



IN THIS ISSUE

- ➔ Current ENSO models show a 55% - 65% chance of a La Niña occurring in late fall and through winter. This conclusion comes far earlier than the normal media declarations that the NOAA has offered in the past. If they're right, it can offer a future allowing earlier warning of El Niños and La Niñas in the future.
- ➔ If a weak or moderate La Niña should occur than the outlook for North America and Asia changes slightly compared to previous expectations. North America would see colder temperatures and a decrease in precipitation. Asia would see the opposite with warmer spreading temperatures and more rain and snowfall.
- ➔ La Niña conditions, along with a neutral IOD and hot Atlantic are influencing the Southern Hemisphere growing season. Western South American and Australia could see difficult harvests while Eastern Australia and Western Africa could have better than average crop growth.
- ➔ FEMA is not prepared for the expensive year that is 2017. With a near record breaking year in billion dollar disasters the average costs that FEMA has prepared for are significantly lower than the needs states and countries impacted by natural disasters will need.

CONTENTS

Is a La Niña Coming? Models have determined a weak La Niña is on its way. While we're not ready to determine that there is a 100% possibility of this happening, if it does, it will influence Asian and North American temperatures and precipitation. page 1

La Niña Conditions Impact on the Southern Hemisphere
The Southern Hemisphere has finished most of its planting and now deals with a long growing season. A Neutral IOD, a warm Atlantic and cold Pacific are the major influences for quality and quantity of the growing crops. page 4

The Trouble with FEMA Governments have two major reactions to a difficult and expensive natural disaster year. They're both wrong and may leave FEMA unprepared should the next 3-5 years also see rising costs.. page 6

News Notes: page 8

Is a La Niña Coming?

SUMMARY Models indicate a slightly better than 0% chance of a La Niña occurring this late fall and into winter. If it does, North American will be colder and drier than previous bulletins considered

Times are continually changing in this turbulent climate decade. Every year brings a new record. A coldest month, a most expensive disaster, a hottest summer, the climate has become a headline grabbing celebrity ready to ensnare readers and viewers at any moment. So imagine my surprise when front and center along several of my daily news site perusals came the headline of an upcoming La Niña.

Browning Media was aware of a potential La Niña based on biweekly ENSO reports. Starting in June the temperatures along the western portion of the Pacific Ocean began to cool. At that time, trade winds along the same area were also cooler than normal. This normally indicates that a cold surge of water is going to maneuver itself along the equator before hitting the western coast of North America and/or South America.

At times these colder than average surges are simply Madden Julian Oscillations, a short 4-6 week burst of hotter or colder than average water. These can lengthen droughts, bring much needed rain or even create flooding events, but their impact is short-term. It normally takes at least 3 to 5 weeks to determine if a burst of cold or hot water in the Pacific is a Madden Julian oscillation, or the start of a longer trend of warm or cold water. Since this source of cold water was coming near the end of a long trend of hot water in the Pacific, there was a higher probability that the cold water was the start of a cooling trend. How cold and how long would take 2 to 3 months of temperature measurements with certain climate phenomenon normally taking far longer to determine. Instead, the NOAA changed decades of reporting conditions and determined a La Niña was almost certain nearly 3 months earlier than their normal reporting time frame.

In years past the NOAA had a standard set of rules in which they would determine the upcoming El Niño or La Niña conditions. The Pacific had to maintain an average temperature of half a degree Celsius hotter or colder than the average temperature of the Pacific in the 3.4 measurement area of the Pacific Ocean. By around the fourth or fifth month, the NOAA would begin reporting a significant chance of an El Niño or La Niña. If the hot or cold temperatures maintained its half degree Celsius difference for seven straight months, a La Niña or El Niño would be officially declared. The determinations and timing of the reports caused difficulties for industries they were dependent on weather and climate. With the prolonged time in announcing the upcoming probability of an El Niño or La Niña, industries were already living in the results that the colder or warmer

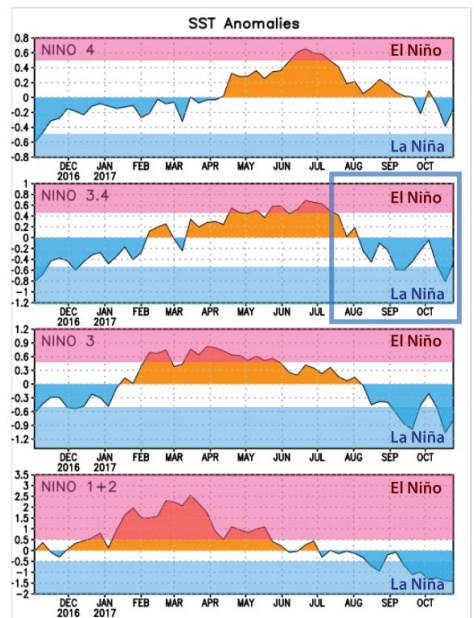


fig. 1 The 3 month average in region 3.4 measured -0.5°C (the criteria for La Niña conditions).

http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/ens0_evolution-status-fcsts-web.pdf

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.

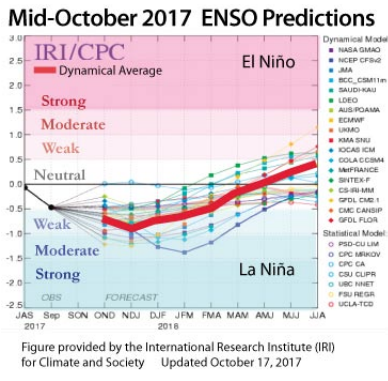


fig. 2 The international models predict a La Niña to develop and persist through early 2018

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

temperatures would create. This meant that by the time the NOAA warned people that a La Niña or El Niño was coming, the conditions were already taking place. The NOAA may be doing something about that.

