CLIMATE SCIENCE FORUM

Summer 2011 #14

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Winds Grew in Power over much of the Oceans

Extreme Waves now more Frequent in Temperate Zones

Australian scientists conclude that winds have increased by 5 to 10% in velocity over the world's oceans during the last 17 years, and that extreme winds (the top one percent of wind speed values) have increased in speed even more than the average winds have. Reporting in the April 22 *Science*, the three scientists I. R. Young, S. Zieger and A. Babanin of Swinburne University in Melbourne used perhaps the most accurate tool now available, radar altimeters on board the GEOSAT satellites, to map winds and waves over the oceans. The most extreme winds are now 15% stronger over nearly all areas of the ocean.

Coast Guard boat climbs a breaking wave at Columbia River bar. **CREDIT: NOAA Photo Library**

Waves are pushed along by the winds, so it is not surprising that wave heights have also increased over many areas. The relationship is more complex, however, as long-period "sea swell" originates in faraway storms, while local

Climate News

The new Ocean climate: Winds grew stronger, larger waves more frequent on much of the world's oceans

Seasonal Forecast for this Summer 2011

Europe's Hot Summers Likely Exceeded Summer Heat in Last 500 Years

Europe's Hot Summers of 2003/2010 break 500-year record

Much of the central and eastern two-thirds of the USA is now in the grip of a pronounced heat wave, as of this July. How often has it been exceptionally warm in the first years of the twenty-first century? According to scientists from four European nations, the hot summers of 2010 and 2003 likely exceeded the warmth of any other summer in the last 500 years in one-half of Europe. Their conclusion appeared in the 8 April, 2011 issue of *Science* (note, below).

The heat wave of 2003 was responsible for about 70,000 heat-related deaths in central and western Europe (mainly in France). And last year, well-populated western Russia and surrounding countries like the Ukraine and Finland roasted. Some 55,000 people died in Russia from the heat. That country suffered economic losses of $15 billion, or about 1% of its gross domestic product, from numerous

waves are caused by local winds. Where a crest of swell meets a local wave crest, the two waves add such that a high mound of water appears. So average and maximum wave heights are related not just to the strength of the local wind, but also to the power and duration of distant storms. The 23-year trend in wave heights is not as significant nor as easy to explain as the upward trend in wind speeds; in fact, there is no trend for monthly-average wave heights. But the most extreme waves (the top 1% of wave heights) have increased in height, and the increase is statistically significant. Height of these large waves grew by 10% over 20 years (satellites have measured the trend for 23 years), in the temperate latitudes of the oceans, from latitudes 35° to 60° in both Northern and Southern hemispheres.

Waves have apparently not grown in most of the Tropical oceans, even though wind speeds have increased on average in the Tropics. In these regions, sea swell affects the wave regime more than locally generated winds do.

These findings support the work of Oregon's Peter Ruggiero, who looked at data from two offshore buoys in the Pacific Ocean 250 miles west of that state. The buoys reported an 18% increase in significant wave height during the 30 years ending in 2007. (The term "significant waves" refers to the highest one-third of all observed waves.) Ruggiero did not examine the causes for the shift in Pacific wave strength.

But the Intergovernmental Panel on Climate Change (IPCC) did look at causes that now explain the stronger winds that the Australians found and the stronger waves that both groups found. IPCC scientists documented lower surface air pressure in the Bering Sea and the Arctic Ocean, plus higher air pressure in the subtropical belt, plus a northward shift in the same belt of high pressure. Together, these changes would strengthen the winds over the North Pacific Ocean. The IPCC found the greatest wave size increases in the northeast Pacific Ocean near North America. They considered it likely that the shifts in the pressure pattern were due in part to human influence. We may conclude that the changing wind and wave climate of the oceans is another human influence.

CITATIONS:

"Global Trends in Wind Speed and Wave Height" by I.R. Young, S. Zieger, and A.V. Babanin (2011). *Science*, v. 332, 22 April 2011, p. 451–455.

"Increasing wave heights and extreme-value projections: the wave climate of the U.S. Pacific Northwest" by Peter Ruggiero, P.D. Komar, and J.C. Allen (2010). *Coastal Engineering,* v. 57, May 2010, p. 539-552.
(http://www.sciencedirect.com/science/article/pii/S0378383909002142)

wildfires and crop failures. The intensity and extent of the 2010 heat wave surpassed the 2003 event.

Does last year's heat wave in Russia stand out in the historical record?

