

Modified from a NASA chart

Prime Meridian

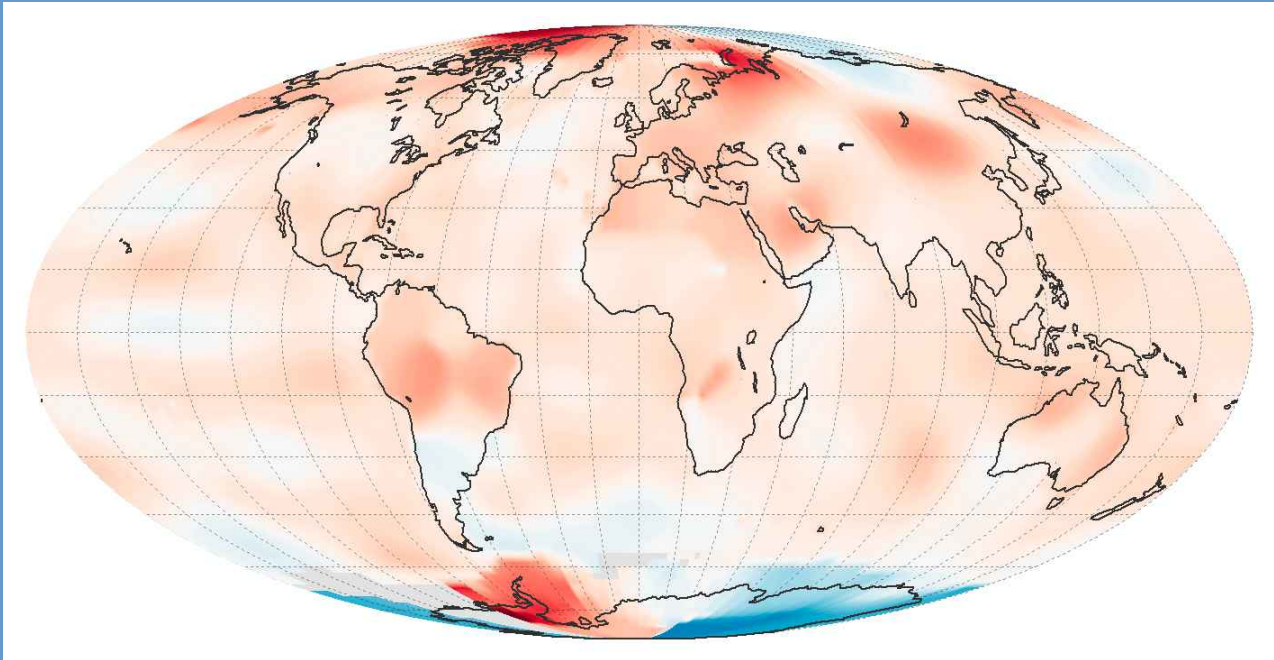
(59) August 31, 2016

Turning up the heat.

A NASA study mapped a record-breaking heat-wave during July. Globally, it was the warmest July in a record that began in 1880.

Land Surface Temperature Anomaly (°C)