Realistically, the Pacific Ocean has only been .5°C cooler than average for two months, with the second of those two months being over 1°C cooler than average. This means that, when combined, the July, August and September 3.4 district Pacific temperatures, the result fell at precisely .5°C cooler than normal. Because a La Niña would have such a strong impact over fall and winter, it appears that the NOAA decided to report



fig. 3 With numerous offices, and drawing on worldwide sources, different IRI agencies can produce different, sometimes contradicting, models. courtesy IRI

immediately that a La Niña was coming. The press, however, normally failed to mention that most models indicated a 55% to 65% chance of a complete La Niña occurring.

There is more certainty for the ENSO scientists this time around in comparison to last year. For those who remember November 2016's *Browning Bulletin*, scientists were flip-flopping on whether a La Niña would occur or not. By the time the NOAA determined the La Niña was going to happen, it was just about to occur. The report stating a La Niña would happen came at month six of the seven months necessary for La Niña determination. Part of the reason for this was because there was disagreement between the North American and Asian/Australian scientists. When you have scientists looking at a phenomenon that affects half the world, a difficulty lies in the fact that it doesn't affect the world the same way.

A La Niña will bring cold water along the western coast lines of North and South America, but it creates exponentially warm water along the eastern coast of Asia, Southeast Asia and at times northeastern and Eastern Australia. Other times the impact of the Indian Ocean Dipole (IOD) impacts Australia's coastline so much that it overtakes the impact of an El Niño or La Niña. Europe receives little to no impact from an El Niño or La Niña and therefore looks at conditions in a different way than the other four continents. With five continents of scientists looking at El Niños and La Niñas in completely different ways, finding agreement can be very difficult. For example, Australia is usually the first to warn of an El Niño or a La Niña. While this is not been confirmed via documentation, there is a general belief that Australia's apparent overreaction is based on the country's ability to react more quickly than other continents to significant

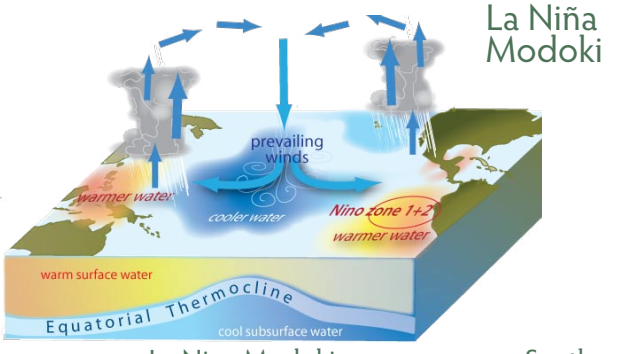
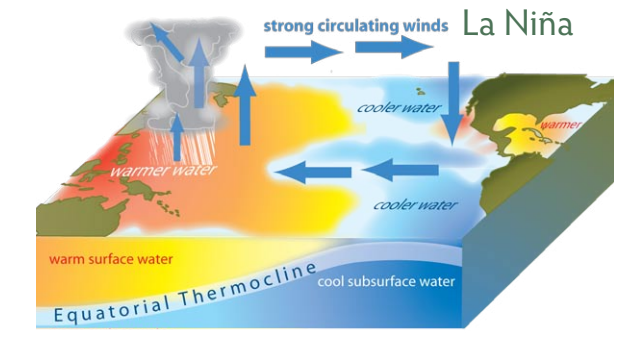


fig. 4A-B La Niña Modokis are warm near South America while normal La Niña's are cold
 © Evelyn and James Garriss

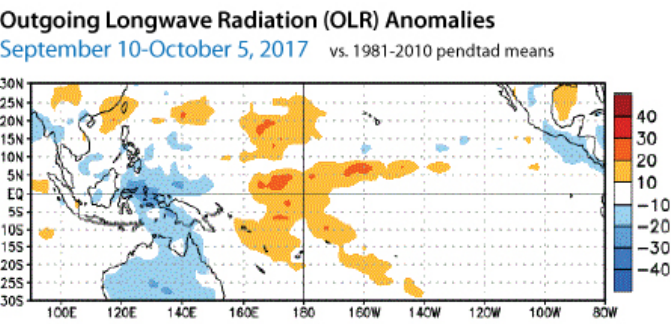
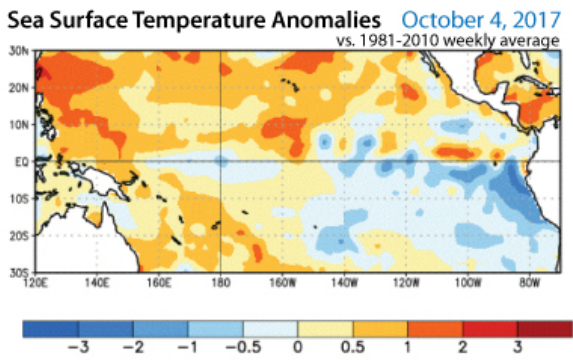


fig. 5A-B Cold eastern waters and western winds improve the chances of a La Niña. http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/figure01.gif

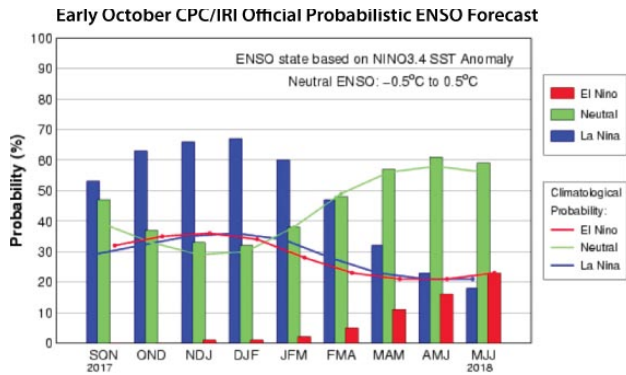


fig. 6 The general belief is that if a La Niña does occur it will last until March or April. http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf

climate events. It is better to prepare for the impact of an El Niño or La Niña that doesn't occur than to be caught by surprise. On the other side, European scientists who are not impacted by an El Niño or La Niña are often the slowest to determine that the climate event will occur.

