A newsletter following global environmental issues
alongside the cycle of the seasons in Southern England

Prime Meridian

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3.7 to 4.8°C?

Taking into account uncertainties, the temperature rise could be 2.5 to 7.8°C.

Is the climate juggernaut unstoppable?

The latest report from the Intergovernmental Panel on Climate Change has laid out disturbing predictions for climate change during this Century.

The IPCC, representing 195 governments, was set up in 1988 by the World Meteorological Organization (WMO) and United Nations Environment Programme (UNEP). It has investigated potential climate change and its implications through a succession of reports, the latest being a longer report and a summary for policy-makers (Nov. 1) and press release (Nov. 2).

The report set out warnings about the consequences of failure to act on climate change in terms that were quite unequivocal. Much of what is said is not, strictly speaking, new, but observers have noted that the language used to underline the message has become more urgent than in previous reports - an attempt to convey the seriousness of the situation to the policy-makers.

The report warned that unless we bring to bear additional efforts to reduce greenhouse gas emissions below those being pursued at present, that global emissions would continue to increase, driven by growth in global population and economic activities. If so, then by the year 2100, we might see a rise in the mean surface temperature of our planet by 3.7 to 4.8°C above the average for 1850-1900. 2°C has been the widely adopted threshold for dangerous climate change.

October 2014: the world's hottest October on record (see page 12)

the mean global temperature was nearly three quarters of a degree above the 20th C mean of 14.0°C

What climate models are telling us - as outlined in key quotes from the IPCC's summary for policy makers:

Human influence on the climate system is clear, and recent anthropogenic emissions of greenhouse gases are the highest in history. Recent climate changes have had widespread impacts on human and natural systems.

Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, and sea level has risen.

Anthropogenic greenhouse gas emissions have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are *extremely likely* to have been the dominant cause of the observed warming since the mid-20th century. throughout the climate system and are *extremely likely* to have been the dominant cause of the observed warming since the mid-20th century.

In recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans. Impacts are due to observed climate change, irrespective of its cause, indicating the sensitivity of natural and human systems to changing climate.

Changes in many extreme weather and climate events have been observed since about 1950. Some of these changes have been linked to human influences, including a decrease in cold temperature extremes, an increase in warm temperature extremes, an increase in extreme high sea levels and an increase in the number of heavy precipitation events in a number of regions.

Continued emission of greenhouse gases will cause further warming and long-lasting changes in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. Limiting climate change would require substantial and sustained reductions in greenhouse gas emissions which, together with adaptation, can limit climate change risks.

Right: Buckthorn (*Rhamnus catharticus*) along a hedgerow near West Kingston, Kent, England. October. 5, 2014.

Cumulative emissions of CO_2 largely determine global mean surface warming by the late 21st century and beyond. Projections of greenhouse gas emissions vary over a wide range, depending on both socio-economic development and climate policy.

Surface temperature is projected to rise over the 21st century under all assessed emission scenarios. It is *very likely* that heat waves will occur more often and last longer, and that extreme precipitation events will become more intense and frequent in many regions. The ocean will continue to warm and acidify, and global mean sea level to rise.

Climate change will amplify existing risks and create new risks for natural and human systems. Risks are unevenly distributed and are generally greater for disadvantaged people and communities in countries at all levels of development.

Many aspects of climate change and associated impacts will continue for centuries, even if anthropogenic emissions of greenhouse gases are stopped. The risks of abrupt or irreversible changes increase as the magnitude of the warming increases.

Without additional mitigation efforts beyond those in place today, and even with adaptation, warming by the end of the 21st century will lead to high to very high risk of severe, widespread, and irreversible impacts globally *(high confidence)*. Mitigation involves some level of co-benefits and of risks due to adverse side-effects, but these risks do not involve the same possibility of severe, widespread, and irreversible impacts as risks from climate change, increasing the benefits from near-term mitigation efforts.

