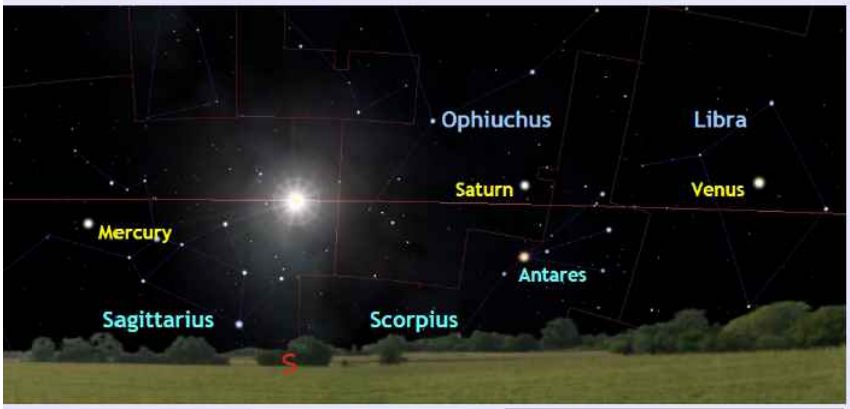
Prime Meridian

(48) December 28, 2015

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



From 2015 into 2016.

Our hemisphere swung through its winter solstice on Dec. 22, and the days are lengthening again. At the South Pole, which was in the middle of its half-year-long day, the Sun began its slow descent towards the horizon.

With the Christmas festivities behind us, the New Year lies ahead, posing huge challenges as we look to the future of our civilisation and of the natural world upon which it depends.

From top. Winter solstice 2015. From a hill top in London the afternoon Sun is just a gleam behind smothering cloud and bare branches. At roughly 51.5°N, the Sun, had fallen to a mere 8° above the horizon by 14:30 GMT. The re-labelled *Stellarium* view shows the Sun flanked by planets Venus and Mercury, which orbit inwards of the Earth and the giant planet Saturn, which lies in the distant background. A mid-summer view from the South Pole (Dec. 16, 16:53) and from DSCOVR of Southern Hemisphere tilted towards the Sun (Dec. 19, 18:20). Christmas, All Saints Church, West Dulwich, S. London.

November 2015 was the world's warmest November on record (page 8).

After December's Paris climate summit . . . . .

The Paris gathering drew to a close with international agreement being reached (Dec. 12, 2015) about *"the urgent need to address the significant gap between the aggregate effect of Parties' mitigation pledges in terms of global annual emissions of greenhouse gases by 2020 and aggregate emission pathways consistent with holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C".*

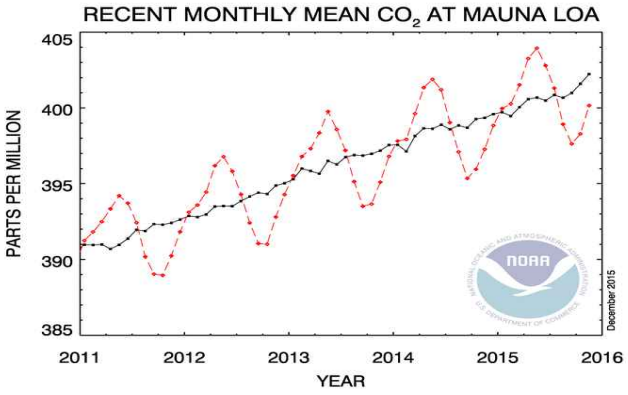
It remains to be seen whether the juggernaut of human impact on planet Earth really can be halted. Paris has been hailed as a breakthrough and yet, at the same time, nations continue to square up to each other over access to hydrocarbon resources. This does not bode well for the future. China's construction of artificial islands in the South China Sea to promote its territorial claims is a case in point. Not only has this raised international tensions but, as emphasised by Elizabeth M. P. Madin of Macquarie University, Sydney, Australia, such projects can do enormous ecological damage. Madin protested at the loss of 1,400 hectares of vital coral reef habitat in the Spratly Islands "*among the most biologically diverse on the planet.*" They support threatened turtle and bird species and are a stopover for migrating birds. Madin, E. M. P. (2015). *Nature* 524: 291.