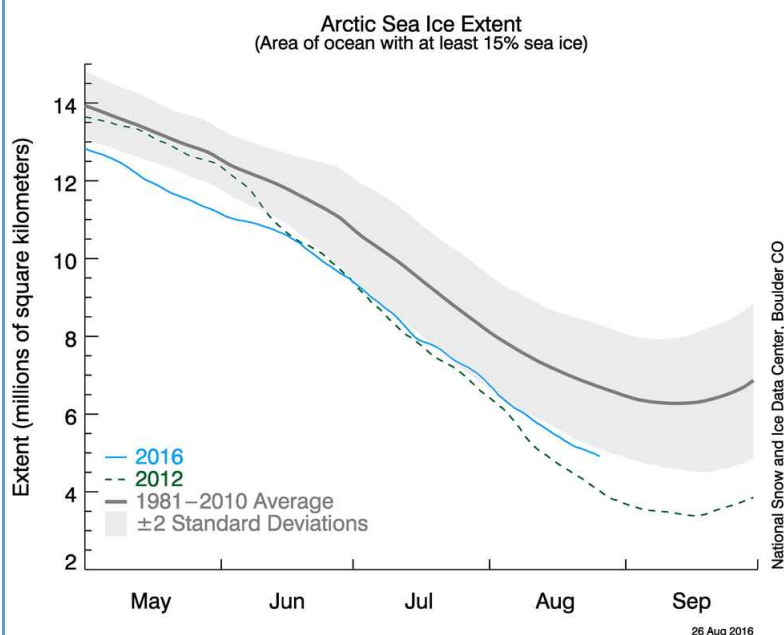
≤-12 0 ≥12



Above: Chart from NASA's Goddard Institute for Space Studies (GISS) combines temperatures measured at about 6,300 stations around the world to show how temperatures for July 2016 were warmer (red) or cooler (blue) than the 1951-1980 average. The deepest red areas were 7°C above the mean. July is the annual peak month for global warmth and July 2016 was narrowly the hottest month on record.

By now, readers will have learned from the media that the world has seen its hottest recorded month. Here, we detail some of the facts and figures.

So far, every month of 2016 has broken records for globally-averaged warmth. This has aided the breakout of wild fires in many localities. The chart from GISS, and those on the following pages, show how West Antarctica, Greenland, Norway and part of Russia, suffered July 2016's most extreme temperature anomalies.



“Ice loss rates indicate little chance for a record low this year”

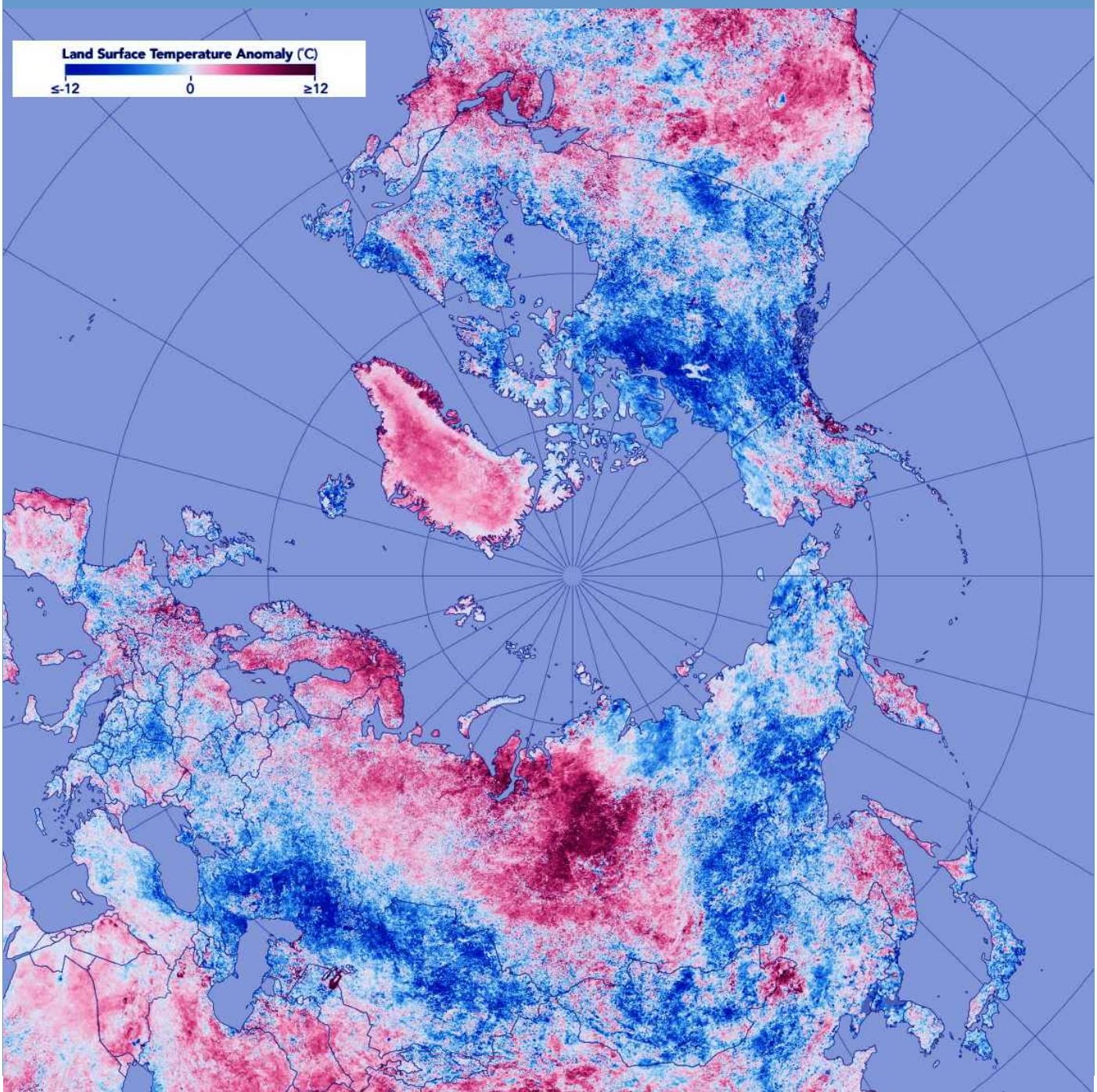
Despite the relatively high temperatures at high latitudes, climate scientists are now predicting that 2016 will *not* be a record year for the seasonal shrinking of Arctic sea ice. We are very unlikely to see the northern cap of floating ice effectively vanish by September's annual minimum, nor an abrupt jump to another climate regime, caused by its disappearance. The USA's National Snow and Ice Data Center has indicated that an opinion supported by the fact that significantly fewer melt ponds have developed on the expanse of sea ice this year compared with 2012. NSIDC has argued on its website that: *“a new record low this September is highly unlikely.”*