This year more factors are present. While last year the impact of La Niña conditions were primarily occurring in the western and central portions of the ocean, this year the La Niña temperatures are falling primarily in the central and eastern portions of the Pacific. This La Niña is acting like a normal La Niña, not a La Niña Modoki which many scientists still don't agree actually exists.

With the cooler temperatures along the eastern Pacific, this gives us the necessary temperature anomalies to determine that La Niña conditions are currently in existence. The determination that it will continue to have colder temperatures is based on the cold trade winds along the western Pacific.

These are significantly colder than normal which would indicate that western Pacific waters are going to be cold as they trail along the equator. Still, due to the quick determination for this La Niña, there is no assurance that the colder than average temperatures will last a full seven months. Ironically by the time we can officially declare that a La Niña has come into existence, it may be coming to its end. If

the first three months cycle of July, August and September have determined La Niña's existence, January would be the seventh month that would conclude the existence of a La Niña. Many scientists believe that the La Niña will end in January or February with the highest agreement range falling towards the end of March.

Either way, fall and early winter should experience La Niña conditions, which October's *Bulletin* maps took under consideration. The upcoming maps are created based on the possibility of a full La Niña occurring and being at least weakly moderate.

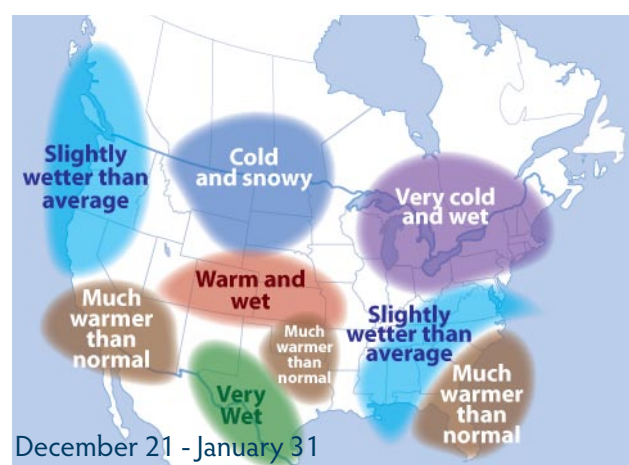
The Hot Gets Hotter and the Cold Gets Colder

If scientists are accurate that a La Niña will occur, it's going to be weak or at most moderate. It will not be a strong event like we saw in the fall and winter of 2010/11. The fall and winter outlooks that were previously created in August and October's bulletins were based on cold water hitting the Pacific. In fact many of the projections were based on comparisons to a very weak La Niña. Therefore should the La Niña occur be it weak or moder-

ate, differences will be minimal to previous predictions. The primary differences we will see are locations of rainfall which would shrink, and the strength of rainfall and/or cold conditions.

The northern plains, most of the northern Corn Belt and the southern Prairie regions of Canada will remain cold with high probabilities of snow. The Northeast will be somewhat wetter and colder leading to a higher possibility of snow, especially in late winter. In the mid-Atlantic there will be a decrease in precipitation in the early portion of winter before becoming colder and wetter as winter progresses. The Delta states as well as Texas will see an increase in precipitation as the colder pressures of the La Niña will mix with the hotter Gulf waters creating heavier storms. Don't be surprised to see some minor flash floods or even snow in late winter. North of Texas in Oklahoma and the southern portion of the northern plains, previously drier conditions may actually become warm with slightly above average precipitation. The Southeast will still be very dry although the northern portion of the southeastern states with the exception of Florida may receive some rainfall in early winter. In the southwest, most states will still remain hot and dry with the amount of precipitation expected in New Mexico decreasing by late winter.

The changes are minimal and Browning Media is not currently ready to adopt the majority belief of late fall and winter having a weak or even moderate La Niña. We will however concede to the impact that the cold Pacific waters will have along the United States and Canada. The cold Pacific waters will increase the impact of a negative North Atlantic oscillation which will bring cold or Arctic temperatures into southern Canada



figs. 7A-B North America's upcoming winter © James Garriss/Browning Media

and the northern US more frequently. It will also increase the impact of the warm Gulf and Atlantic waters creating stronger storms especially in areas such as coastal Texas, the Delta states and in late winter the Mid-Atlantic States. This year may determine how in tune the NOAA is becoming to the new normal. If they are right, it will make them a much more dependable source for the mil-

lions that rely on them to make their seasonal plans.

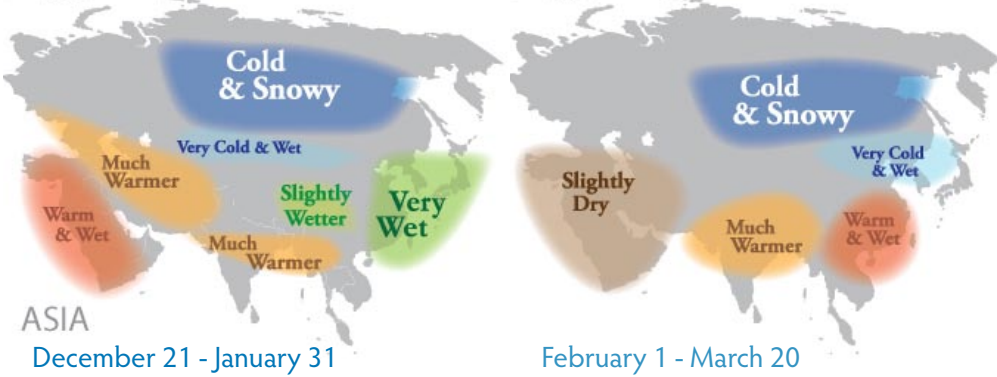
ASIAN IMPACT

The current La Niña trending within the Pacific is pushing warm water along the East Asian coastlines. This is creating a somewhat opposite impact than what North America is currently experiencing.

