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Original Papers – Historical Perspectives

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- The drought in the Great Plains is over. Meanwhile, the drought west of the Rocky Mountains is easing in the Southwest and intensifying in Western Canada and the Pacific Northwest. Flooding is dominating the Midwest, but historically eases and permits a large crop followed by a wet, difficult and frequently late harvest.
- In similar years, insurance companies usually experience late spring and early summer storm and flood losses, followed by a quieter late summer/autumn hurricane season and then an active winter Western storm and flood season.
- Headlines predicting a “mini – ice age” exaggerate the projected impact of the latest research which explains solar cycles and predict reduced radiation and cooling over the next two decades. Reduced radiation would cause cooling but it has to continue over several cycles to be significant.
- The Tropical Pacific is now, unofficially, experiencing strong El Niño conditions. The El Niño conditions are given a greater than 90% chance of lingering through winter and 80% chance of lingering into spring. However, historically strong conditions, necessary for heavy California rainfall, last a maximum of seven months and would probably end by late winter.

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North America – Feeling the Extremes

Summary: The drought in the Great Plains is over. Meanwhile, the drought west of the Rocky Mountains is easing in the Southwest and intensifying in Western Canada and the Pacific Northwest. Flooding is dominating the Midwest, but historically eases and permits a large crop followed by a wet, difficult and frequently late harvest.

“It takes a flood to end a drought.”

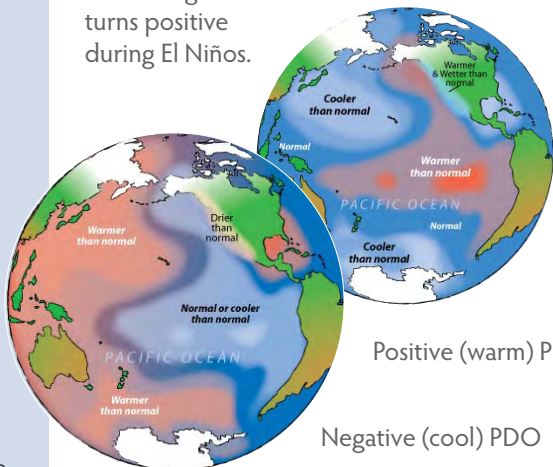
Attributed to Mark Twain

Here is the good news – the drought in the plains is over. Here is the bad news – it ended with a flood. North America is once again suffering through a summer of extreme weather.

Ending the Drought

For four years, the US Great Plains have endured a drought. It always included the Southern Plains, Texas, Oklahoma and parts of Kansas and the Desert Southwest. The drought sometimes include large portions of the Midwest and Gulf states. It remained centered in the US, never extending to Canada and only occasionally including Northern Mexico.

figure 1 The PDO now trends negative but turns positive during El Niños.



This dry weather is part of the “New Normal”, the standard climate for North America when the Pacific is in the Negative phase of the Pacific Decadal Oscillation (PDO). This huge, long-term cycle is centered in the North Pacific and affects the entire ocean. Since the Pacific is slightly greater than 30% of the globe’s surface, it shapes weather all over the Earth, but especially for Pacific Rim nations, including Canada, the US and Mexico.

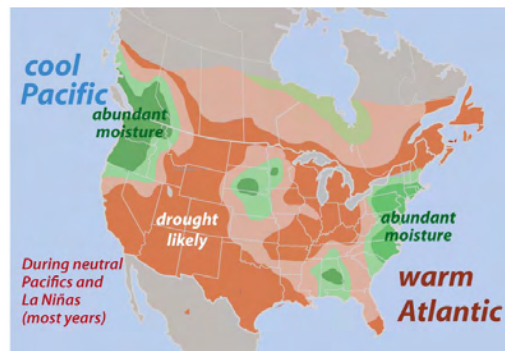


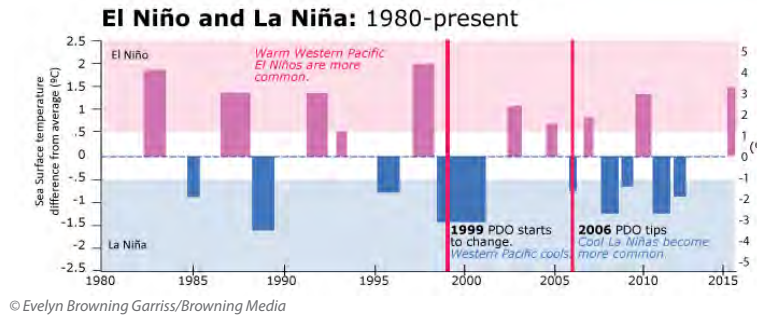
figure 2 The dark orange areas experience dry conditions 20% of the time or more
© Evelyn Browning Garriss/Browning Media. US data: USGS

In 2004 the US Geological Survey published a study of what historically happens when the PDO is in this phase and the Atlantic is warm. It shows large sections of the US and Canada average dry conditions 20% of the time. Unfortunately, these times usually occur when there is a La Niña and cool, drought-causing La Niñas are more frequent when the PDO is negative. We started to see more La Niñas when the PDO turned negative in 1999 and they have become common after the PDO tipped to the negative phase in 2006.

Our research shows that climate, over the next term, will cause dramatic changes in our social and economic patterns. We feel that readers, attuned to the changes that are occurring, may develop a competitive edge; and, by understanding their current and future environment, can use the momentum of change to their advantage.

figure 3

Since 2006, cold La Niñas have become much more common.