Encouragingly (and surprisingly) 2015 saw a halt in the growth of CO_2 output.

What is the explanation? Have we arrived at an historic turning point? These questions were explored in a comment from Robert B. Jackson (Stanford University, California, USA) and co-workers in *Nature Climate Change*. In 2014, CO_2, after a decade of emissions growing at 2.4% per year, they grew by a mere 0.6% during 2015, the best guess is that emissions actually stopped growing. The range of possible change lies between an increase of 0.5% and a decrease by 1.6%, but most probably, 2015 saw 35.7 billion tonnes released as compared with 35.9 billion tonnes in 2014. This cannot be explained in terms of a global downturn in economic activity, because, according to the International Monetary Fund, this grew at 3.3 to 3.4 % per year from 2012 to 2014 and by 3.1% in 2015. According to Jackson and co-workers, the most likely explanation, was decreased use of coal in China, reduced growth in petroleum and expansion of renewables. It was uncertain whether emissions have finally peaked:

"Time will tell whether this surprising interruption in emissions growth is transitory or a first step towards emissions stabilization." **Jackson, R. B. *et al.* (2015).** *Nature Climate Change* December 7, www.nature.com/natureclimatechange

We must be careful not to celebrate too soon. Zero *growth* in emissions is not zero emissions. Until the latter is achieved, the amount of CO_2 in the atmosphere will increase. This year it passed the 400 parts per million milestone, which means that it is higher than at any time in the last 800,000 years, and it is still climbing. The chart at right illustrates how the seasonal rise and fall in the amount of CO_2 in the atmosphere (controlled by plant growth in the N. Hemisphere) is superimposed on the long-term increase, which is evident from year to year.



Our thanks to Belair House Ltd (UK) for generous provision of community and internet facilities.

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

Prime Meridian **is published as part of the outreach programme of the Ecospheres Project's Earth Campaign.**
Email: prime-meridian01@hotmail.com Website: www.ecospheresproject.org

"Policymakers like to hide behind scientific evidence . . . . ."

Debate continues about the controversial 2°C target.

"no scientific assessment has clearly justified or defended the 2°C target as a safe level of warming . . . it is unclear what level can be considered safe."

Another challenging paper, published online by *Nature Climate Change*, Reto Knutti and co-workers at the Institute for Atmospheric and Climate Science, ETH Zürich, Switzerland, has taken a timely and critical look at the 2°C target.

The goal of stabilising the quantities of greenhouse gases in the atmosphere so as to prevent the world experienceing dangerously high temperatures was stated explicitly by the United Nations Framework Convention on Climate Change (UNFCCC) in 1992. The goal of keeping the global mean temperature below 2°C above pre-industrial levels at the 2009 Copenhagen climate conference.

Knutti and fellow writers stressed that: "*This target was a political decision informed by science, but no scientific assessment ever defended or recommended a particular target. Policymakers like to hide behind scientific evidence* [Stirling, 2010]*, ask for 'actionable science' and claim to make 'science-based decisions'. Some argue that this process "has more in common with a salad bar — where people pick and choose convenient studies — than with the balanced search for truth that science aspires to"* [Schmidt, 2015]."

There are no grounds to believe that this arbitrary figure of 2°C provides us with a single definitive planetary boundary for the entire Earth system and that we would be safe if we can only keep the temperature increase below this, but under threat if we cannot. Knutti and colleagues considered alternative ways to assess our impact on planet Earth, but they all had drawbacks. The concentrations of greenhouse gases in the atmosphere are readily measured, but there are uncertainties about how temperature and other impacts respond, particularly when we take into account factors such as aerosols and land use could change predictions. The energy uptake of the entire climate system is a fundamental quantity, but 90% of the energy is involved in warming the ocean and there can be a delay of centuries in the warming of the depths, with little impact on the land. Sea level goes up as sea water warms and expands and as water from melting ice sheets enters the oceans. However, even if surface temperature stayed constant or even fell, melting of ice sheets could continue for millennia.