Should CO_2 build up to over 1,000 parts per million (volume), the odds of global mean temperature rise staying below 1.5ºC, 2ºC or 3ºC (relative to 1850-1900) during the 21st Century were deemed by the IPCC to be "*unlikely*", whilst remaining below 4ºC was "*More unlikely than likely*". What would this mean for human communities? According to the IPCC's summary:

The risks associated with temperatures at or above 4˚C include substantial species extinction, global and regional food insecurity, consequential constraints on common human activities, and limited potential for adaptation in some cases (*high confidence*). Some risks of climate change, such as risks to unique and threatened systems and risks associated with extreme weather events, are moderate to high at temperatures 1˚C to 2˚C above pre-industrial levels.

Left: Hawthorn (*Crataegus mongyna*) berries in a hedgerow near West Kingsdown, Kent. Oct. 5, 2014.

In urban areas, climate change is projected to increase risks for people, assets, economies and ecosystems, including risks from heat stress, storms and extreme precipitation, inland and coastal flooding, landslides, air pollution, drought, water scarcity, sea-level rise, and storm surges (*very high confidence*). These risks are amplified for those lacking essential infrastructure and services or living in exposed areas.

Rural areas are expected to experience major impacts on water availability and supply, food security, infrastructure, and agricultural incomes, including shifts in the production areas of food and non-food crops around the world (*high confidence*).

Aggregate economic losses accelerate with increasing temperature (*limited evidence*, *high agreement*) but global economic impacts from climate change are currently difficult to estimate. From a poverty perspective, climate change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security, and prolong existing and create new poverty traps, the latter particularly in urban areas and emerging hotspots of hunger (*medium confidence*). International dimensions such as trade and relations among states are also important for understanding the risks of climate change at regional scales.

We are warned of a world in which significant numbers of people will become climate victims or refugees.

Climate change is projected to increase displacement of people (*medium evidence*, *high agreement*). Populations that lack the resources for planned migration experience higher exposure to extreme weather events, particularly in developing countries with low income.

The longer IPCC report observed (SYR-29):

Climate change can indirectly increase risks of violent conflict by amplifying well-documented drivers of these conflicts, such as poverty and economic shocks (*medium confidence*)

but it had noted also that (SYR-17):

Violent conflict increases vulnerability to climate change (*medium evidence*, *high agreement*).

It is not unreasonable to read this in terms of a vicious circle in which climate change may encourage conflict, which, by reducing the abilities of societies to cope with climate change, would set the stage for further conflict – an additional reason why human societies may disrupt themselves through warfare.

Right, from top to bottom: Sloes (blackthorn; *Prunus spinosa*) in the hedgerow and dogwood (*Cornus sanguinea*) at West Kingsdown, Kent. Oct. 5, 2014. Fungi on fallen tree. Belair Park, South London. Oct. 19, 2014.

Exactly how the IPCC's generalisations would translate into reality can only be known for certain if the mean global temperature continues to rise. No matter how severe the consequences of higher temperatures, models predict:

Surface temperatures will remain approximately constant at elevated levels for many centuries after a complete cessation of net anthropogenic CO_2 emissions.

"*Seven years to save the planet.*"

Remember that slogan? Time's almost up.

In 2008, British scientist Bill McGuire, (Emeritus Professor of Geophysical and Climate Hazards at University College London, member of the UK Government Natural Hazard Working Group established in January 2005 and member the IPCC team) produced a book entitled "*Seven years to save the planet: the questions and answers*."

It was argued (quoted from online outline): "*We live at a pivotal time in human history. While most of us go about our daily business oblivious to the unprecedented environmental changes taking place around us, our world is poised at a critical tipping point beyond which we will bequeath to our children and our children's children a world of environmental degradation, economic breakdown and social chaos. A ruined planet, sweltering beneath a carbon-soaked atmosphere, plundered of its resources, and shorn of many of its iconic (and not so iconic) species will be our legacy. . . . Most climate scientists agree that a rise in global average temperature of just 2 degrees C above pre-industrial values, would almost certainly be sufficient to have dangerous, pervasive and long-lasting repercussions for both our planet and our civilisation. Just how close we are to committing ourselves to such a rise is reflected in the title of this book. Temperatures have already climbed more than 0.7°C and because warming lags somewhat behind the accumulation of greenhouse gases in the atmosphere, another 0.6 degree C or so rise is already 'in the system', leaving us less than one degree C away from crossing the critical threshold.*"