The European scientists looked at both historical climate records and "proxy" records from sediments, tree rings and other clues since the year 1500. They found that temperatures in the past ten years surpassed those in any other decade since 1500. In other words, the 2003 and 2010 summers were likely hotter than any in the five centuries up to 2000. In the last ten years, the area of Europe that has ever had a summer warmer than 99% of the summers in the 30-year period from 1971 to 2000 has doubled. There may be other clever ways that statisticians can say this; but recent summers have been remarkably hot!

Might the summer climate of Europe be influenced by global warming? The authors reviewed climate model experiments and concluded that a summer like 2003 is projected to occur again by mid-century (2050), but not a summer as warm as 2010. However, by the year 2100, a summer like 2010 may occur roughly every eight years in Eastern Europe.

CITATION:

"**The Hot Summer of 2010: Redrawing the Temperature Record Map of Europe**" by David Barriopedro, E.M. Fischer, J. Luterbacher, R.M. Trigo, and R. Garcia-Herrera. *Science,* vol. 332, 8 Apr. 2011, 220–224.
(http://www.sciencemag.org/content/332/6026/220.abstract)

CLIMATE SCIENCE FORUM

http://climate-science.org

Chief Editor:
Michael A Fortune, Ph.D.

Climate News in the print edition

The following news is in the current PDF newsletter :

Carbon dioxide, not water vapor, controls temperatures on Earth ..... Water vapor is a greenhouse gas but it cannot keep the Earth warm and livable.

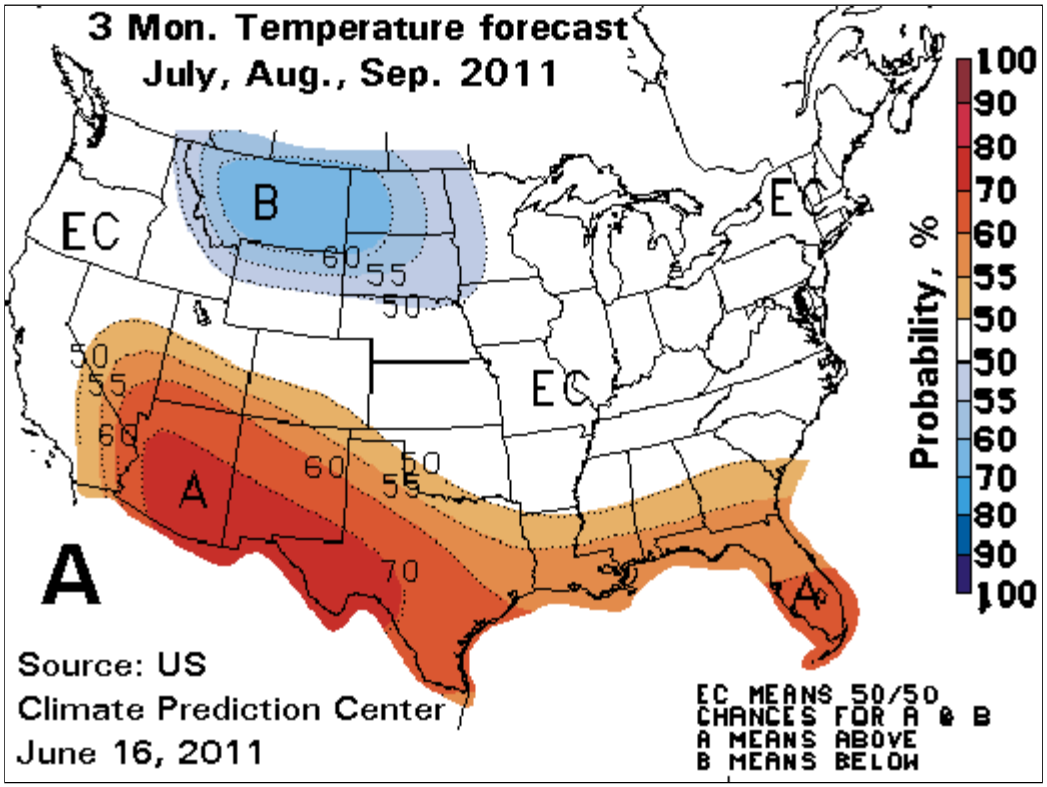
CLIMATE SCIENCE FORUM

Summer 2011 Forecast

La Niña no Longer Rules!

The La Niña phase of the El Nino-Southern Oscillation (ENSO) finally expired by the first days of June 2011. La Niña has been responsible for a prolonged drought in the Southwest and Southeast United States, at the same time that it favored heavy snowfall and rainfall in the upper Midwest and Northwest, in the winter and spring seasons ending on June 1. The surface of the equatorial Pacific Ocean now is observed to have normal temperatures over a wide area, which indicates that ENSO is in a "neutral" phase. (The ENSO phenomenon is commonly called "El Niño" in its warm phase and "La Niña" in its cold phase.) There are strong indications that the neutral ENSO will persist from now through the northern winter of 2011–2012.