Beginning in 2011 and continuing until 2013, the Pacific had a La Niña and it brought hard drought to much of the US, particularly Texas. Average weather could not repair the severe water deficits and the drought continued through 2014. As a result, from 2011 to 2014, the drought in the Southern Plains resulted in over 15 billion dollars in damages. This prolonged drought was so severe that it could not end until the recent floods. There is an old adage, “Big droughts end with big floods” and it was true this year.

an El Niño began and by lingering into late springtime, it brought the typical heavy rainfall to the Plains. We have been warning clients that the planting would have flooding problems and it would be a difficult growing year. Typically (80%) despite the difficulties, the growing season produces a good crop. We still see that scenario.

Indeed, the rainfall is following the historical average almost exactly. By June 1, we could warn our clients what would probably happen and that is the pattern that this July has been following.

East of the Rockies – Wet and Warm

So much rain fell in May that it was the wettest month the Lower 48 had experienced since records began in 1895. Although the rains were beneficial in terms of drought recovery, they also caused record flooding. Lives were lost and property was damaged as the rain fell too quickly for natural and man-made systems to manage.

The exceptionally cold, snowy and long winter in parts of the Northeastern U.S. and Canada, and the delayed but severe tornado season in

the Midwestern and Southern U.S. created overall losses of \$12 billion in North America for this first half of 2015. The figure does not include indirect losses like delayed flights, power failures and business interruptions caused by the storms. According to a recently released report by Munich Re these natural catastrophes have resulted in \$8 billion in insured losses. **The winter storms cost \$3.2 billion in direct insured losses (\$4.3 billion overall), while the April through June storms, hail, tornadoes and flooding in the South and Midwest hail--caused overall losses of \$6.5 billion, of which \$4.8 billion was insured.** The figure does not include indirect losses like delayed flights, power failures and business interruptions caused by the storms.

Unfortunately, the damaging weather is not over. The heavy rains have flooded Midwestern fields, particularly in the Eastern Corn Belt where the flooding is affecting crop quality. While the corn had been planted, much of the soybean crop had not. By mid-July, planting was 4% below the five-year average, with later planted crops facing an increased risk of early frost and low yield.

Now the Midwest is facing heat and, if history repeats itself, continued rainfall. Remember – these types of years are not as good as they tend to be stressful and heat at the end of July, when corn is silking and establishing kernels. However, historically the heat has been accompanied by enough rain to reduce heat stress – at least for crops if not for humid, overheated cities. In 70% of similar years the summer ended with timely rainfall for soybeans and stress-reducing cooler temperatures in late August weather. The exception to this is Eastern Canada, which usually has warmer than normal temperatures that hastens maturing for all but the northern most crops.

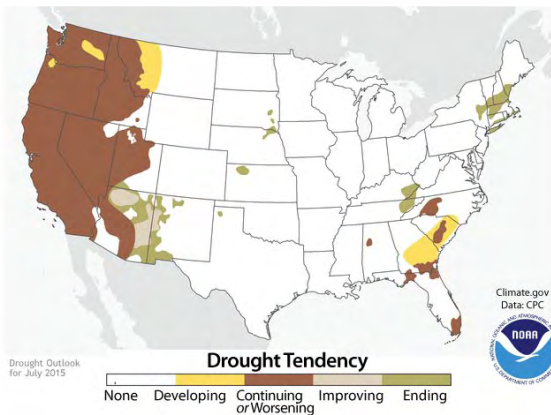


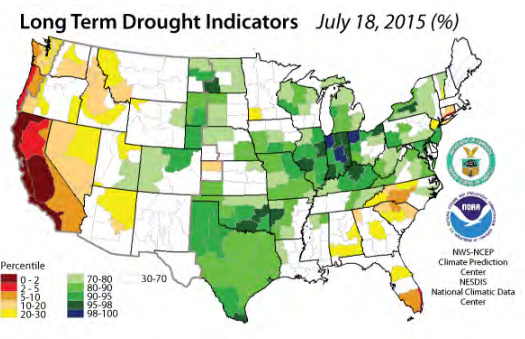
figure 4 The drought has ended for the Great Plains but is expected to worsen for the West (including Western Canada).

<https://www.climate.gov/maps-data/data-snapshots/drought-outlook-monthly-cpc-2015-07-00?theme=Outlooks LABEL>
 “The drought has ended for the Great Plains but is expected to worsen for the West (including Western Canada)”

Indeed, history shows that this pattern has happened in 80% of similar years – years when El Niños combine with unusually cold, volcanic ash/chemical northern air masses. Last October,



figures 5A-B The Mid-summer weather has followed the pattern that it does in 80% of years with similar natural factors shaping the climate.