Back in 2008, environmental writer Mark Lynas likewise summed up the situation (p. 256): "*if our target is two degrees, in order to confidently avoid the unstoppable climatic domino effect of positive feedbacks, global emissions of all greenhouse gases must peak by 2015 and drop steadily thereafter with an ultimate CO_2 stabilisation target of 400 ppm (or 450 ppm for CO_2-equivalent) - however politically unrealistic this emissions trajectory might seem.*"

Lynas, M. (2007; updated 2008) *Six degrees. Our future on a hotter planet* (London, UK: Harper Perennial). McGuire, W. J. (2008). *Seven years to save the planet: the questions and answers* (London, UK: Weidenfeld & Nicolson).

Left: Fallen leaves of ornamental plane trees in a puddle along a road side gutter. West Norwood, South London. Oct. 16, 2014.

Above: Field of maize near West Kingsdown, Kent, after harvest. Oct. 31, 2014.

We have already hit 400 parts per million CO_2 and there is no plan in operation that could stabilise CO_2 at this level over the next few months. We have seen global CO_2 emissions and the atmospheric concentration of CO_2 continuing to rise every year, despite the pronouncements of politicians.

Measurements made at the Mauna Loa Observatory (Hawaii) by the Earth System Research Laboratory of the USA's National Atmospheric & Oceanic Administration show that seasonal variations in CO_2 are already hovering around the 400 ppm mark.

CO_2 falls during the northern hemisphere growth season as it is taken up from the atmosphere by plants. It hit its annual low in the week beginning Sept. 29, 2013, when it dropped down to 393.21 ppm, as the 2013 northern hemisphere growth season drew to an end. The concentration of CO_2 was then able to rise again thanks to respiration and decay. It peaked in the week beginning May 4, 2014 at 401.91 ppm and then fell once more as the next growth season began.

This year's minimum of 394.79 ppm took place in the week beginning September 14, 2014 and the value for the week that opened on November 16, 2014 was 397.26 ppm.

Right: The Sun glints through the foliage of an oak tree on Oct. 19. Some of the leaves have already turned yellow or brown. Belair Park, South London.

Left: Seed heads of red campion (*Silene dioica*) along a field margin near West Kingsdown, Kent. Oct. 5, 2014.

Should we abandon the 2ºC target?

PM 32 reported that two USA scientists, David Victor and Charles Kennel (2014), had challenged the hallowed target of restricting the total temperature rise brought about by human release of greenhouse gases to 2ºC (*Nature* 541: 30-31). This, they argued, was unrealistic and less helpful than using a wide range of indicators of planetary health. The oceans, for example, may take up most of the Earth's excess energy and warm while, at the same time, the Earth's mean surface temperature does not rise. This perspective has not gone unchallenged. In *Nature*'s correspondence section (*Nature* 514: 434) Michael Oppenheimer of Princeton University (New Jersey, USA) responded that "*On the basis of 40 years of science and policy research, there are good reasons why this temperature is the favoured indicator.*" Also, "*As for ocean heat content, its trend experiences interruptions much like the global mean temperature, and bears no direct relationship to most impacts and risks.*" Rising mean surface temperature, he stressed, was more directly relevant to impacts on people and ecosystems. H. Damon Matthews of Concordia University (Montreal, Canada) agreed, noting that global mean temperature can be related to changes in local climate. He considered, "*Now that the international community has finally coalesced around the 2ºC goal, compelling reasons are needed to interrupt this momentum.*"

Editorial: Re-visiting the energy dilemma.

The world has become locked into an unproductive ritual of climate conferences, disturbing reports from the IPCC, concerned editorials in science journals, mass demonstrations and earnest-sounding promises from the politicians - followed, quite regardless, year on year, by a rise in CO_2 emissions.

The scale of the challenge facing policy makers (most of whom have no scientific background) is immense. Their blatant failure to set in motion a meaningful process for curtailing human-caused climate change should not be surprising.

There is, of course, no simple and comforting answer to the question of how we might continue to provide economic growth and prosperity and, at the same time, cut back on the use of fossil fuels which remains fundamental to sustaining it.

