Prime Meridian

(11) March 16, 2013

Bare branches in the February sunshine. Above: Looking N across Dulwich Woods towards central London on Feb. 20, 2013. Right: Oak tree, Belair Park, South London, Feb. 17, 2013.

Planetary mismanagement.

Looming gaps in weather satellite coverage may reduce our ability to foresee how dangerous weather conditions will develop.

The global community needs efficiently managed weather satellite programmes. These would be essential even without climate change, but now have added urgency.

The reader may have assumed that the need for weather satellite coverage of our planet was understood by everyone, that it was being organised through close international co-operation, and that getting it right was a priority for national agencies. In fact, the provision of weather and other essential research satellites is a much more hit and miss affair than is generally realised. The world needs a much more determined and better coordinated effort.

"this level of degradation in weather forecasts could place lives, property, and critical infrastructure in danger."

That is the conclusion of a report issued last year from the USA's Government Accountability Office. The former Administrator of the National Oceanic and Atmospheric Administration, D. James Baker, highlighted these concerns in a letter published in *Science* (**338**: 1,419) on December 14, 2012.

Concerns have focussed on satellites whose orbits carry them over the Earth's poles. As the Earth rotates beneath these satellites, they will pass over the whole of our planet's surface. Each completes around 14 orbits every day and sees the entire Earth twice a day. With a sufficient number of such satellites, weather in any region can be monitored every few hours.

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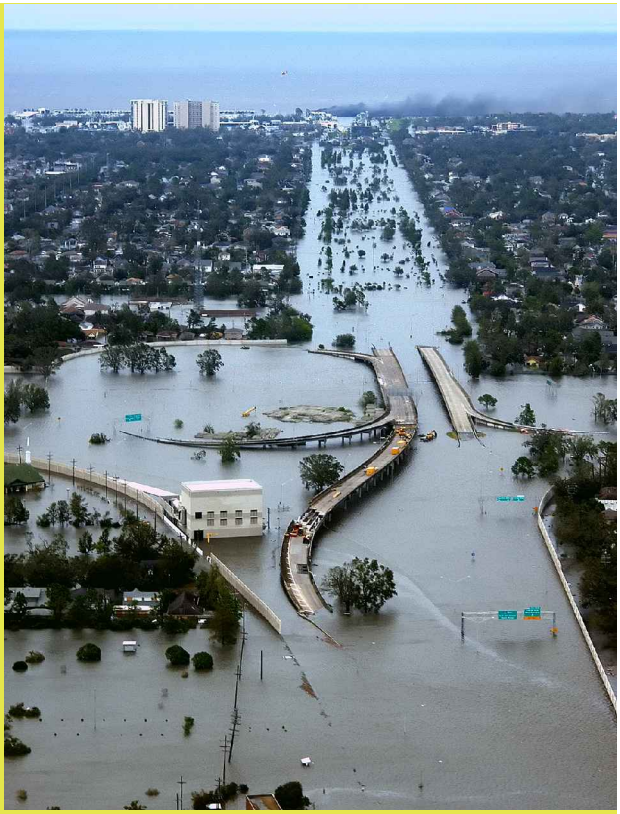


Right: On Aug. 29, 2005, Hurricane Katrina caused 53 breaches in levees in greater New Orleans, resulting in 80% of the city being flooded. Image: US Coastguard.

Vital satellites have been delayed by management failures, technical problems and budget cuts.

Polar-orbiting satellites are the main input to models for forecasting weather and warning of extreme weather events. They are also invaluable in studying global climate change, ozone depletion and drought.

From the 1960s, the USA operated two separate sets of polar-orbiting satellites - the National Oceanic and Atmospheric Administration's Polar-Orbiting Operational Environmental Satellites (POES) and the Air Force's Defense Meteorological Satellite Program (DMSP). A May 1994 Presidential Decision Directive merged these programmes into a National Polar-orbiting Operational Environmental Satellite System (NPOESS).

