell in December to recur in July we would be enduring a record heatwave and drought conditions.

Finally, the blocking tendency is still there and is currently resurrecting itself in these first few days of the New Year. While a return to the extremes of December does not look likely in the short term, we have to remember that there are three hard months of winter ahead and it's quite likely we'll get a reprise of some sort, even if it is less severe, before it's time to drown the shamrock in March.

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