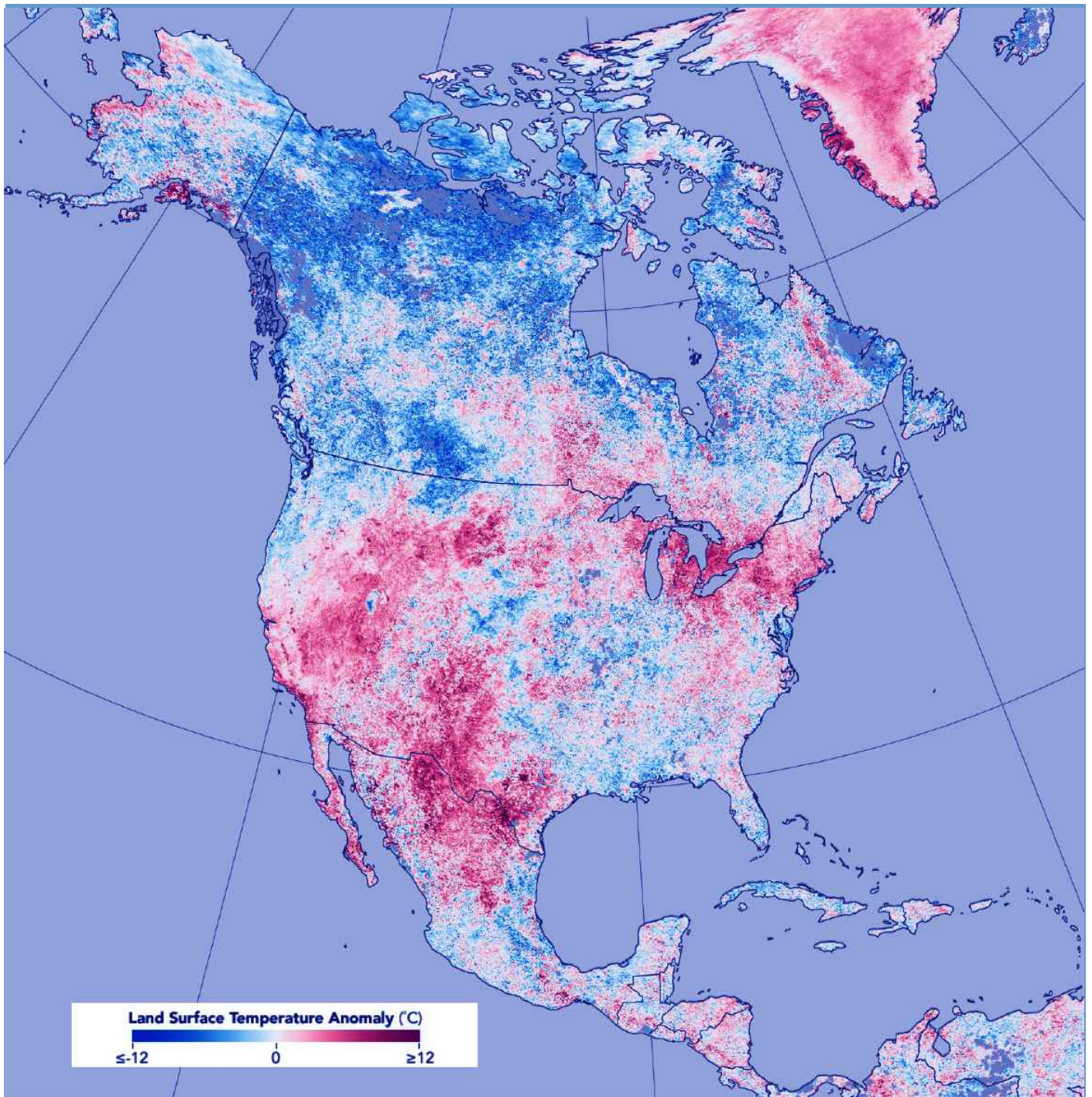
A series of reports for July 2016 painted an ominous picture of a world that is growing decidedly warmer as greenhouse gases released by human activity continue to build up in our planet's atmosphere.