Another complication is that some climate impacts will scale linearly with temperature, but some will increase sharply. Global precipitation rises linearly, as do the temperatures of the hottest days and the intensity of heavy precipitation. On the other hand, the number of exceptionally hot days is expected to increase by a factor of 6 for a world that is 1°C hotter, by a factor of 20 with 2°C.

At recent rates of emission, the threshold for 2°C warming would be crossed by about 2045 and by the end of this Century, warming will actually reach 3 to 5°C. There has been a growing concern to limit the mean global temperature rise to 1.5°C.

They concluded that global temperature did indeed provide the best measure of climate change, even though there are no firm grounds for identifying a precise danger threshold. They pointed out, realistically that: "*The 2°C target is useful for anchoring discussions, but has been ineffective in triggering the required emission reductions*". In any event, the actions that need to be taken to keep the temperature increase at 1.5°C are similar to those required to prevent a 2°C rise.

"The political debate about a lower target of 1.5°C at present seems to be disconnected from the level of mitigation ambition expressed by countries."

References: Knutti *et al*. (2015). *Nature Geoscience* 7 DECEMBER 2015 | DOI: 10.1038/NGEO2595. **Schmidt, G. A. (2015).** *Bull. Atom Sci.* 71, 70-74. **Stirling, A. (2010).** *Nature* 468, 1029-1031.

This year, global warming reached the 1°C threshold. This means that if we are to keep the total temperature rise below 1.5°C, the real goal is to prevent a further 0.5°C rise.

Seasons in South East England

November, 2015

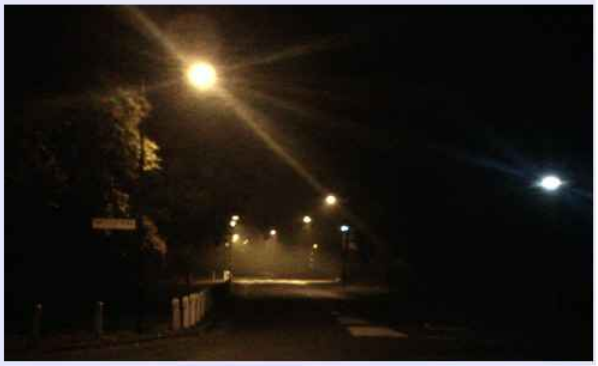
Above: By Nov. 9, 2015, hedgerows along the floor of a valley near West Kingsdown, Kent were losing their leaves.

A warm, but dull and dry month in the SE.

The days were shortening as the year moved closer to the mid-winter solstice. The bleakness of the colder months was setting in. There were foggy episodes and flurries of snow fell, but did not settle, in South East England. Apart from a cold snap between Nov. 21 and 23, the UK's Met Office described the rest of the month as "*generally mild, dull and changeable with south-westerly winds.*"

The UK as a whole saw its third warmest November in a record which began in 1910, as did England (at 2.4°C above the 1981-2010 mean). It was warmest in the south. The month opened with the UK's warmest day of the month, but this was outside our region at Trawsgoed, Ceredigion, Wales (22.4°C). In terms of the 1981-2010 average the UK enjoyed a mere 64% of its normal sunshine, duller than any other November in a record extending back to 1929 and rainfall amounted to 176 mm, which was 145% the norm for November. The SE was generally warmer, duller and drier.

Fog was widespread in the UK on the first two days of November and it lingered in the Thames Valley and its environs, having an impact on air travel.



