October 2012 Vol. 37, No. 10

World Reports Covering Climate, Behavior, and Commodities Original Papers Historical Perspec-

BROWNING

©Evelyn Browning Garriss NEWSLETTER

A Fraser Management Publication

EL NIÑO: WEAK WIMP OR WARM WINTER?

IN THIS ISSUE

- Most models of the Pacific are projecting a weaker El Niño than they did last month. This difference is largely due to a cool Madden Julian Oscillation drifting through the warming El Niño conditions and slowing the warming process.
- The El Niño looks as if it will be a weak-to-moderate event, peaking in late November/December. It will last through winter but at this point threatens to end in early to mid-spring.
- Winter will be shaped by a weak to moderate El Niño and a negative North Atlantic Oscillation. This normally produces a colder, wetter winter than last year, but not a colder than normal winter for most of the North America.
- History and a China/US agricultural analogy map from the 1950s and 60s show that the phase changes of the PDO are more disruptive for Chinese agriculture than for US.
- The weather outlook for South America shows that northeastern Brazil faces problems with precipitation, but the Argentina and Southern Brazil should have good growing conditions. This should provide a good enough grain and oilseed harvest to help bring down prices in the coming season.

SUMMARY

Most global models are projecting a weaker El Niño than before. Overall, it appears that the autumn and winter will be shaped by a weak to moderate El Niño and a negative North Atlantic Oscillation. This will produce a colder, wetter winter than last year, but not a colder than normal winter for most of North America.

As any businessperson knows – no single factor determines success in business. As any climatologist knows – no single factor determines winter weather. This is especially true this month, when the weather outlook is especially complex.

The dominant factor shaping global weather is the developing El Niño conditions. When an area between 5 to 15 million square miles, greater than the size of the US (which is 3,794,083 square miles or 9,826,630 sq. km.), heats up in the Tropical Pacific, that is an enormous amount of energy. It distorts air pressure, winds and weather around the Earth.

The size of its impact depends upon how strong the El Niño is. In North America, for example, an El Niño is

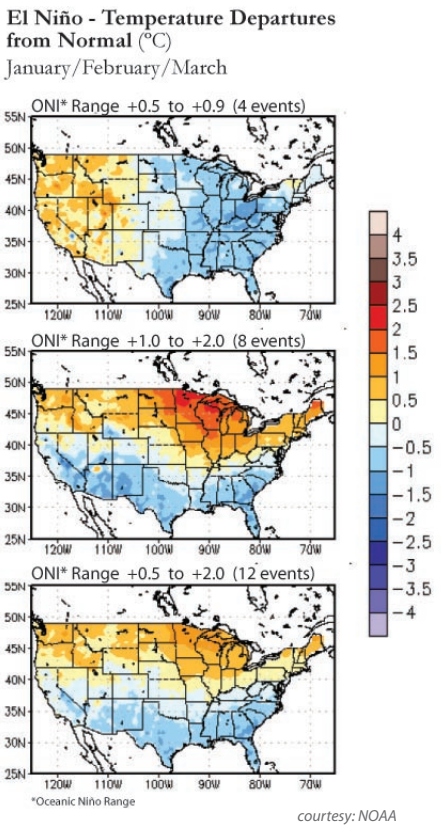
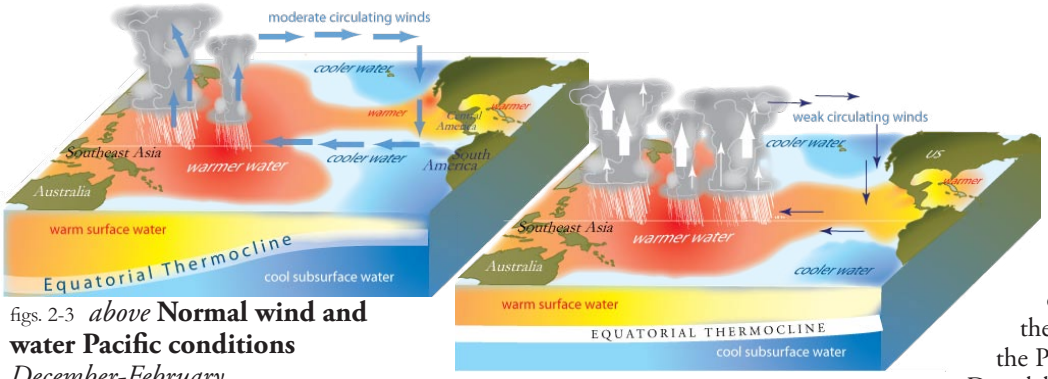