Land surface temperatures measured by the MODIS (Moderate Resolution Imaging Spectroradiometer) instrument aboard NASA's Terra satellite confirm that many areas of the Northern Hemisphere were struck by a heat wave in late July 2016.

“Warm weather is to be expected in the summer, but the oppressive heat that affected several regions in the summer of 2016 went well beyond warm.” NASA's Earth Observatory Image of the Day.

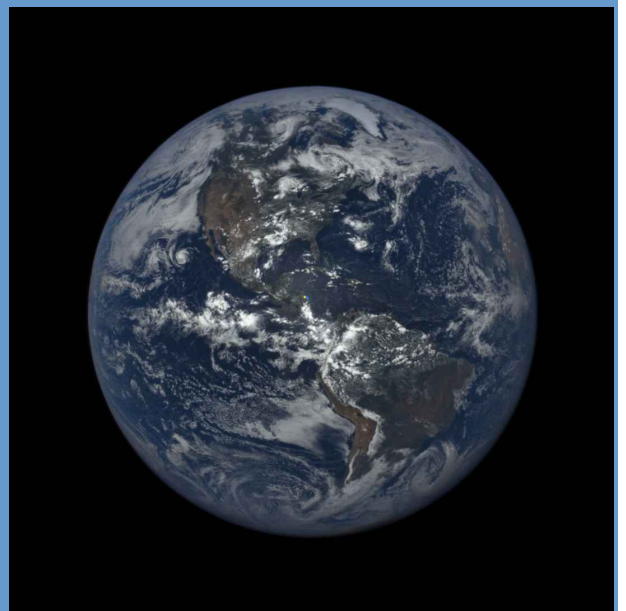
The charts show how land surface temperatures for the period July 20 to 27, 2016, differ from those for this same period averaged for the years 2001 to 2010. Red pixels are warmer than the norm, blue pixels cooler and white normal. Greyish-blue areas on land lacked sufficient data. We have colourised the oceans and lakes with a bluish tinge. Land surface temperatures should not be confused with air temperatures.