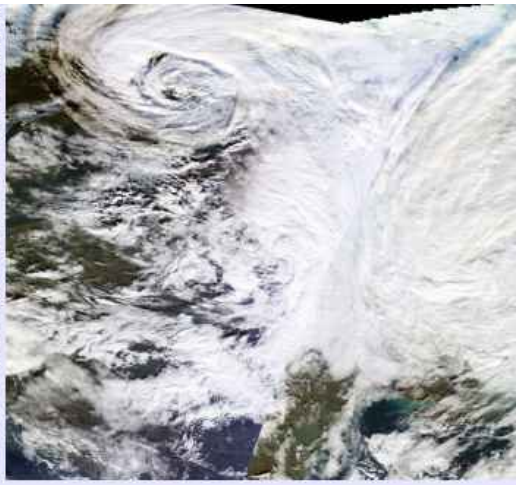
Right: West Dulwich, S. London. A foggy Halloween night (Oct. 31) passed into the early hours of a foggy All Soul's Day (Nov. 1). At New Ash Green, Kent (image credit: P. Stanford), the disk of the Sun was visible through the fog and droplets of water picked out the web of a garden spider (*Araneus diadematа*) and (below) hung on twigs (Nov. 2).

Above: Water droplets hanging on the sticky strands of a spider web, New Ash Green, Kent (Nov. 2).

The SE and central S was the warmest part of the UK. Its mean temperature was 10.0°C, which was 2.2°C above the mean. The duration of sunshine was less than 83% and its rainfall less than 45% of the UK mean. Rainfall was lower (70.4 mm) only in East Anglia, which for geographical purposes is usually included in the SE. Meanwhile, in contrast, some places in SW Scotland, higher parts of NW England and N Wales received twice their usual rainfall.

The SE saw rainy days, despite the lower rainfall total for the month. At left (Nov. 5), we see a vehicle sweeping through a large puddle, Brands Hatch and woodland, West Kingsdown, Kent, on a wet and dismal day. Below: Traditonal Nov. 5 fireworks at New Ash Green and a hedgerow near West Kingsdown on Nov. 9.





Above, left to right: Storms Abigail (Nov. 12), Barney (Nov. 17) and Clodagh (Nov. 30). NASA.

The month's highest temperature at Heathrow (Nov. 6) was about 17.5ºC. 10 mm rain fell there on Nov. 7. Throughout Nov. 10, Heathrow's temperature remained above 14ºC.

A number of named storms swept by during the month, the full weight of their impact being felt north of our region. The practice of naming storms (agreed between the UK's Met Office and Eire's Met Éireann) began with Abigail. It arrived on Nov. 12, passing between Scotland and Iceland. Gusts of up to 135 km per hour hit the Hebrides. NW Scotland suffered power cuts. On Nov. 14, 7 mm of rain were recorded at Heathrow (Greater London). Storm Barney, with winds of over 100 km per hour, crossed Britain between the morning and late afternoon. Gusts of 137 km per hour struck Wales and there were power cuts in Wales and the midlands. Meanwhile, fat Heathrow in the SE, a modest 6 mm of rain fell on Nov. 17.

A cold snap caused by the arrival of Arctic air interrupted mild conditions from Nov. 21 to 23. Otherwise, frost had been absent. Snow fell in N and E. The UK as a whole suffered 2.8 days with frost (4.2 days less than average), whilst the Met Office credited SE and central S England with 2.5 days of frost (3.5 days less than average for November).



Left, from top: Nov. 9. Leaf fall. Hedgerow, near West Kingsdown, Kent. Nov. 15, Belair Park, S. London. Long-tailed tit (*Aegithalos caudatus*) in hedgerow. Grey squirrel (*Scuirus carolinensis*) with acorn. Below: Hawthorn (*Crategus monogyna*), Belair Park, Nov. 15. Remnants of beech (*Fagus sylvatica*) foliage and (centre) *Clematis vitalba* gone to seed. Near West Kingsdown. Nov. 16.