Politicians court the trust of electorates by projecting an image of being confident and in control. It may be unrealistic to expect them to admit openly that they have no real handle on the climate problem, although that is clearly the situation. Leaving aside assertions from some that climate change is illusory or that it is part of a benign natural cycle which we cannot possibly influence in any way by releasing greenhouse gases, there remain window-dressing options that have allowed politicians to create a reassuring *appearance* of engaging seriously with the problem. We must acknowledge that in November 2014, President Barack Obama of the USA and President Xi Jinping of the Peoples' Republic of China announced an agreement to cut CO_2 emissions substantially (Obama pledged 26 to 28% by 2050). As a feat of diplomacy this should not be under-estimated, but even were the pledge to be fulfilled by future administrations, which remains to be seen, it would be too little, too late.

Referring back to Mark Lynas' 2008 book, we can appreciate just how little genuine progress has been made since then. Lynas reminded his readers that in order to keep the temperature rise under 2°C, we would need to see a global cut of 85% in emissions by 2050 (Lynas, 2008). There is a push to promote renewable energy sources, but a general perception that although these might offer a significant degree of mitigation, they cannot, on a year-round basis, supply the greater part of UK energy needs. As he perceived it (p. 265): "*Most people believe that tackling climate change is simply a case of building enough wind turbines, fitting solar panels to enough roofs or recycling more of their glass bottles.*" He saw this as yet another kind of denial about the climate problem (for a succinct and optimistic summary of the potential for renewables, including geothermal energy, readers are directed to Al Gore's 2009 "*Our Choice*").

Lynas emphasised that there is insufficient agricultural land to grow enough biofuel to replace fossil fuels. It is hard to see how we could support our present population by returning to a more primitive life and abandoning the internal combustion engine. However, both Lynas and environmentalist George Monbiot in his 2007 book "*Heat*" looked at the possibility of carbon rationing for the individual, a move that would undermine cherished life-styles (and, presumably, be extremely unpopular). Monbiot noted that from 1990 to 2004 the number of travellers through UK airports had risen by 120% and the energy consumed by planes by 79% (Department of Trade and Industry, 2005, *Energy: Its Impact on the Environment and Society*). Associated CO_2 emissions had climbed from 20.1 to 39.5 million tonnes (Office of National Statistics). For Monbiot (p. 188): "*long-distance travel, high speed and the curtailment of climate change are not compatible. If you fly, you destroy other people's lives.*" Lynas and Monbiot exposed our dilemma in the starkest terms. However one feels about their proposed solutions, we cannot cannot escape this dilemma by simply ignoring it.

Gore, G. (2009). Our Choice. How We can Solve the Climate Crisis. New York, NY, USA: Melcher Media.
Monbiot, G. (2007). *Heat. How To Stop The Planet From Burning*. Cambridge, MA, U.S.A. South End Press).

We have yet to see a road map that resolves the daunting problem of how we could, without de-stabilising economies, prosperity and employment, dismantle major carbon-releasing industries like auto-mobiles and aviation (linked closely to huge incomes from tourism), which feed vital wealth into other sectors. Nor can we realistically expect up-and-coming economies, such as India and China, to meekly renounce their aspirations to western standards of living. Clearly, if we are to continue to enjoy all of the benefits that our civilisation has enabled, then we must find much cleverer ways to provide them, cleverer economics and cleverer technology.

Faith that technological advances will save the day was, in Lynas' opinion, another form of denial. It is true that we cannot count on new technology saving the day until it is actually perfected. Nuclear fission is an effective way to produce energy for domestic and industrial purposes, but it runs the risk of nuclear accidents and produces long-term radioactive waste. Clean nuclear fusion power has not yet been developed beyond an initial experimental stage, let alone on commercial or industrial scales. Ambitious geoengineering schemes may eventually have to be adopted as panic measures to control climate, but awkward questions, such as who should sit in the driving seat of our global environment, remain unresolved. Unless they are backed up by massive programmes of research, geoengineering schemes may back-fire and do more damage than good.

Globally, we are seeing the consumption of energy and materials and the human impact on our planet increasing. This is hard to control because it is integral to economic prosperity. It is time that our politicians acknowledged that the welfare of human communities around the world depends upon us addressing this dilemma with the urgency and determination that it deserves.