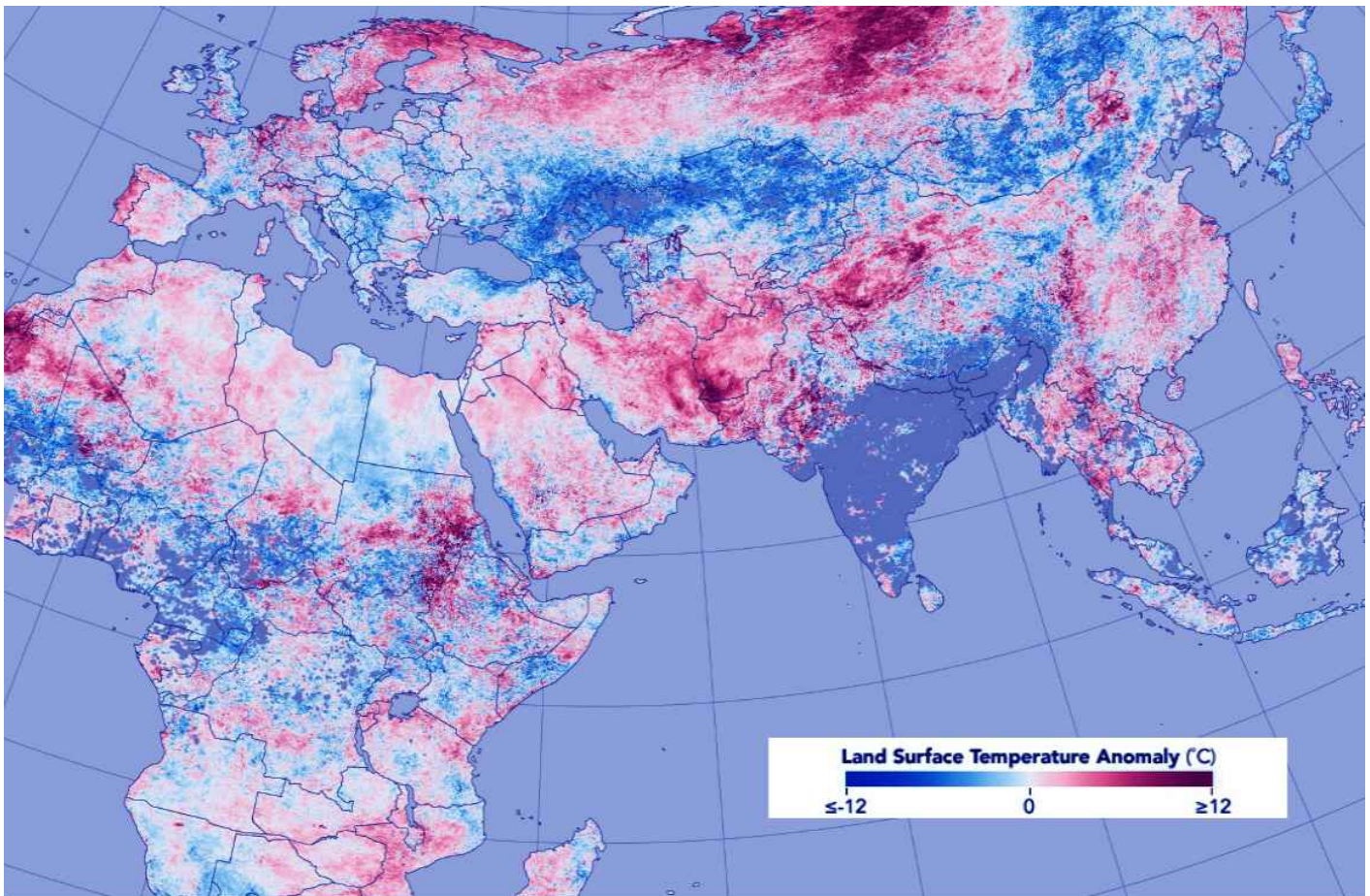




The catalogue of events outlined by NASA included over 2,300 reindeer and a child dying from anthrax after melting permafrost in the Yamal Peninsula of Siberia released a reindeer carcass, a temperature of 54°C in Mitribah, Kuwait (provisionally flagged up as the highest ever recorded in the Eastern Hemisphere) and the hottest recorded temperatures observed in various places across the SE and SW USA, with Florida and New Mexico hitting their highest recorded temperatures.

Right: The Americas on July 27, 2016 seen from the NASA/NOAA DSCOVR satellite at 17:54:36 GMT.





Left below: Africa and Eurasia on July 27, 2016 seen from the NASA/NOAA DSCOVR satellite at 09:10:54 GMT.

Dry and warm conditions aided outbreak of wildfires in many places across Russia.

Right: A view of central Russia obtained by the MODIS unit on NASA's Aqua satellite on July 12, 2016 showed "dozens of fires burning . . . Each individual red hotspot marks an area where the thermal bands on the MODIS instrument detected temperatures markedly higher than background. When combined with typical smoke, as in this image, such hotspots are diagnostic for actively burning fire. Many of the fires appear to be burning in dark green areas typical of taiga (forest)." Below: North central Russia from Aqua satellite on July 8.



Aphelion 2016.

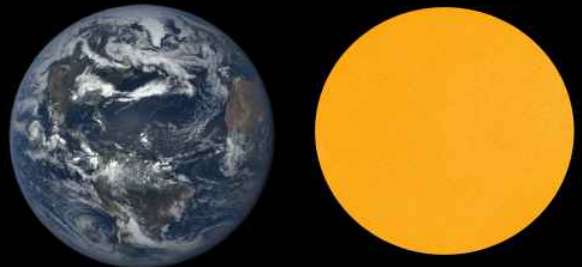
Planet Earth reached aphelion (the furthest point of its orbit from our Sun) on July 4, 2016 at precisely 16:24 GMT (equivalent to Universal Time). It lay 1.0167509 Astronomical Units from our star. 1 AU = mean Earth-Sun distance. The AU was defined at an August 2012 meeting of the International Astronomical Union in Beijing as 149.5978707 million km.