The warmth is creating more energy and increasing what already looks to be a snowy winter for Russia, eastern China, Japan and South Korea. It will also keep temperatures warmer although winter will still be cold. The precipitation increase should last throughout winter.

The southern portions of Asia are less influenced by the Pacific water and are instead dealing with a neutral IOD. In this case, the neutral IOD is keeping cold waters along the northern portion of the Indian Ocean. This is creating drought like conditions for many of the southern countries, but not the southeastern. Those will be covered in the upcoming article. The IOD may shift earlier and bring warmer temperatures in late January or February.

figs. 8A-B © James Garriss/Browning Media



ASIA

December 21 - January 31

February 1 - March 20

La Niña Conditions' Impact on the Southern Hemisphere

SUMMARY While La Niña conditions have a strong influence over the southern hemisphere, a neutral IOD and a hot Atlantic will either exacerbate or neutralize the normal results of La Niña conditions.

The southern hemisphere can also be heavily impacted by La Niña conditions. This is especially true in Australia, southeastern Asia and western South America. And in what can be considered a fair is fair nod to the Northern Hemisphere, other climate events can offset or strengthen a La Niña impact. In the northern hemisphere it falls primarily on volcanic activity. In the southern hemisphere for many continents it is the Indian Ocean Dipole. Australia, southern and southeastern Asia and Eastern Africa are as significantly influenced by the IOD as they are by their Atlantic or Pacific counterparts.

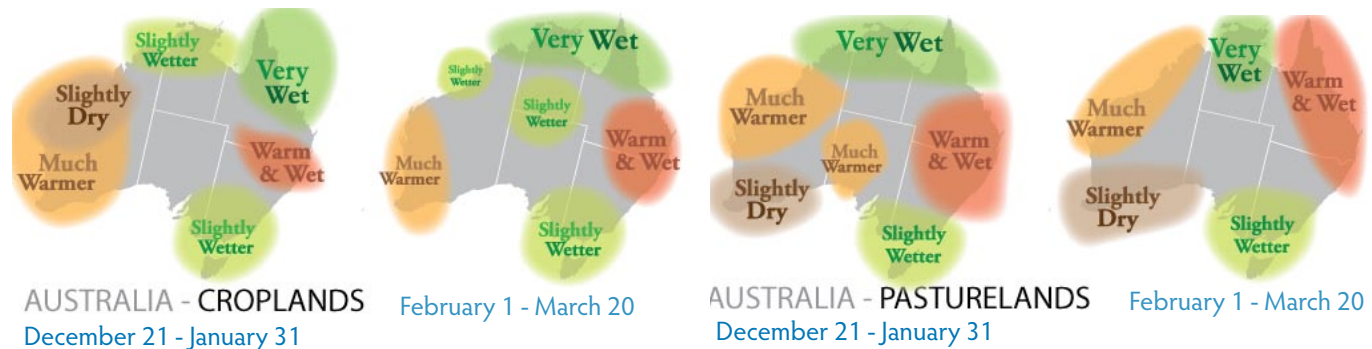
In South America, the Atlantic can change the impact of the Pacific, especially in the thinning Argentina and Chilean regions. If the La Niña is to occur through late spring and summer, it will be probably be weak. This means that the heat of the Atlantic and the impact of a neutral IOD may circumvent the natural impact the La Niña would have. Should the La Niña strengthen to a moderate or strong event, then outlooks will change. Currently here is the expectation for December - March in the southern hemisphere.

AUSTRALIA

Australia is being bombarded with cold water from the neutral Indian Ocean and warm water from the La Niña influenced Pacific. Although the waters along the

northern coast are warmer than a month ago, they're still slightly cooler than average. This means that the colder temperatures of the Indian Ocean are winning out in the war of hot and cold. What this means for Australia is the neutralizing of either ocean's impact along most of central Australia.

The northern, northeastern and eastern coast of Australia will receive significant rainfall with northeastern Australia having much higher than average. The western coasts of Australia will remain slightly drier than normal with significantly higher temperatures. This means slightly lower yields for southwestern crops, and slightly higher yields for southeastern crops. Like the oceans this will neutralize each impact and create an average crop yield for Australia although the more heavily harvested



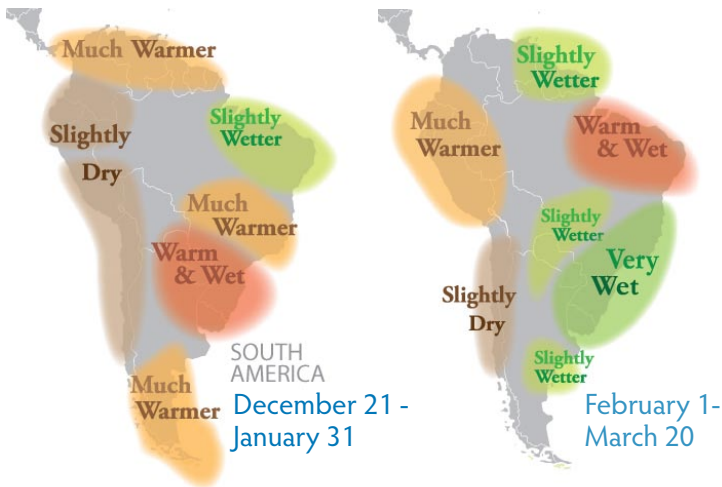
AUSTRALIA - CROPLANDS
December 21 - January 31

February 1 - March 20

AUSTRALIA - PASTURELANDS
December 21 - January 31

February 1 - March 20

figs. 9A-D © James Garriss/Browning Media



figs. 10A-B © James Garriss/Browning Media

southeastern portion may bring yields slightly higher than average percentages, but nothing significant. Most grazing regions with the exception of the far western and southwestern portions of the country should receive enough precipitation to re-grazed lands.