Streamflow vs. Historical Average July 24, 2015 (%)

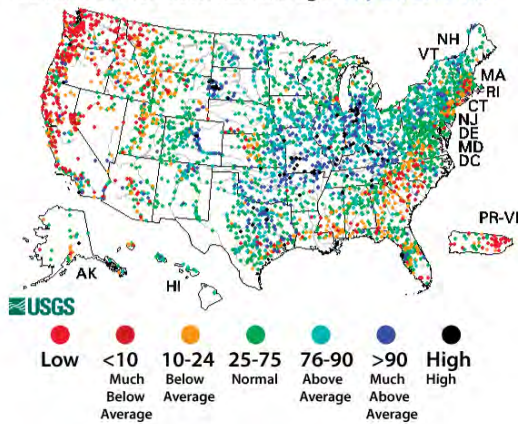


figure 6 The streams in large sections of the Corn Belt, Mississippi and Southern Plains are at or near flood levels.

http://waterwatch.usgs.gov/index.php?id=real&sid=w__map

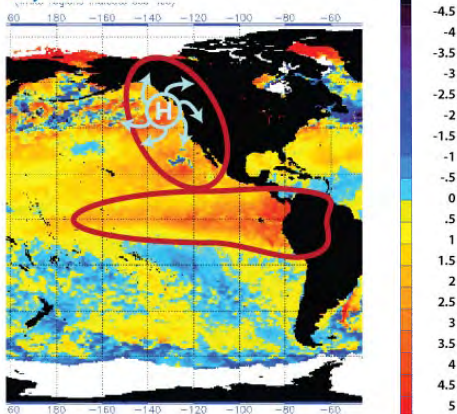
West of the Rockies – Dry in the North and a Strong Monsoon in the South

The West has been dominated by drought. California is in a four-year drought. The Southwest, particularly the vital Colorado River Basin, the key source of water for 40 million people, has been suffering for sixteen years. Even Western Canada, which avoided drought throughout most of the decade, is now the most severe drought in decades.

The problem has been a combination of extraordinarily hot water off the West Coast and a semi-stationary high pressure pattern

figure 7

Sea Surface Temperature Anomalies (°C) July 30, 2015



ing El Niño using hot water along the West Coast th America ficulously Resilient Ridge nning to fade

<http://www.ospo.noaa.gov/data/sst/anomaly/2015/anomnight.7.20.2015.gif>

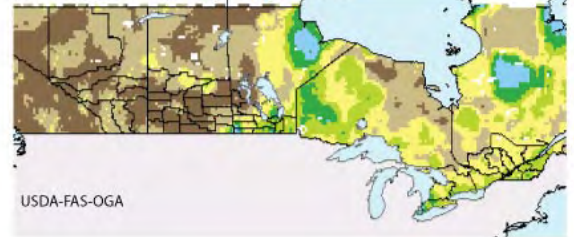
nicknamed the Ridiculously Resilient Ridge or Triple R. The heat has increased evaporation while the Triple R steered Pacific storms far to the north. (Normally the high appears in summer but moves away in winter, allowing a winter wet season. For the past few years, it has lingered in place.) Currently, while the growing El Niño condition is not reducing the heat, it is allowing the Triple R to fade. The pattern is still reducing Western Canadian rainfall but it now allows tropical moisture to flow into parts of California and the Southwest.

Canada has received some late July rainfall, but the West is suffering from drought. In British Columbia Victoria Island and the Coastal region, including Vancouver had to declare Category 4 drought. Further east, both Alberta and Saskatchewan are enduring deep drought, with several Alberta counties declaring emergencies and Saskatchewan cattle raisers calling for aid. The crop insurance should help the farmers but cattle raisers are reeling from the double hit of parched pastures and soaring hay prices.

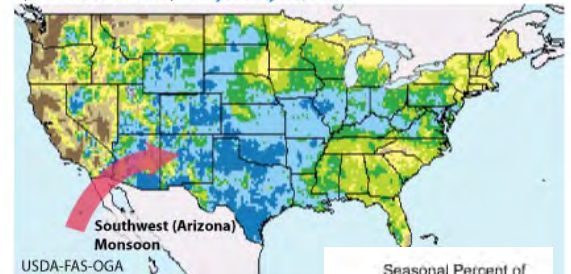
As El Niño has shifted the worst of the drought north, it has allowed the Southwest Monsoon to start early and stay strong. Spectacular thunderstorms have rumbled from the California deserts to West Texas and the Great Plains. On July 6, our hometown, Albuquerque, New Mexico, had the heaviest rain in its recorded history – more than two inches in 24 hours with 70 mile per hour gusts of wind. Flood waters ripped through Las Vegas, causing even the most dedicated gamblers to pause. Flash floods have ripped from the coast of California to Texas.

The monsoon season usually lasts through September. However, during El Niño years like this, it is not unusual for the remnants of a Pacific hurricane to get sucked inland. Indeed, in May the monsoon inhaled the remnants of Hurricanes Andres and Blanca, causing heavy rainfall from Santa Barbara, California to

Canada: Seasonal Percent of Normal Precipitation (USAF 557th WW) May 1-July 20, 2015



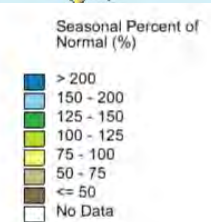
United States: Seasonal Percent of Normal Precipitation (USAF 557th WW) May 1-July 20, 2015



figures 8A-B

top: Canada <http://www.pecad.fas.usda.gov/cropexplorer/>

bottom: <http://www.pecad.fas.usda.gov/cropexplorer/>

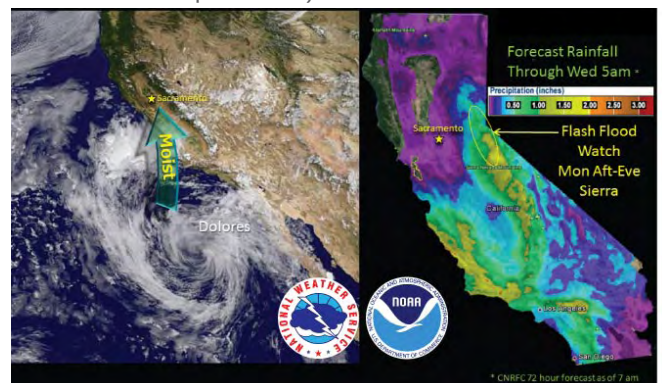


Phoenix, Arizona and the Colorado Rockies. The “Miracle May” yielded enough rainfall to allow Californian and Colorado River managers to avoid making draconian supply cuts. Then Hurricane Dolores came along.