Editor M. J. Heath. Editorial assistance, Penelope Stanford.

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Email: prime-meridian01@hotmail.com Website: http://www.ecospheresproject.wordpress.com/


A narrow coppiced beech wood near Ash, Kent. October 11, 2014.

Seasons in South East England

October, 2014

Above: Looking along a browning hedgerow (the yellow tree is a wind-deformed beech) at West Kingsdown, Kent. The buildings in the background are the towers at Canary Wharf, London, around 35 km distant.

A warm, but unsettled month.

The Met Office reported that October 2014 had been "*predominantly unsettled, with strong winds and rain a recurring feature, but these winds were generally from a southerly direction so it was mild, especially in the second half. Rainfall was above average, most especially over Cumbria, but with less in the way of rain during the final third of the month.*"

For the UK as a whole, this was provisionally the 10th warmest October in a record beginning in 1910 and the mean temperature of 11.1°C was 1.6°C above the 1981-2010 norm. For England, however, with a mean temperature 1.9°C above average, this was the 7th warmest October.

A depression moved in on Oct. 3 and rain arrived in the SE by Oct. 4. Around 10 mm was received at Heathrow. Rain resumed as another depression moved in on Oct. 6 and 6 mm fell at Heathrow. Both weather systems brought strong winds. On Oct. 12, rainy and windy conditions saw 10 mm received at Heathrow and wet and windy conditions were widespread on Oct. 13, when over 17 mm fell at Heathrow. For comparison, 43 mm fell at Winchcombe in Gloucestershire. On the same date, the UK's minimum temperature of -3.7°C was recorded at Altnaharra (Sutherland). Drier conditions followed.

Right and below: Great mullein (*Verbascum thapsus*) had mostly gone to seed along a field margin near West Kingsdown, Kent. Oct. 5, 2014.

Above: Cloud formations over eastern London and ripening pumpkin on the Rosendale Allotments, South London. Oct 10. A wasp hovers over flowering ivy (*Hedera helix*). Oct. 11.

Roughly 9 mm of rain were received at Heathrow on Oct. 15. Oct. 17 saw temperatures reach 20ºC in London and Essex with 22ºC recorded in Kent and Essex the following day.

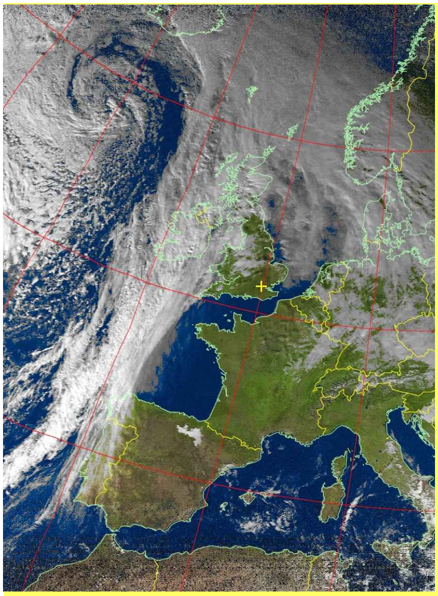
Remains of Hurricane Gonzalo hit the UK.

The disturbance that was to become Hurricane Gonzalo was first noted as a tropical wave to the east of the Lesser Antilles on Oct. 10, 2014. By Oct. 12, its sustained winds were up to 65 km per hour and the USA's National Hurricane Center rated it as Tropical Storm Gonzalo. As it crossed Antigua on Oct. 13, its wind reached 103 km per hour, and it qualified as Hurricane Gonzalo as it reached Saint Martin. On Oct. 14, with winds of 185 km per hour, it was upgraded to a major hurricane and when it reached the Atlantic on Oct. 15, it was the first example of a Category 4 entering the Atlantic since Hurricane Ophelia in 2011. At maximum intensity on Oct. 16 (left, NASA), its winds peaked at a sustained velocity of 230 km per hour. It then swung NE and weakened. Sustained winds dropped to 80 km per hour as it crossed Bermuda on Oct. 18 (but a gust reached 232 km per hour). It passed close to Newfoundland on Oct. 19. Winds reached 106 km per hour over Cape Pine. No longer sustained by the warm tropical waters, it became an extratropical cyclone.