The question then is will the IOD will remain neutral, and will La Niña will linger through March. In both cases scientists believe the answer is yes. Therefore the late summer months show minimal change in precipitation outlooks. There will be a slight increase of rainfall in the central portion of Australia and temperatures will become much hotter in the western portion of the country. Thankfully brushfires will be a minimal risk until March or April.

SOUTH AMERICA

The cold eastern Pacific waters will have a similar impact on western South America as a does in western North America. This spells bad news for the heavily agricultural regions of Chile and Peru. The Chilean fruit and vegetable crops that provide a large amount of European and North American produce during their winter months will be significantly lower than average. Chile and Peru in general have suffered from the cold water trends of the Pacific Decadal Oscillation, and the increased cooler temperatures that may turn into a La Niña will not help. The dry conditions will reach into Western Argentina as well. On the other side of the continent, Brazil and Eastern Argentina are benefiting from heavy rainfall thanks to the heat of the Atlantic. The heat is not as strong along South America as it has been along the eastern US coastlines and Gulf of Mexico. The rainfall in Brazil and Argentina has been steadier with lower risk of flooding. There is still a significant chance for longer dry spells in mid to late summer. For crops that were planted late this could

spell difficulty and likely lower the yields and more importantly the quality of the crops. Despite that, look for Argentina and Brazil to have slightly higher than average yields although the chance of bumper crops is minimal except for in northern Argentina.

tures and a decrease in precipitation. The strength and length of a weak or moderate La Niña will determine if crops are slightly or significantly above average. Do not anticipate any bumper crops.

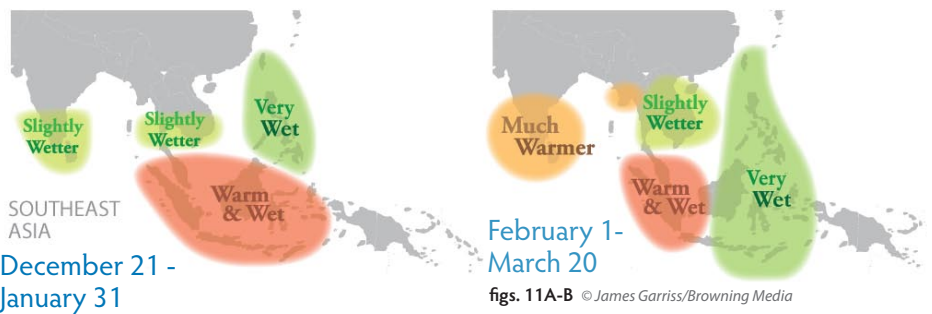
AFRICA

The neutral IOD is still placing cooler water along the northern portion of the Indian Ocean. This is causing a drying affect along eastern Africa that should continue for their spring and into early summer. On the western coastlines worry is that the La Niña will impact western coastal precipitation seriously reducing coffee and cocoa crops. This is a legitimate concern if the La Niña lasts a long time and is strong or on the stronger end of moderate. Most models determine the La Niña will be weak and only last through March. If it lasts longer or does strengthen, then some crops will have a delayed planting for northern hemisphere spring crops, and quality will be lower for areas that are harvesting at their fall if in the Southern Hemisphere. Otherwise look for average to slightly above average crop yields and quality.

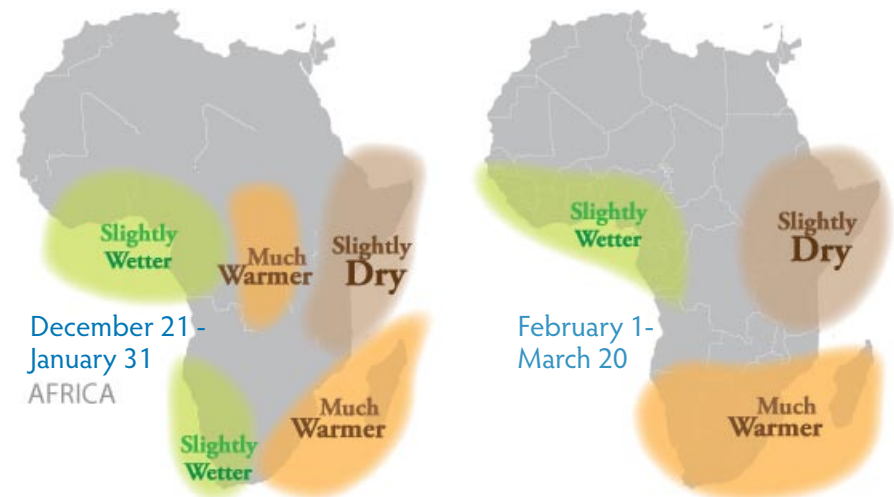
A long or strong La Niña may seriously reduce coffee and cocoa crops.