The vital Colorado River Basin, the key source of water for 40 million people, has been suffering for sixteen years.

California here I come. In mid-July Hurricane Dolores was cruising along the Mexican Riviera before being inhaled by

figure 9 Hurricane Dolores delivers a wet surprise to dry California



courtesy NWS/NOAA, <http://yubanet.com/uploads/6/0720sto.png>

the monsoon. Suddenly she was California bound. The result, California was hit with (according to the headlines) “SUPER HISTORIC” rainfall. Los Angeles, San Diego and over a dozen other California cities set all-time rainfall records for the month of July. Interstate Highway 10 from Phoenix to Los Angeles was washed out “completely and indefinitely” according to officials. The 20,000 trucks and cars that use the Interstate daily will be forced to go hundreds of miles out of their way to find another road.

While the record rainfall was not enough to end or even “dampen” the California drought, it gave citizens of the state enormous hope. Many are counting on an enormous El Niño to bring back the rains and end the water shortages. Unfortunately, this hope is causing many to delay making necessary changes needed to adjust to the new drier reality of the changed Pacific Decadal Oscillation.

Hot	Warm	Cool	Dry	Wet
5° C or more higher than normal temps.	2-4° C or more higher than normal temps.	2-4° C or more lower than normal temps.	75% or less of normal moisture.	125% or more of normal moisture.

The Outlook for Late Summer and Fall

El Niño precipitation usually eases up in late summer and crops ripen in the Midwest and Great Plains. In 60% of similar years, August temperatures moderate in the Midwest, reducing heat damage. Further north, temperatures rise in Canada, which is good news for Eastern crops but not for the already stressed Western Prairie crop and pastures. Also, for beleaguered Vancouver and Victoria Island, rain usually begins to creep down the West Coast toward the very end of the season.

Despite El Niño conditions in autumn, California usually has only normal to below normal rainfall in 80% of similar autumns, with the exception being the two times a late season Pacific hurricane was absorbed by the September monsoon. In only one of those times did the moisture reach the coast, the other time had rainfall sprinkle the eastern desert.

What does normally happen, especially

during strong El Niño conditions, is that the Midwest gets heavy rainfall and in 40% of similar years, Texas and Oklahoma get more flooding. (Both years had difficulties planting winter wheat.) In the Midwest, October and November harvests were wet and tricky, with storage facilities need to dry the crops to prevent quality deterioration.

In the past, insurance companies basked in the reduced hurricane damage, when El Niño conditions were subduing the Atlantic Hurricane season. (With the extreme heat of the Atlantic and the storms, there remains a high risk of storms exiting the East Coast and becoming sub-tropical/tropical. These storms tend to cause heavy surf and they flow out to sea causing little damage. Fewer storms form in the tropics.) After autumn, however, insurers need to get ready for winter rainfall in California. Hurricane Dolores showed how unprepared the West is for heavy rain. The odds are that this winter will have heavy western rainfall and payouts.

Remember – the West is in a drought and it takes a flood to end a drought.

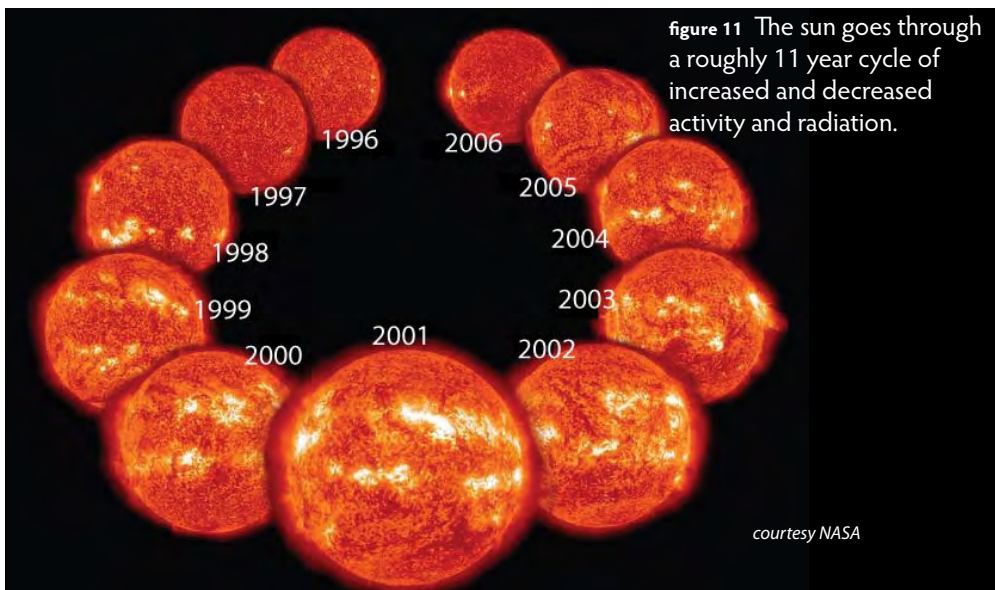
figures 10A-C * A moderate Russian volcanic eruption will make this region colder. *If El Niño conditions continue.
© Evelyn Browning Garriss/Browning Media



Science Note -The Fading Sun? A Mini Ice Age?