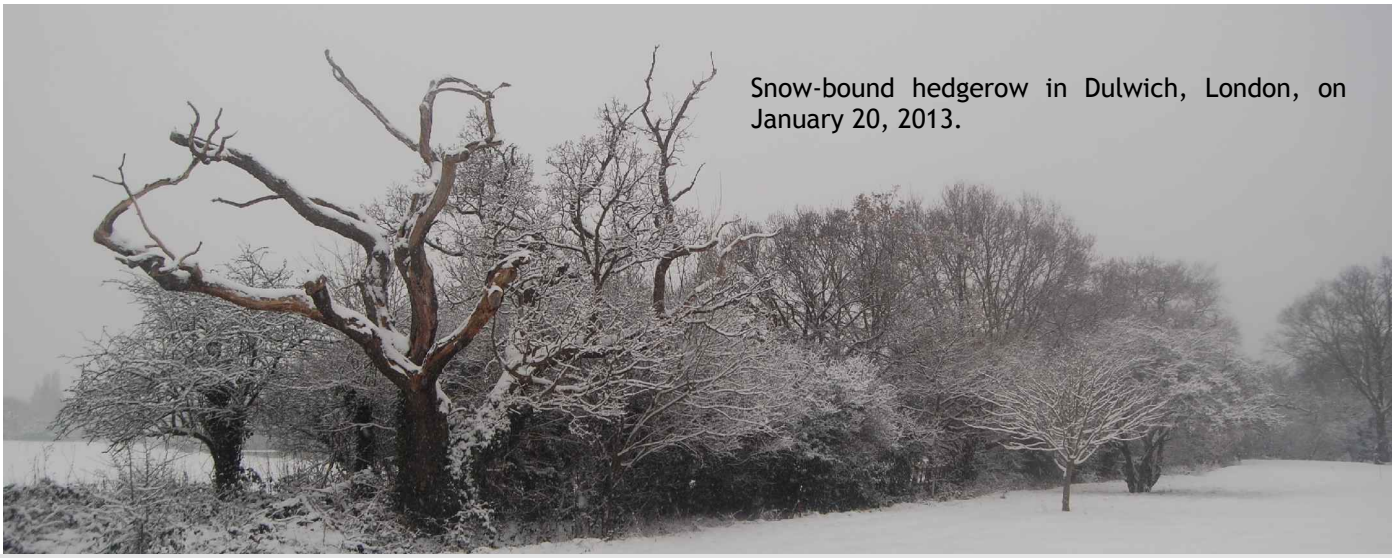
The new system was to be managed by NOAA, the Department of Defense/US Air Force and NASA. Considered "*critical to the nation's ability to maintain the continuity of data required for weather forecasting and global climate monitoring*", it was not managed successfully. Between 2002 and Aug. 2009, cost estimates jumped from $ 7 billion to $15 billion. Launch dates had slid back by more than half a decade. According to the GAO: "*significant functionality had been removed from the program, and the program's tri-agency management structure had proven to be ineffective.*" In Feb. 2010, the Director of the Office of Science and Technology Policy announced that NOAA and DOD would now develop separate satellite systems. NOAA pursued a Joint Polar Satellite System, and in Oct. 2011 launched the successful NPOESS Preparatory Project (NPP) satellite, but the GAO reported that: "*NOAA plans to revise its program requirements to remove key elements, including sensors and ground-based data processing systems, to keep within budget. Further, in early 2012, DOD decided to terminate its program and reassess its requirements.*" The DOD holds two satellites in reserve to replace existing satellites, but they are old and it is not known how well they will function. In the worst case, some gaps in satellite coverage could last for 17 to 53 months.

It was feared that NOAA: "*runs the risk of not being able to fulfill its mission of providing weather forecasts to protect lives, property, and commerce.*"

United States Government Accountability Office (2012). Report to the Committee on Science, Space, and Technology, House of Representatives. POLAR-ORBITING ENVIRONMENTAL SATELLITES Changing Requirements, Technical Issues, and Looming Data Gaps require Focused Attention. June 2012.

Left: Hurricane Sandy from NASA's geostationary GOES satellite. Sandy is another reminder of the need for weather satellites in safeguarding communities. It was a tropical cyclone which rejuvenated dangerously on Oct. 28, 2012, by merging with a cold front (visible here as the line of clouds extending from the Gulf of Mexico). Its impact on Oct. 29, along the coast of New Jersey, New York, Connecticut, and in the two dozen states was severe. A recent report (Tollefson, J., 2013; *Nature* **494**: 162-164) noted that in January 2013, Congress had approved $ 60 billion for recovery efforts with "*around $33 billion for longer-term investments, including infrastructure repair and construction by the Army Corps of Engineers.*" Klaus Jacob of the Lamont-Doherty Earth Observatory was quoted: "*I don't see anything yet that looks towards long-term solutions.*"

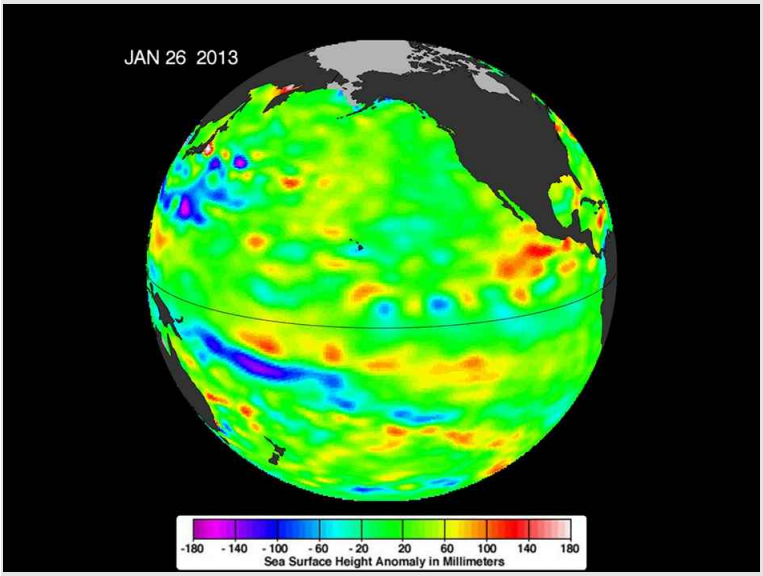
We will provide updates in future issues.