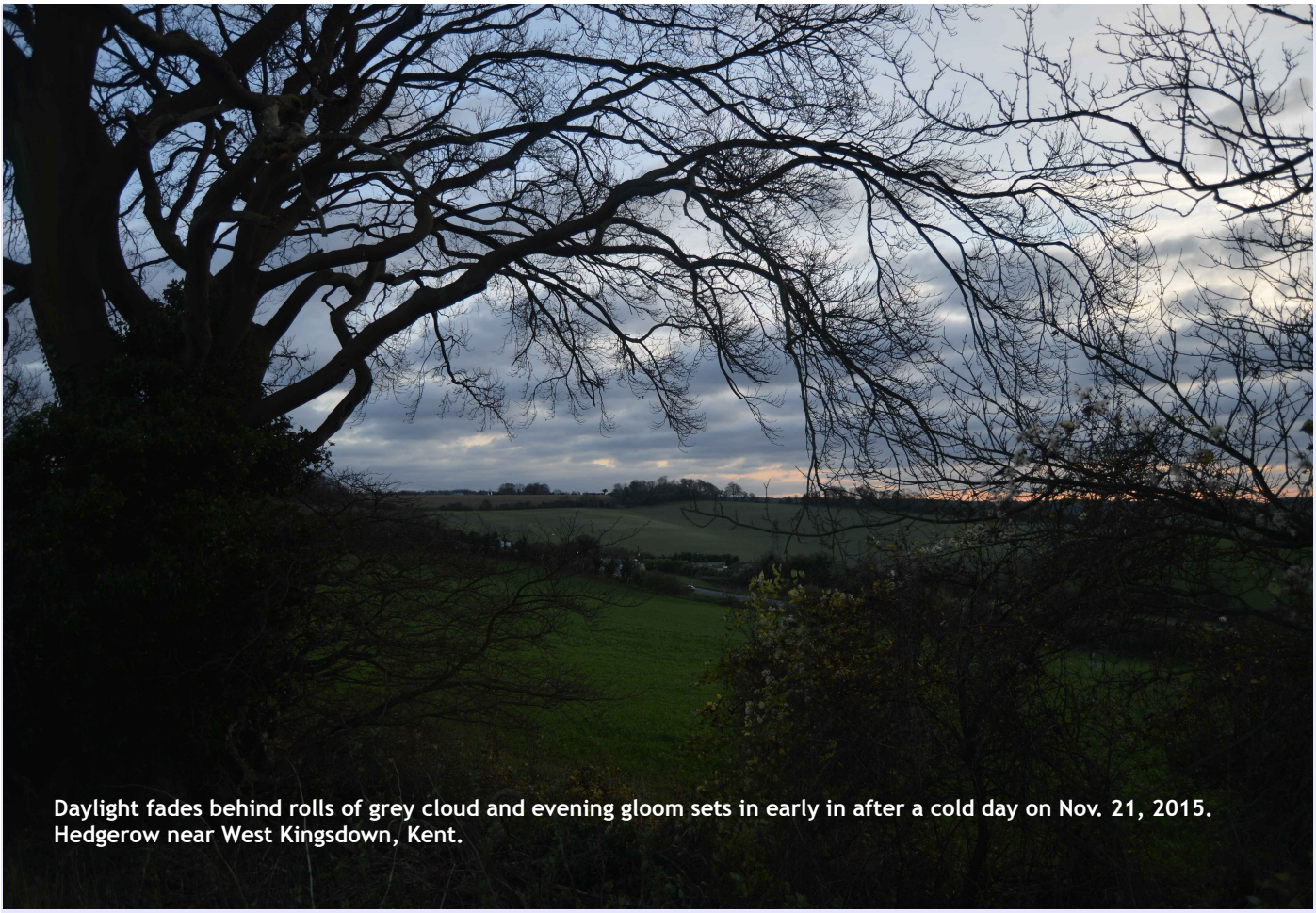

Above (left to right): Dulwich and Sydenham Hill Woods, S. London, on Nov. 16, 2015. A view of Britain from space on Nov. 17 at 16:04 GMT from NOAA-18. (courtesy Geoff Hamilton). A sunnier interval for the woods on Nov. 21. Left (upper to lower): Snow fell, but did not remain for long, on the morning of Nov. 21, at New Ash Green, Kent (image credit: P. Stanford). Frost sparkled on the roof of a car in S. London on the night of Nov. 23. A strong wind bends twigs on a S. London street tree on evening of Nov. 29.