Summary – A science article has sparked another climate change argument. The author theorizes the sun has two cycles that, combined, will reduce radiation and may cause cooling over the next two decades. An objective review.

One of the sillier debates is whether human activity OR natural factors shape climate. A warning – here at the Browning Bulletin we find the two interact, with different levels of influence on different parts of the globe. (For example – human activity affects urban climate more while



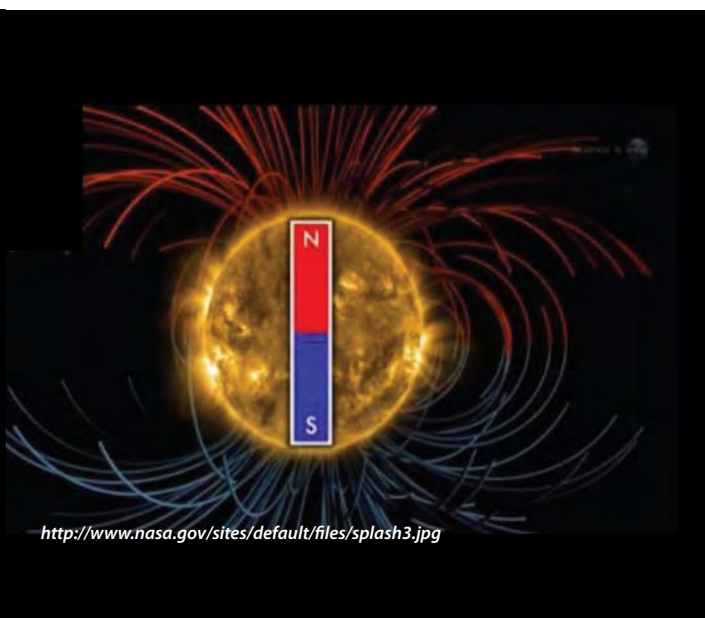
natural factors have a bigger influence in the middle of an ocean.) One of these debates is now centered on a very well done science research article.

It is well known that the sun goes through a roughly 11-year cycle of sunspot activity. Scientists have discovered that at the peak of the activity, the solar maximum, the sun gives off increased activity. After peaking, the sun typically goes through three years of increased solar flare and gas emissions, then quiets down. Then the cycle builds up again. During the 1600s the cycle was relatively quiet, with little difference between the peak and bottom of the cycle. More recently, the cycle has been much more active, (The Modern Maximum) with the most active cycle in the 1960s. The current cycle, Cycle 24, has been less active than any cycle in the last 50 years.

Scientists theorize that these sunspots and storms are due to the sun's magnetic field. This field spins and this magnetizes the gassy star. Like an electric magnet, the sun is a spinning dynamo that generates a magnetic field and the magnetic field lines get tangled and cause swirls and storms in the star's hot gas.

What hasn't been explained is why these solar cycles are so different. The cycles in the 1600s (The Maunder Minimum) and the early 1800s (The Dalton Minimum) were relatively quiet. The Earth received less radiation and went through a period of time cooler than now. Recently the cycle has been active and there has been a lot more radiation. Some scientists claim this is the main reason for the past century of global warming while others claim that the

figure 12 The spinning ball of gas of the sun generates a magnetic field – or maybe two fields.



<http://www.nasa.gov/sites/default/files/splash3.jpg>



figure 13 A return to the Little Ice Age – when the Thames froze and Holland was an ice skating rink? *Winter landscape with iceskaters* c. 1608 Hendrick Avercamp

different amount of radiation was too minor to have much of an impact on global climate, especially when compared to human greenhouse gases.

Now a new theory attempts to explain this irregularity. On July 9, 2015, Great Britain's Royal Astronomical Society (RAS) published the presentation of Prof. Valentina Zharkova at the National Astronomy Meeting in Llandudno. She theorized that the different layers of the sun spin at different rates and there are actually two dynamos inside the sun, both generating separate magnetic fields. Sometimes the two work together and combine to form a very strong solar field. Sometimes, however, the two are out of sync and the fields cancel each other out. The RAS quoted Zharkova as announcing that "Combining both waves together and comparing to real data for the current solar cycle, we found that our predictions showed an accuracy of 97%".

What made the article controversial was the authors finding that their model predicts that the pair of waves become increasingly offset during the 2022 solar cycle.

Then, "During Cycle 26, which covers the decade from 2030-2040, the two waves will become exactly out of synch and this will cause a significant reduction in solar activity." They compared this to mechanics that led to the cool Maunder Minimum.

You guessed it – the headlines proclaimed the potential doom of a new mini-ice age. Time to invest in mittens!

Then came the opposing scientific opinions. The *Washington Post*, for example, quoted Georg Feulner, of the Potsdam Institute on Climate Change Research claiming that the reduced solar radiation would only cool the Earth by 0.1°C, an insignificant amount compared to the 1.3 °C heating that he attributed to man-made greenhouse gases. In short, the argument now has become another man vs. nature argument.

What is significant is that the theory may explain the erratic behavior of solar cycles. It is now going through peer testing.