Sunset on July 4. Belair Park, S. London.

Earth perihelion and aphelion Table Courtesy of Fred Espenak, www.Astropixels.com.

A planet and its star.

The Sun on July 4 showed no spots on the side facing our planet. Two small spots finally appeared on July 6. Image was obtained by NASA's Solar Dynamics Observatory. The Earth on July 4 (16:39:19 GMT) as seen from the NASA/NOAA DSCOVR satellite.



Canis Major

Lepus

Sirius

Rigel

Saiph

Orion

The view from Antarctica. This webcam image of the Amundsen-Scott South Pole base was obtained on August 24, 2016 at 16:34:56. The Southern Hemisphere's spring equinox and sunrise were about a month away. The stars were fading in the sky as the Sun, still circling below the horizon, cast a brighter light into the sky with every passing day.



Seasons in South East England July, 2016



Above: Storm clouds and showers over Kent on the afternoon of July 2. From West Kingsdown.

A warm and distinctly dry month, despite showers.

For the UK as a whole, the mean temperature was 15.3°C, which was 0.2°C higher than the 1981-2010 norm. England was warmer at 16.7°C (0.4°C above the norm) and the Met Office' SE and Central S region was hotter yet at 17.5°C (0.4°C above its July norm). Rainfall averaged across the UK was 81.2 mm, essentially normal at 104%, but England was dry with just 41.1 mm, only 66% of the usual amount. Meanwhile, rainfall in our region was around half that, and a mere 41% the normal amount for July. The Met Office reported that Southern England saw its driest July since 1999.