SOUTHEAST ASIA

The warm waters that originally surrounded the eastern portions of Southeastern Asia have spread thanks in large part to La Niña like conditions. This means that the Pacific heat will create more energy and increase rainfall while keeping temperatures hot. This will be very beneficial for the summer tropical crops and will likely produce three rice crops. Should the La Niña recede in January or February as opposed to March or April, than the later part of the summer crops and the third rice crops could struggle with an increase in tempera-



figs. 11A-B © James Garriss/Browning Media



figs. 12A-B © James Garriss/Browning Media

The Trouble with FEMA

SUMMARY FEMA plans its budget based on a 25+ year average for natural disaster costs. The past 5 years have all broken 25 year averages on number, length, intensity and costs from natural disasters. Something's got to give.

FEMA (Federal Emergency Management Agency) finds itself in a perilous position. As of October 6, 2017, there have been 15 weather and climate disaster events with losses exceeding \$1 billion each across the United States. These events included 1 drought event, 2 flooding events, 1 freeze event, 7 severe storm events, 3 tropical cyclone events, and 1 wildfire event. Overall, these events resulted in the deaths of 282 people and had significant economic effects on the areas impacted. From 1980-2016 the annual average of billion dollar disasters is 5.5 events. In general that is not too bad, but when we look at the annual average for the most recent 5 years (2012–2016) that number nearly doubles to 10.6 per year. Both of these numbers have been adjusted for inflation. Additionally the recent Northern California wildfires are included in the general “Western Wildfires” portion of the disasters. Those recent fires have nearly doubled the cost of the summer and fall wildfire season.

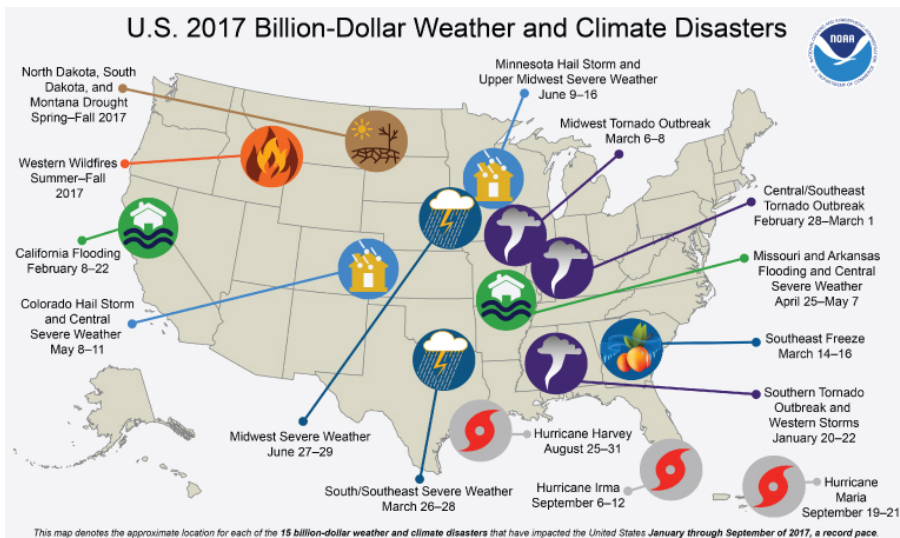
FEMA plans on only 5.5 billion disasters a year. We've had 15 so far this year.

The number of billion dollar disasters is one away from tying the record 16 from 2011 which also placed 3rd for most expensive. 2005, with Hurricane Katrina, was the most expensive year until potentially this year. With 2017 only two disasters away from overtaking the record, expenses were already going to be high just from sheer volume. When we add in the significant amount of damage from Hurricane Harvey (estimated cost \$65 to \$190 billion), Irma (estimated cost \$50 to \$100 billion) and Maria (estimated cost \$40 to \$80 billion), there can be little question that this year will be close to if not higher in cost than 2005. Remember it took nearly 3 years to correctly ascertain the actual cost of Hurricane Katrina, and now we have to determine those figures for three extremely damaging hurricanes.

These numbers are a problem for FEMA. A few weeks before Hurricane Harvey hit Texas, FEMA Administrator Brock Long wrote that the \$3.8 billion left in the DRF (Disaster Relief Fund) was “Sufficient to support the needs of disaster survivors and communities through the remainder of the fiscal year”—but only “absent a new catastrophic disaster.” Let's keep in mind that he said this before the height of the hurricane season with a hot Atlantic and most experts including ourselves determining that it was going to be a very active hurricane season. Unfortunately for Mr. Long, we were all right.

As a rule, FEMA does not plan for the worst-case scenarios when it comes to natural disasters. Instead, the amount of money in the DRF allocated for declared disasters, is determined based on the average annual cost of past catastrophes. So that means that FEMA plans on only 5.5 billion dollar disasters a year and that a Hurricane Katrina happens once every 15-25 years.

Currently there is around 4 billion dollars in the DRF. Additionally Congress approved a \$22 billion aid package as part of president Donald Trump's government funding deal with Congress. FEMA will need to ask for more, a lot more, and judging by recent reactions to Puerto Rico's needs, the amount they get may not be enough. This means that the states or countries impacted by natural disasters will have to find alternative methods to repair and rebuild. For those that didn't have insurance, they may never see any financial restitution, especially in Puerto Rico. There are experts in other fields who could make a better estimate as to the economic impact 2017 will have both nationally and globally, but some secondary questions may still remain. What will FEMA do in the future, and are we in store for another 2017-like year in the future? Recent history has shown that the government reacts in one of two ways when natural disasters happen. The first is they hope it's a fluke, and the second is they blame it solely on man-made climate change. Neither is correct.