Even if the author was right, history has shown that a less active sun does not act quickly. It takes one or more entire 11-year solar cycles to start noticeable cooling and other factors, such as the current warm flow of the Atlantic, can mask the effect for years. If the sun stays quiet for multiple cycles, temperatures do drop, sometimes by one or two degree Celsius (up to 5° F), but it took almost five cycles, more than a hundred years, to cause that much of a drop and other climate cycles may also have joined the sun to cause the cooling.

So, if the theory is right, and it might be, a mini-ice age is not in the near future. It doesn't look as if polar bears will be moving into your neighborhood any time soon.

It takes one or more 11 year cycles to start noticeable cooling and other factors can mask the effect for years.

A Strong El Niño?

Summary – The Tropical Pacific is now, unofficially, experiencing strong El Niño conditions. The El Niño conditions are given a greater than 90% chance of lingering through winter and 80% chance of lingering into spring. What does this mean, especially for Pacific Rim regions like the California, Australia, and the croplands of South America?

Californians, still reeling from the damage of the remnants of Hurricane Dolores are cheering themselves up with the following thought – this is an indication of a strong El Niño. For residents of that beleaguered drought-stricken state, an El Niño

The majority of international climate and oceanological agencies now agree that they expect this warmth to continue into spring. They give a greater than 90% chance of it lasting through winter and 80% chance of it lingering into spring. The majority agree that the event should be strong (1.5°C or 2.7° warmer than average) by December.

Remember – scientists use a different vocabulary. What they are saying is that one small part (a section they call El Niño 3.4) of the Tropical Pacific will be 0.5°C (0.9°F) warmer than normal for a defined amount of time. It

[El Niño] conditions formed in the last part of July...bigger than and almost as strong as 1997-8.

So it is important to understand – we are experiencing strong El Niño temperatures right now. That is probably one of the factors shaping the unexpected behavior of Hurricane Dolores and the monsoon. It was acting like a strong El Niño. As Figures 16 show, there is a dramatic difference in the type of weather generated by strong El Niños and weak to moderate ones.

Scientists note that while the Pacific Ocean temperatures are equal to a strong El Niño, the Madden Julian Oscillation winds are not exactly behaving like a strong El Niño. Currently, a cooler MJO, a pool of cooler water and more turbulent winds, is entering the Central Pacific and will drift through the pool of hot El Niño waters toward South America. It may cool the 3.4 area that the scientists measure to less than 1.5°C above normal.

The big concern is that this may be like the March – May 2014, where temperatures built up and then fizzled. Even when El Niño conditions returned, they were a Central Pacific (Modoki) El Niño from January through April and did not have much impact on the Americas. In particular they didn't bring rainfall to California. The problem is that when the long-term Pacific Decadal Oscillation is trending negative, the small MJO patterns are extremely variable. Earlier this summer, one Madden Julian Oscillation developed that was an astonishing four standard deviations larger than normal. The Pacific has been astonishingly variable over the past two years.

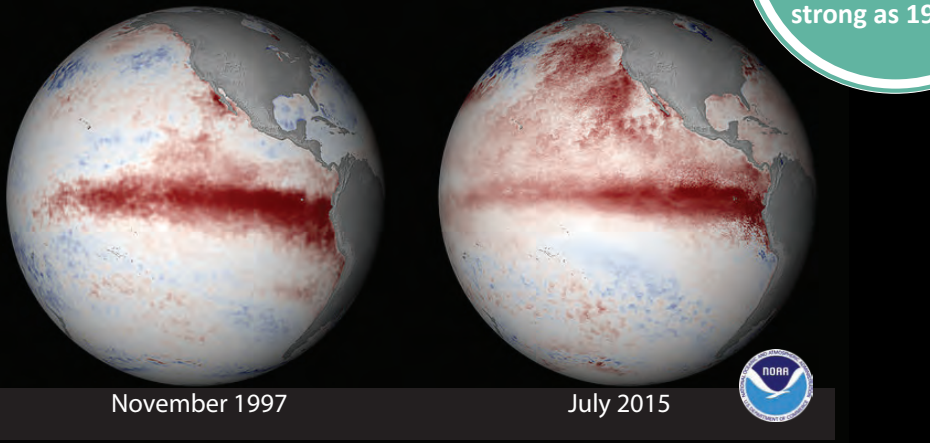


figure 14 <http://www.theweathernetwork.com/us/news/articles/climate-and-environment/june-heat-breaks-records-el-nino-locking-us-in-for-back-to-back-hottest-years/54638/>

means one thing – rain! So they wait for an El Niño like a five-year old waiting for Christmas, with great anticipation and not much patience.

The wait is over. The scientists have to observe for an entire month before officially announcing strong El Niño conditions, but the conditions formed in the Tropical Pacific in the last part of July. The latest satellite image shows a hot pool of water that is bigger than and almost as strong as the giant El Niño of 1997 – 1998. That event brought storms, landslides and lots of beautiful rain and snow.

has to be warm for longer than a month (or in some agencies, two months) to be an official El Niño condition. It has to be warm for roughly 7 months in a row to be an official El Niño event.

As soon as the temperatures get warm, they begin to create El Niño weather, even if it is not yet called an El Niño condition or event. Indeed, the US Climate Prediction Center still are calling the current conditions an El Niño condition, not an official El Niño. We may have had hot temperatures since October, but in February area 3.4 was only 0.4°C, not 0.5°C above normal and the heat needs to be continuous in that one little area. We have had El Niño weather for 10 months – and technically haven't had an El Niño yet!