On Nov. 21, the highest temperature at Heathrow only just made it above 6°C. The morning of Nov. 23 saw frosts and -5.5°C at Benson in Oxfordshire (UK's minimum temperature for the month). At Heathrow, temperatures fell to about -1.5°C on Nov. 22 and approaching -1.0°C on Nov. 23.

2 mm of rain arrived at Heathrow on Nov. 24. Nov. 26 saw "*light patchy rain*" around the Thames Valley, and by evening of the next day, rain and gusting winds had arrived (gusts of around 80.5 km per hour were recorded on exposed southern coasts). Storm Clodagh, which had caused power cuts in Eire, brought strong winds to the UK on Nov. 28 and 29. South Yorkshire felt winds of 156 km per hour. The storm disspated on Nov. 30. Information from UK's Met Office and WeatherOnline.

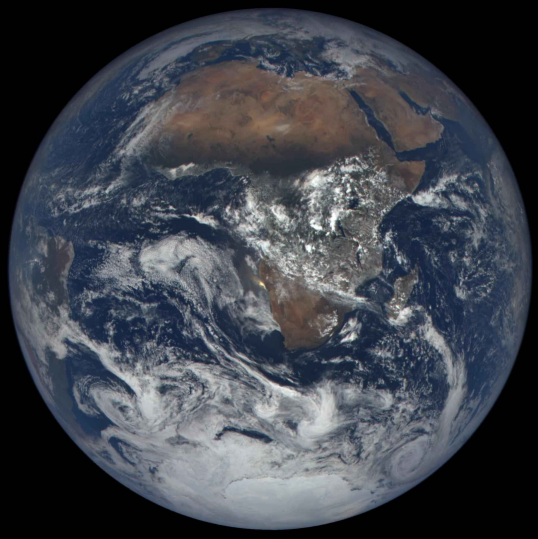
SE and central S England, mean max. temp.: 12.8°C (2.2°C); mean min. temp.: 7.27°C (3.0°C). Hours of sunshine: 30.3 (42%). Rain: 78.5 mm (90%). Anomalies re. 1981-2010 norm in brackets. Source: UK Met Office.

Below: Near West Kingsdown. The Moon rises into a cold sky on Nov. 21.



Daylight fades behind rolls of grey cloud and evening gloom sets in early in after a cold day on Nov. 21, 2015. Hedgerow near West Kingsdown, Kent.

Global climate: November 2015 – yet another temperature record is broken.



According to the USA's National Oceanic and Atmospheric Administration reported that: *"This marks the seventh consecutive month that a monthly global temperature record has been broken. The temperature departure from average for November is also the second highest among all months in the 136-year period of record. The highest departure of 0.99°C (1.79°F) occurred last month."* The 20th C average global temperature for November was 12.9ºC and this year, the value for land and ocean taken together was 0.97 ± 0.09ºC higher. Land areas were 1.31 ± 0.21ºC above their mean (5th warmest after 2010) and oceans were the warmest on record at 0.84 ± 0.03ºC above the mean. As expected, El Niño warm conditions are continuing in the central and equatorial Pacific.

In the N. Hemisphere, the combined mean temperature for land and ocean was 1.17 ± 0.12ºC, the warmest recorded, although land areas (1.37 ± 0.17 ºC above the mean) were only the 7th warmest after 2010. The oceans were the warmest on record at 1.05 ± 0.03ºC above the norm. In the S. Hemisphere, the mean combined land and ocean temperature was 0.76 ± 0.06ºC and the ocean 0.69 ± 0.03ºC above the norm; both the warmest on record. Meanwhile, the land, 1.15 ± 0.12ºC above the norm, was its 2nd warmest after 2009.

Source: *NOAA National Climatic Data Center, State of the Climate: Global Analysis for November, 2015.* Published online. Data provisional.

The DSCOVR image of the Earth was taken on November 30, 2015 at 10:51:59 GMT. NASA/NOAA.