This was the season for traditional English fêtes and the weather, following tradition, was a lottery. Left: Left: In the sky above the village of New Ash Green, Kent, veteran World War II planes, a Spitfire (left) and a Hurricane (right) entertained the crowd, whilst venerable steam engines performed at ground level.



Below: Sunset seen from the hills around Ash, Kent on July 2.





Above left: Water droplets from recent rain linger on the undersurface of a fallen leaf and magnify its veins. Ash, Kent, July 2, 2016.

According to the UK's Met Office, *“At the start of July the weather was breezy and showery, with low pressure in charge. Unsettled conditions persisted for much of the first half of the month, with fronts frequently bringing rain to the north and west, although rainfall amounts were generally small in the south.”*

Relatively small amounts of rain were recorded at Heathrow, London. July 1 saw 1 mm. 2 mm fell on July 2. That date also saw the UK's lowest temperature (0.5° C) at Altnaharra in Sutherland, well beyond our region. The month's coldest temperature at Heathrow, around 10°C, was recorded on July 3. July 7 saw a mini-peak of over 23°C. The Met Office summary generalised about the south being dry, but from West Norwood in South London, showers could be seen and a rainbow appeared around sunset.

Above right and top right: Showers seen in the vicinity of the setting Sun and a rainbow set against a pink-tinged sky. July 7, 2016. West Norwood, South London.

Below and lower right: Wheat ripens in a field near Idleigh, Kent. A female spider of the species *Pisaura mirabilis* guards its nursery web.





Gusts of about 90 km per hour were recorded at the Needles Old Battery on the Isle of Wight on July 10 and 11. The Met Office reported that: "*The 11th was slightly cooler, remaining showery with heavy showers south of London stretching into Kent . . . south-east where Lingwood (Norfolk) recorded 47 mm*". However, a mere 1 mm of rain fell at Heathrow, where 5 mm was recorded the next day, followed by a desultory 1 mm on July 13.

Warmer and sunnier conditions followed between July 17 and 24, with July 19 being particularly hot. On July 18, 15.4 hours of sunshine were enjoyed at Wattisham in Suffolk. The temperature reached 30°C in London.

Clockwise from top left: Barley in a field near Idleigh, Kent. July 9. Two fast maturing goslings of Egyptian geese (*Alopochen aegyptiaca*), on the lakeside, Belair Park, South London (July 10). Chicory (*Cichorium intybus*). Lesser knapweed (*Centaurea nigra*) and wild carrot (*Daucus carota*) in Burgess Park, South London (July 16). Cabbage white butterfly alights on lucerne (*Medicago sativa*), being grown as a crop to feed animals and a bee on bramble (*Rubus fruticosus*) in a field near West Kingsdown Kent (July 23). On the far side of a boundary hedgerow, an initial crop of oil-seed rape failed. The weed charlock (*Sinapis arvensis*), which has a similar appearance, replaced it and was sprayed leaving bare stalks. Scarlet pimpernel (*Anagallis arvensis*) sprang up in profusion from the ground.





Anti-clockwise from the upper right: July 24. Belair Park, South London. A sign of the times. The floor of a flood control basin has dried and cracked as the summer wore on. Two bumblebees feed on the head of a spear thistle (*Cirsium vulgare*). The weed is unwelcome in an agricultural setting, but not problematic in this urban parkland. Purple loosestrife (*Lythrum salicaria*) also attracts bumblebees. On July 23, a female glow-worm (*Lampyrus noctiluca*) displays in Beacon Wood, Bean, Kent. The population of glow-worms has tumbled here. One reason is probably that management to encourage this important species has been neglected as responsibility for the woodland has been passed, with poor communication, from the council to an agency and then to a friends group. Potato and tomato plants flower in a back garden in New Ash Green, Kent. July 30.