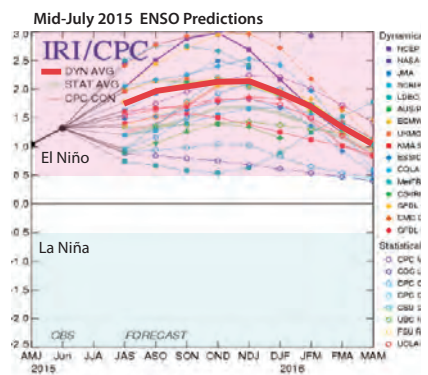


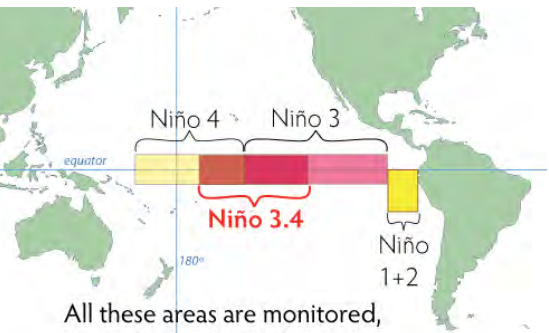
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 14 July 2015).

figure 15 El Niño predictions though spring courtesy IRI

California will get some drought relief but not a rescue while Texas and the Great Plains get solid rainfall and cool temperatures.

At this point it is probable that the El Niño will continue to be strong in late summer and part of autumn and fade to a more moderate size during winter. History shows us that strong events stay strong for only six or seven months. It will probably shrink to a Central Pacific El Niño is if it lingers to mid-spring. At this point there is a high probability of good rain for the southern part of California and a 50 – 50 chance that it will be heavy in the San Francisco and north areas. **Even if it is strong in winter and spring, it is very unlikely that it could provide enough water to end California's drought. No historical event has ever delivered enough rainfall to make up for the current state deficit.**

Across the Pacific, it looks as if the El Niño will be very rough on Australia and Indonesia. Both the Pacific El Niño and the developing positive figures 17A-D



All these areas are monitored, but only sustained, elevated temperatures in area 3.4 will lead to a declared El Niño event.

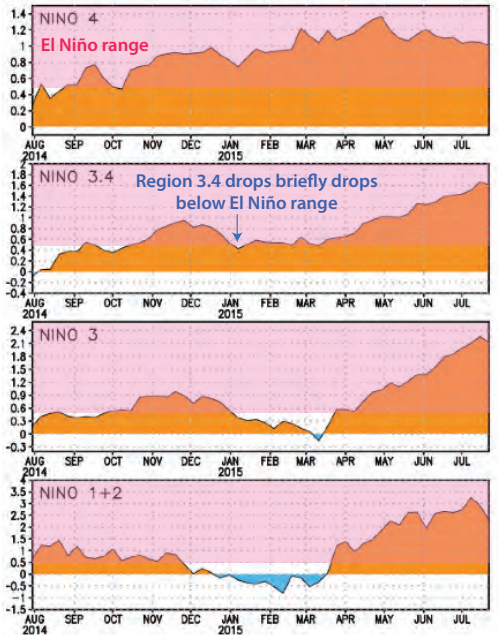
figures 16A-B Scientists use the temperatures in section 3.4 to determine if the Pacific is experiencing an El Niño.

Indian Ocean Dipole oscillation are in configurations to maximize drought, heat and, for Indonesia, fires. The entire Malaysia/Singapore/Indonesia is at risk for heavy smoke. Also, as an International Monetary Fund working paper noted – non-fuel commodity prices usually rise by 5.3% on average in the 12 months following the announcement of an El Niño event.

In Latin America, a strong to moderate El Niño hurts the important South American fishing industry while helping Argentinian and Southern Brazilian crops.

At this point, it is still speculation. While scientists are trying to expand their ability to project events, so far their reliability is still best at 3 months out. Typically the

Sea Surface Temperature Anomalies, by zone (°C) August 2014-July 2015



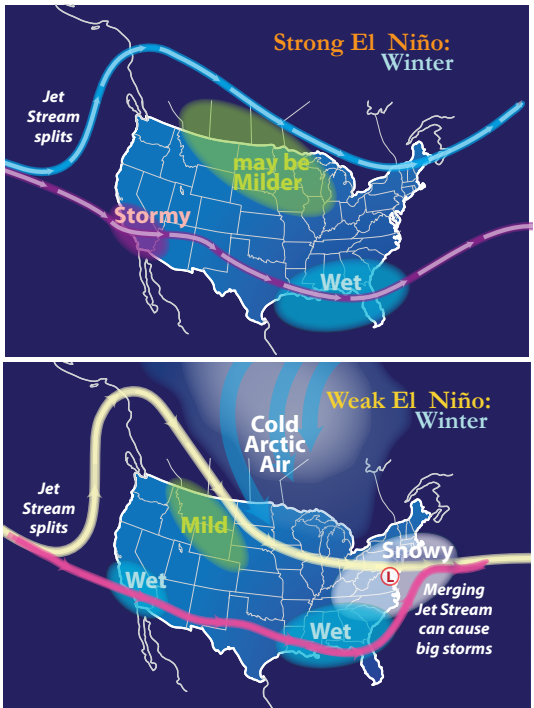
http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf

spring forecasts are the most inaccurate and the October and November forecasts have proven most reliable. Because California is so desperate for rain, the media tends to exaggerate the probability of heavy rainfall.