It arrived in the UK in the form of a deep depression, accompanied by wind and rain, on the night of Oct. 20/21. A gust of nearly 113 km per hour was recorded at the Needles on the Isle of Wight. A gust of 60 km per hour was recorded at Heathrow on Oct. 20 and 55 km per hour on Oct. 21. Numerous trees were brought down across England and one in Hyde Park, central London, fell into a road, striking and killing a woman. In Essex, a van raised on a car jack collapsed and killed a man working beneath it. The depression passed over Europe bringing snowfall to the Alps. By Oct. 23, the disturbance had reached the Aegean. It was associated with flooding in Athens on Oct. 24, 2014.

Below: Tree damage after the remnant of Hurricane Gonzalo swept across UK. From left to right we see (in the grounds of Belair Park, South London) a fallen willow, the remains of an American swamp cypress (*Taxodium distichum*) which was struck by lightening, and the stump of a yew (*Taxus*) into which the top of the tree fell.



Left: Weather systems over the UK and adjacent areas of Europe. NOAA-19 satellite; 13:20 GMT on Oct. 31, 2014. Courtesy Geoff Hamilton.

On Oct. 22, rain from the NW arrived in the SE by dusk. Heathrow recorded around 3 mm of rain that day. Mainly dry days followed. Oct. 24 saw about 2 mm and Oct. 29, about 3 mm of rain at Heathrow. On Oct, 27 and Oct. 30, temperatures in the south achieved 20ºC. The Met Office noted: "*The 31st was mainly dry with sunny spells and very mild with Gravesend (Kent) and Kew Gardens (Greater London) recording 23.6ºC, this being the warmest Halloween on record for the UK.*"

SE and central S England, mean max. temp.: 16.6ºC (2.2ºC); mean min. temp.: 9.9ºC (2.7ºC). Hours of sunshine: 107.1 (99%). Rain: 111.3 mm (148%). Anomalies re. 1981-2010 norm in brackets. Source for weather summaries: Met Office online reports. Heathrow data from WeatherOnline.

Global climate: We have just seen the hottest October on record.

Data published by the USA's National Oceanic and Atmospheric Administration indicate that October was yet another month that broke records. For land and ocean combined, the mean temperature for October 2014 was 0.74 ± 0.07ºC above the 20th Century mean of 14.0ºC. It was the warmest year also for the global ocean, which was 0.62 ± 0.04ºC higher than the norm. According to NOAA: "*This marks the sixth month in a row (beginning in May 2014) that the global ocean temperature broke its monthly temperature record.*" The land, at 1.05 ± 0.11ºC above the norm. broke no records, but was, even so, the 5th warmest on record after 2005.

In the Northern Hemisphere, the combined mean temperature for land and ocean together was 0.81 ± 0.09ºC above the mean (3rd warmest after 2003). Land areas, at 0.91 ± 0.11ºC above the norm, reached their 10th warmest October temperature after 2011, although the oceans, at 0.76 ± 0.05ºC above the mean, exhibited their highest October temperature on record. In the Southern Hemisphere, where the spring is well under way, the combined land and ocean temperature was 0.67 ± 0.06ºC above the norm, which was the hottest on record. The land likewise reached its hottest recorded October temperature, 1.44 ± 0.19ºC above the norm. The report noted that: "*Australia observed its highest nationally-averaged maximum temperature for October since official records began in 1910, at 2.76°C (4.97°F) above the 1961–1990 average. Combined with the eighth highest October minimum temperature on record, the mean October temperature (average of maximum and minimum temperatures) for the country was the second highest on record at 1.91°C (3.44°F) above average, behind only 1988. The warmth was notable for its spread across Australia; New South Wales, South Australia, and Western Australia all had record high mean temperatures for the month while Victoria had its second highest.*"

The Southern Hemisphere's ocean areas meanwhile, had achieved their third warmest October temperature (0.53 ± 0.04ºC above the norm; the warmest was 1997). [Source: NOAA National Climatic Data Center, State of the Climate: Global Analysis for August, 2014, published online. Data provisional.]

The setting Sun glows through the window of a church in Kent, England on Oct. 31, the eve of the traditional Christian celebration of All Hallows.