Snow-bound hedgerow in Dulwich, London, on January 20, 2013.

Global climate; January 2013.

Data released by the USA's National Atmospheric and Oceanic Administration confirm that the long-term global warming trend persists; January temperatures are amongst the warmest since records began in 1880. Globally, for land and ocean taken together, January 2013 was 0.54 ± 0.08°C warmer than the 20th Century mean of 12.0°C. It was the 9th warmest January on record.



For the world as a whole, the land was +0.90 ± 0.16°C warmer than the average (13th on record with 2007 as the warmest, and the ocean was +0.41 ± 0.04°C warmer (8th warmest with 1998 as warmest on record) For the Northern Hemisphere the combined result for land and ocean was +0.58 ± 0.12 above the 20th Century mean, making it the 11th warmest January (warmest was 2007). In the Southern Hemisphere, the combined land and ocean temperature was +0.51 ± 0.07°C above the mean, making it the 8th warmest January (warmest was 2010). For the second month in a row, the average temperature for land in the Southern Hemisphere (where it was summer) reached a record temperature, 1.10°C above the 20th C average.

"*Temperatures in the Northern Hemisphere ranged from cooler than average across regions that included much of the western United States, northern Canada, and parts of northern Russia to much warmer than average across southern Greenland, Iceland, Central America, northern South America, and parts of the Middle East.*" However, "*No land areas in the Southern Hemisphere were cooler than average.*"

Global climate shows the effects of a natural oscillation between El Niño (warmer than average) and La Niña (cooler than average) conditions in the Pacific (2012 was the warmest La Niña year on record). Climate scientists were expecting the climate to switch to an El Niño state, but in January it was still locked in a neutral or La Nada, state, after 10 months. The chart (above left; from NASA) used 10 days of data (centred on Jan. 26, 2013) from its Jason-2 satellite. The height of the sea surface is partly controlled by temperature: the warmer the water, the higher it rises. NASA climatologist Bill Patzert stated: "*This absence of El Niño and La Niña, termed 'neutral' by some, has left long-range climate forecasters adrift . . . Seasonal, long-range forecasting works best when signals like El Niño and La Niña are strong.*" In the American West La Nada conditions have produced both the driest and wettest winters on record. In early 2015, NASA with CNES, NOAA and EUMETSAT will launch Jason-3. This will make highly detailed measurements of sea level, providing insight into ocean circulation and climate change.

Sources: NOAA National Climatic Data Center, State of the Climate: Global Analysis for January 2013, published online February 2013, retrieved on March 1, 2013 from http://www.ncdc.noaa.gov/sotc/global/2013/1. NASA information release. Alan Buis. Feb. 6, 2013.

Seasons in South East England

January, 2013

New Year's Day was bright, particularly in the south of England. Patchy rains followed and the Jan. 3 was mild, with temperatures of 12ºC in many places. Overcast conditions prevailed from Jan. 4 to Jan. 6. and the south missed rains on Jan. 7 and 8, but they caught the SE on Jan. 9, clearing to give a fine day. Episodes of fog and light showers were followed by colder weather from Jan. 12. Bands of rain and snow swept over from the west on Jan. 12, 13 and 14. Marham (Norfolk) saw 9 cm of snow. On the night of Jan. 15/16, the temperature at Marham fell to -13.1 °C and the day of Jan. 16 was cold. Further bands of rain, sleet and snow crossed England and a band of snow reached the SE on the morning of Jan. 20 and the E side of England in the afternoon. 16 cm of snow was recorded at Andrewsfield (Essex) and Wittering (Cambridgeshire). Jan. 21 was bright and clear and Jan. 22 began with -13.6°C at Buntingford (Hertfordshire). South-westerlies brought milder weather from Jan. 26, and north-westerlies colder conditions on Jan. 30, turning brighter on Jan. 31.

For SE and central S England, mean max. temp.: 6.2ºC (-1.0ºC); mean min. temp.: 1.5ºC (0.0ºC). Hours of sunshine: 44.1 (80%). Rain: 78.9 mm (97%). Anomalies re. 1971-2000 norm in brackets. Respective figs. re. 1981-2010 norm are -1.3ºC; -0.2ºC; 84%; 102%.

Top: An evening view across snowy fields near West Kingsdown, Kent (Jan. 26, 2013).

Upper left: Hedgerow, Dulwich, S. London (Jan. 20, 2013). Lower left: Sydenham Hill Wood, S, London (Jan. 21, 2013).

Right: Britain from space (Jan. 26, 2013), NASA. Snowman in Sydenham Hill Wood (Jan. 20, 2013).

Weather data from UK Met Office.