Conclusion

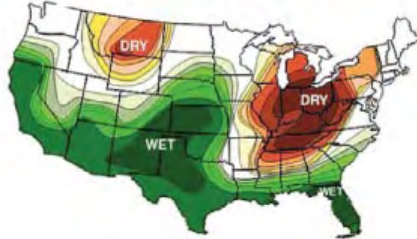
At this point, the El Niño conditions are strong, but scientists need to wait before officially declaring it a strong El Niño event. In the past, the longest time an El Niño remained strong was seven months, so it is probable that the phenomenon will be strong in late summer and autumn and turn more moderate sometime in winter before fading in spring. California will get some drought relief but not a rescue while Texas and the Great Plains get solid rainfall and cool temperatures.

When the Pacific pattern settles more in autumn, we will revisit the probable El Niño impact. Until then, prepare to see more headlines predicting that the El Niño will ride in on a white charger and rescue California from all its myriad problems.

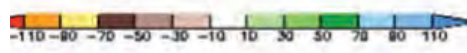
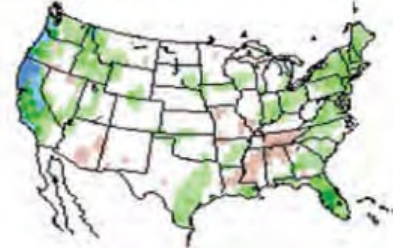


left © Evelyn Browning Garriss/Browning Media, right courtesy NOAA

STRONG El Niños Precipitation Anomalies January - March



WEAK to MODERATE El Niños Precipitation Anomalies January - March



Get out the skis – it's snowing in July. A cold front brought rare July snow to the Northern Rockies and record low temperatures to Idaho and parts of Montana. Jackson Hole ski resort reports more than an inch (2.54 cm) of snow. Meanwhile, on the edge of the cold front, a tornado swept through Manitoba province and another, unconfirmed tornado hit Wyoming. The wandering Low pressure cell is generating high wind above 60 mph (100 kph) through parts of Montana, the Dakotas, and Saskatchewan. Local farmers scrambled to cover crops and run sprinklers to prevent frost damage.

The most important part of this story is the warning it gives. With the extraordinarily hot temperatures along the West Coast, the northern jet stream is already behaving like autumn. History suggests this section of the Canadian/US border will average hot temperatures, but the records show averages, not variability. Late summer and autumn may be extremely volatile.

On the opposite side of the globe, Europe is also reeling from a volatile jet stream as well. Late July storms lashed Britain and Western Europe with autumn type weather, bringing soaking rain, howling winds of 65 to 95 kph (40 to 60 mph) and severe thunderstorms. Parts of Great Britain had two inches of rain, equivalent of a month's rainfall, in a couple of hours. The storms lashed France, the Netherlands, Belgium, Denmark, and southern Scandinavia before rolling into Central Europe.

The winds were lethal in the Netherlands and even worse in Germany, Poland and Slovakia. At least 3 people were killed and 15 injured by falling trees and lightning. Meanwhile, Southern Europe has endured extreme heat.

Saved by the IOD! The Indian monsoon, which normally is much lower than average during a Pacific El Niño is seeing more rainfall than expected due to an Indian Ocean pattern – a positive Indian Ocean Dipole. It has shifted the warmer waters towards the western portions of the ocean, which normally increases and strengthens rainfall in Southern Asia while weakening it in Southeast Asia.

Experts have been projecting an Indian monsoon only 88% of normal but currently India has received 95% of its average rain, including some good rainfall in the important wheat-growing regions in the northwest. So far 72% of India has received normal to above normal rainfall and only 28% is enduring below normal precipitation. Current patterns indicate near normal monsoon moisture until August 10.

● Enjoy that guacamole and orange juice while you can. A survey is showing that California is switching crops in response to the repeated years of drought and unreliable or expensive water supplies. As late as the 1980s, California was the leading producer of cotton, planting 1.5 million acres; now it plants a tenth of that amount. Row crops and pastures are being abandoned for higher value orchards and vineyards. Citrus and avocado were the leading crops around San Diego. Now they have over 12,000 acres of these crops out of production with entire orchards abandoned and dying as the water gets cut off. Instead farmers are discovering dragon fruit, persimmons and pomegranates, which use much less water.

● Who knew that shifting ocean currents could heat up a war – between the US and Canada. Since 1783, there has been a dispute over North Rock and Machias Seal Islands, two tiny, unpopulated (except for 11,600 puffin birds) hunks of rock off the coast of the northern border of Maine. The Canadians maintain a lighthouse there and fishermen from both nations fish for lobsters in the surrounding waters. The waters have been disputed since 1783 and occasionally the "fishing war" has been violent.

Right now, with lobster at \$5.50 a pound, new fishermen have entered the competition. It has gotten rowdy and Americans are accusing Canadians of acting like "Vikings" and remind the news that eight years ago the dispute cost a US fisherman his thumb.

While this dispute is minor, it is a reminder that when water temperatures shift, so do underwater populations and fishing fleets following the fish. There are increasing tensions in international waters, particularly in Asia, as some nations attempt to police their offshore ocean claims much more aggressively than here in North America.

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