In the northern High Plains, where the temperature map (**A,** right) has blue tones, the US Climate Prediction Center (CPC) is forecasting a cool summer or late summer (July, August, and September 2011) , due to very wet soil in the region. The wet ground also supports a forecast of a rainy summer in the same region (precipitation forecast in second map, below). La Niña was largely responsible for the very wet and snowy conditions in the High Plains and northern Rockies in the last six months. The Northwest had its wettest spring season on record, with precipitation 160% of normal from March to May.



The CPC forecasts a hotter-than-normal season in the southern swath of the nation from Arizona and Las Vegas all the way to Florida (area of orange tones on **A**, above). This is based on trends they have observed in the Southwestern and Southeastern US over several decades. Whether related to global warming or not, the summer season climate has measurably warmed in these regions. Some may find relief in the precipitation forecast (map **B**, below) which indicates that nothing out of the ordinary is expected for these three months in the South, except in Florida and coastal areas of the southeastern US, where it is expected to be wet.

Interestingly, western Oregon is predicted to be drier than normal, unlike Montana. Both regions endured six months of well-above-average precipitation (130% to 160% of normal) last winter and spring, but the forecast for Oregon is based not on soil moisture, but on trends noticed in recent decades in the summer season.

Trends also underpin the forecast of a warmer-than-normal summer in northern Alaska. The rapidly warming Arctic climate has been noted and commented on by the Arctic Climate Impact Assessment and the IPCC, or Intergovernmental Panel on Climate Change.

Monthly and seasonal forecasts are now based on a new 30-year averaging period, 1981–2010. The new averages of temperature, precipitation, and other observed elements of the weather, called "**climate normals**," were released to the public recently on July 1. The new normals document that warming in the United States is now extensive and has been underway for more than thirty years. Watch for a report in the next few days on NOAA's new climate normals on this site.

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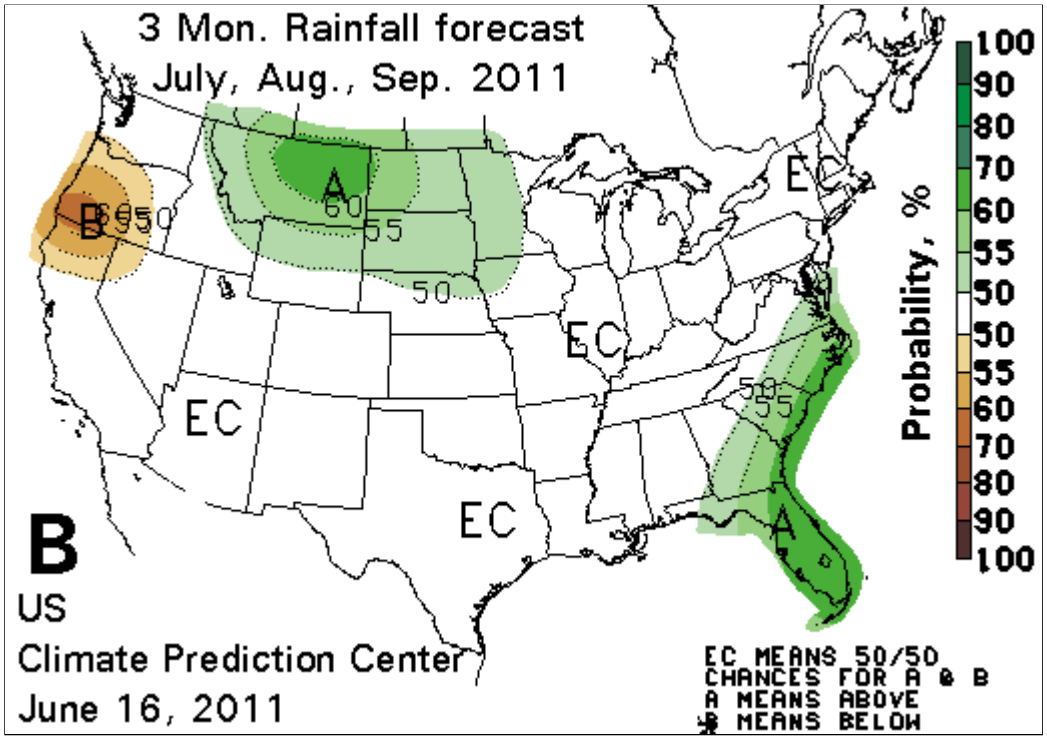

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