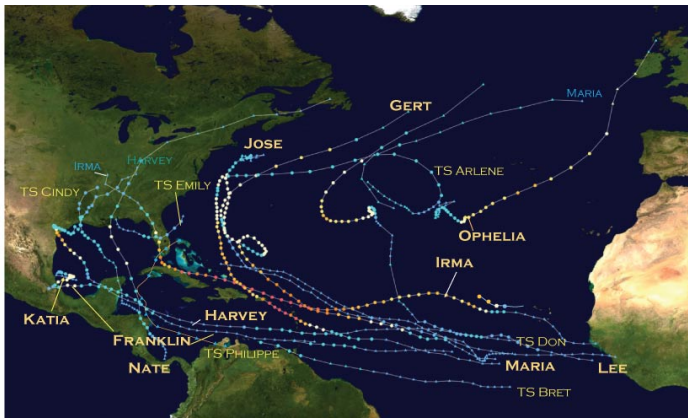


The Fluke

The Atlantic Multidecadal Oscillation (AMO) went from cold to warm in 1995 while the Pacific Decadal Oscillation (PDO) switched from warm to cold along the western shores in 2005. The Atlantic is likely at its peak of heat while the Pacific is close to its peak of cooling intensity. This means that the storms along the Atlantic have the highest availability of energy, increasing hurricane lengths, strengths and

fig. 13 The Northern California wildfires are included in the Western Wildfires token

<https://www.ncdc.noaa.gov/billions/>



figs. 14A-B, right
2017's record breaking natural disaster season spells a financial crisis for FEMA.
<https://www.ncdc.noaa.gov/>

fig. 15, left
This year's Atlantic hurricane season has broken many records.

frequency. This is why 4 of the last 7 years have been record breaking hurricane seasons. The peak of the Pacific increased the drying conditions that are hitting western and southwestern states. This increases long-term droughts and forest fire risk. Unfortunately these bad years are not a fluke, and the peak of the Atlantic and Pacific's intensity may last another 3-5 years.

Additionally man's activity having nothing to do with carbon footprints still impacts the damage costs of natural disasters. More people are moving to cities and nearly 40% of the US population has moved to coastal regions. In areas like Puerto Rico, the extreme increase in population density in certain areas puts too much pressure on poor infrastructure. The costs of improvements were high and loans were excessively high interest. This magnifies the impact of a natural disaster.

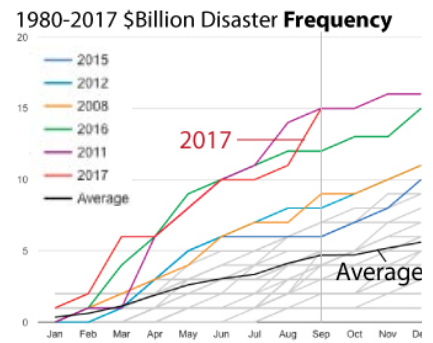
Meanwhile in major US cities such as Tampa and Houston, the economic value of the city increases with the population. Recent trends also found wealthier people are moving towards the coast. This means coastal properties, coastal businesses and coastal insurance premiums all go up. As these values go up, the middle and poorer classes normally can't afford the premiums of their insurance nor the cost of living. They either move away or stay but have far less security should a natural disaster strike. When it does, they often have little choice but to turn to the government for both short and long-term assistance.

The fluke approach, while hoped for by both parties, is utilized more by a Republican led congress. When Democrats take over, they lean towards climate change.

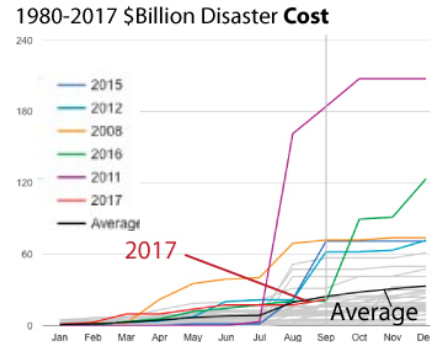
It's All Global Warming

At the most recent Intergovernmental Panel on Climate Change (IPCC) meeting, findings were presented by a variety of climate change scientists. They determined that although climate models do not agree on all details, most models predict the following general trends are almost purely from an increase of greenhouse gases:

- A The warming atmosphere will probably boost temperatures over most land surfaces, though the exact change will vary regionally.
- B The increase in global temperatures will likely increase:
 - a Risk of drought,
 - b Intensity of storms, including tropical cyclones with higher wind speeds,
 - c A wetter Asian monsoon,
 - d More intense mid-latitude storms.



Event statistics are added according to the date on which they ended. Statistics valid as of October 6, 2017.



Event statistics are added according to the date on which they ended. Statistics valid as of October 6, 2017.

- C The increased global temperatures will intensify glacial melting and increase sea levels which will:
 - a Increase coastal flooding
 - b Increase hurricane and flooding intensity and activity.

While the information provided is accurate, a concern can be allowed for scientific bias. Many of the presented reports determined that changes in the AMO, PDO as well as the influence of volcanos had little to no effect on the increase in temperatures. Additionally there was a consensus that man's reduction of carbon use could in theory nullify a majority of natural disasters and global heating creating relatively neutral weather. While changes can be made to reduce carbon emissions, a belief that this is the only action that needs to be taken does not solve the current FEMA problem. It also ignores the fact that weather find a way and there will still be billion dollar natural disasters based solely on natural weather phenomenon.

More than 40% of US population has moved to coastal regions, increasing the impact of natural disasters.