The UK's highest temperature for July an impressive 33.9°C, was recorded at Jersey Airport in the Channel Islands on July 19. On this day, 33.5°C was recorded in our region at Brize Norton in Oxfordshire and Heathrow managed over 33°C (its lowest temperature that day being nearly 23°C. July 22 saw a paltry 1 mm of rain arrive at Heathrow. On July 23, the temperature peaked at 28.6°C at Heathrow. day being nearly 23°C. There were 13.9 hrs of sunshine at Shoeburyn in Essex. The Met Office recorded that on July 30, fresher conditions prevailed with showers over east Anglia and the southern counties of England.

SE and central S England, mean max. temp.: 22.1°C (0.1°C); mean min. temp.: 12.8°C (0.6°C). Hours of sunshine: 213.4 (99%). Rain: 21.0 mm (41%). Anomalies re. 1981-2010 norm in brackets. Source UK Met Office.

Data in this article have been derived from online publications by the UK Met Office and WeatherOnline.



Global climate: July 2016 was the seventh record month this year.

The USA's National Oceanic and Atmospheric Administration has confirmed that July, 2016 was the warmest July in a record commencing in 1880.

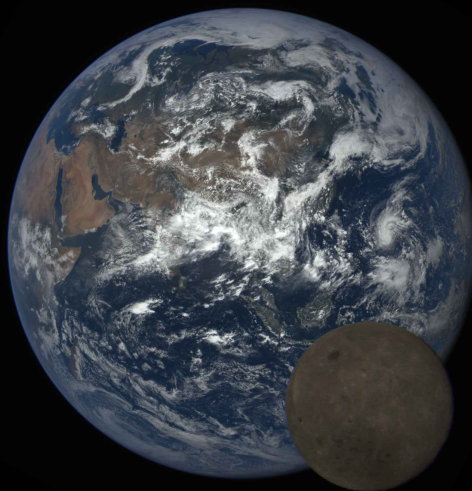
"For the 15th consecutive month, the global land and ocean temperature departure from average was the highest since global temperature records began in 1880. This marks the longest such streak in NOAA's 137 years of record keeping. The July 2016 combined average temperature over global land and ocean surfaces was 0.87°C (1.57°F) above the 20th century average, besting the previous July record set in 2015 by 0.06°C (0.11°F). July 2016 marks the 40th consecutive July with temperatures at least nominally above the 20th century average."

Global mean temperatures for land plus ocean and for the ocean and land taken separately, were all the highest on record.

For the world as a whole, the oceans were $0.79 \pm 0.14^{\circ}\text{C}$ warmer than their mean (warmest on record), whilst land areas were $1.10 \pm 0.17^{\circ}\text{C}$ warmer (both the warmest on record).

In the Northern Hemisphere, the combined mean temperature for land and ocean was $0.99 \pm 0.19^{\circ}\text{C}$ and the oceans $0.91 \pm 0.13^{\circ}\text{C}$ above the norm. Both these figures were the highest on record. The land, however, at $1.12 \pm 0.15^{\circ}\text{C}$ above the July norm, was the third warmest after 2012.

In the S. Hemisphere, the mean combined land and ocean temperature ($0.75 \pm 0.15^{\circ}\text{C}$), the ocean ($0.69 \pm 0.15^{\circ}\text{C}$) and the land was ($1.05 \pm 0.13^{\circ}\text{C}$) were all the warmest on record.



Source: NOAA National Climatic Data Center, *State of the Climate: Global Analysis for July, 2016*. Published online. Data is provisional.

Above right: Planet Earth on July 5 at 06:21:37 GMT. This was the day after Earth passed through aphelion - the furthest point of its orbit from the Sun. Because of the tilt of the Moon's orbit around the Earth, the DSCOVR satellite (which is located at the L1 position, caught between the gravitational pull of the Earth and the Sun) does not see the Moon cross the Earth's disk every lunar orbit. On July 5, however, the space craft, Earth and Moon lined up. NASA/NOAA.

Prime Meridian

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