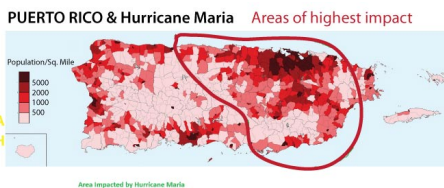
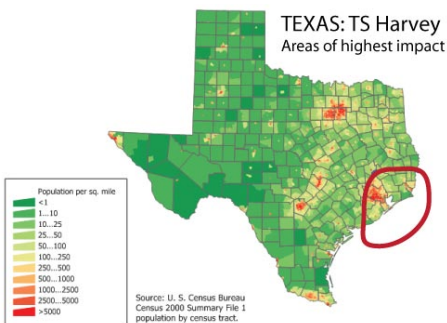


fig. 16A-B Population densities increase along coastal cities, creating strain on infrastructure and increasing natural disaster damage.

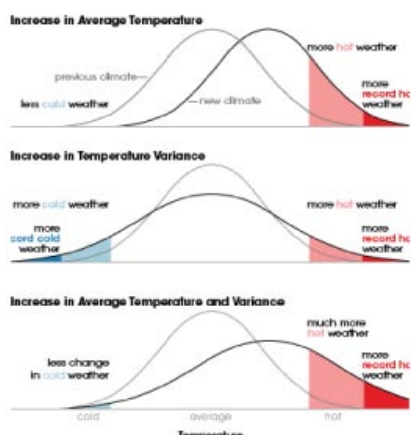


fig. 17 Whether from man-made carbon or natural factors, an increase in average global temperatures will increase hot and record temps.

https://earthobservatory.nasa.gov/Features/RisingCost/rising_cost5.php breaking temperatures

The overall outcome of current trends in natural disasters tells us that this year was not a fluke, and even if we can reduce global warming completely, the impact would come long after the current peak of the AMO and PDO. So we have at least three to five more years with high billion dollar disaster risk. FEMA will be unable to provide help to everyone, so for those in high risk areas, plans need to be made. Don't be surprised if we see both FEMA and flood insurance become more public allowing for private entities to invest in what was solely a government program. As with any disaster, opportunity can rise from adversity.

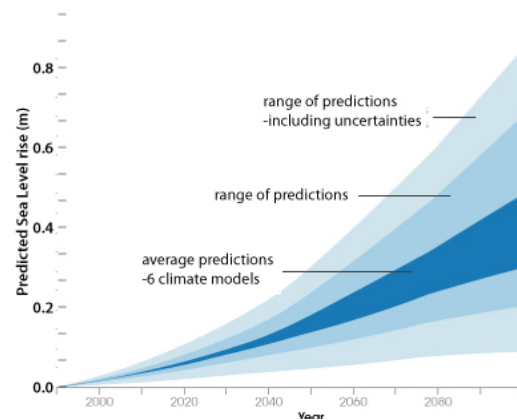


fig. 18 Models create a very wide variety of intel on how much sea levels will rise based on current factors. https://earthobservatory.nasa.gov/Features/RisingCost/rising_cost5.php

NEWS NOTES Long Live the Atlantic King

In what may be a surprise to no one, September was the most active month on record for Atlantic hurricanes. When measured by the ACE (accumulated cyclone energy) the value for the month of September stands at 155.4, surpassing the previous record of 155.0 from September 2004. The ACE is measured by adding each tropical storm or hurricane's wind speed through its life cycle. This month's ACE measured Irma, Jose, Katia, Lee and Maria. All of those except Katia were long-lived hurricanes, and Lee and Katia were the only ones to not reach Category 4 or Category 5 intensity at their peaks.

The Atlantic also generated 35 hurricane days in September, which is the most in the Atlantic of any calendar month on record. The previous record was 34.5 hurricane days in September 1926. A hurricane day is defined as a measure of hurricane activity, one unit of which occurs as four 6-hour periods during which a tropical cyclone is observed or is estimated to have

hurricane-force winds. While the Atlantic storm activity is not on pace with the record-breaking 2005 storm season, with a quarter of the hurricane season remaining it's nearly broken the record for hurricanes, and category three or higher hurricanes. It has been a busy season so far and it will be interesting to see what the remaining two months bring.

| Atlantic Hurricane Season | | | |
|---|-----------------|----------------|------------------------|
| A comparison - as of September 30 each year | | | |
| year | 2004 | 2005 | 2017 |
| total named storms | 12 | 17 | 13 |
| hurricanes | 8 | 10 | 8 |
| major hurricanes category 3 or higher | 6 | 5 | 5 |
| notable September storms | Ivan, Jeanne | Maria, Rita | Harvey, Irma, Maria |

fig. 19



BROWNING MEDIA, LLC
PO Box 93685 Las Vegas, NV 89120

The *Browning World Climate Bulletin* is published monthly at an annual subscription rate of \$295. Subscriptions should be directed to: Michelle@BrowningClimate.com
1-704-471-0176



DISCLAIMER

Browning Media, LLC ("Browning") provides this publication and its content "as is" without representations or warranties of any kind, either expressed or implied, including, but not limited to, any implied warranties of merchantability or fitness for a particular purpose. Browning endeavors to ensure, but cannot and does not guarantee the accuracy or completeness of the information contained in this publication. In no event shall Browning, its employees, members, directors, agents, licensors, suppliers or contractors, be liable to any third party for any damages of any nature,

Need more in-depth information and analysis?

We offer a **Premier Edition** with expanded access and more detailed forecasts and updates.

For more information: www.BrowningNewsletter.com

including direct, indirect, incidental, consequential, special or exemplary damages or lost profits, resulting from any use or misuse of this publication or the information contained herein. Unless otherwise indicated, this publication and its contents, including any copyrights, trademarks and other intellectual property rights embodied therein, are the property of Browning or its licensors. This publication may not be reproduced or distributed without the prior written permission of Browning. Reference herein to any specific company, product, process or services does not constitute or imply Browning's endorsement thereof.