fig. 1 **The Impact of Different Types of El Ninos on US Temperatures:** *top* **weak El Ninos,** *middle* **moderate to strong El Ninos,** *bottom* **the average impact of El Ninos**

CONTENTS

This newsletter contains articles, observations and facts to support our contention that man is significantly influenced by the climate in which he exists. Our calculations show the climate, over the next term, will cause dramatic changes in our social and economic patterns.

We feel that the reader, attuned to the changes that are occurring, may develop a competitive edge; and, by understanding his now and future environment, can use the momentum of change to his advantage.



© Browning Newsletter data courtesy NOAA

figs. 2-3 *above* **Normal wind and water Pacific conditions**
December-February

right **El Niño wind and water conditions**
December-January

strong or moderate in strength it heats up Canada and the northern tier of states in the US. The southern tier becomes cooler and wetter. If, on the other hand, it is weak it heats up the western states and the heavily populated eastern states are cooler.

In the first scenario, heating demands and energy consumption are down. In the second, heating demands soar and energy companies profit.

If you are invested in the energy sector, it is important to know, if not only there is an El Niño, but also how strong will it be.

The Growing El Niño of 2012

So what do we mean – "a strong El Niño"?

El Niños are complex weather/water events that occur in the tropical Pacific. It's most simple description is that it is a large scale weakening of the trade winds and warming of the surface layers in the eastern and central equatorial Pacific. The trade winds are tropical winds that blow from the east to the west around the equator. When they are strong, they ruffle the surface of the ocean, causing it to cool. When, as they have this year, the trade winds weaken, the surface of the tropical Pacific becomes still and sunbaked, warming up.

The El Niño triggers a larger weather pattern called the Southern Oscillation. Indeed the entire phenomenon is called the El Niño/Southern Oscillation or ENSO, with the El Niño being the hot water and the Southern Oscillation being the resulting weather pattern. It is a large pattern. The five to 15 million square miles of water remains unusually warm for months at a time and its effect can be felt throughout the globe. The air warms over the hot water, air pressure changes, wind patterns and extreme weather events slam the world, particularly tropical and Pacific Rim nations.

The weather is so extreme South Americans have been keeping records of the events for centuries. By matching these event records with weather records, both man-made and natural (like tree rings), we have a good idea of how El Niños affect global climate.

Let's start with some basic definitions:

El Niño event – The three month running average temperature of the Tropical Pacific is 0.5˚C (0.9˚F) warmer than average between 90˚ – 150˚W latitude.

- **Weak El Niño** – The Tropical Pacific temperatures average between 0.5 – 0.9˚C (0.9 – 1.7˚F) above average.. If the warmth doesn't last a total of five months, it is not an "official" El Niño.
- **Moderate El Niño** – The ocean temperatures are 1.0 – 1.5˚C (1.8 – 2.7˚F) above average
- **Strong El Niño** – Greater than 1.5˚C (2.7˚F) above average.

Usually the strong events are larger, last longer and affect larger portions of global weather.

Using these definitions, the current El Niño conditions are weak. The big question is will the conditions continue to develop until they form a moderate event?

What makes this complicated is that the El Niño is not the only climate factor evolving in the Pacific. A larger event, the Pacific Decadal Oscillation, (PDO) is cooling large portions of the ocean. It is discouraging the growth of El Niño.

Meanwhile, a smaller factor, the small, cool Madden Julian Oscillation, is floating through the middle of the warming El Niño waters and cooling an area around 120˚W. It makes for a very confusing picture.

MJOs – The Troublemakers of the Oceans

Madden Julian Oscillations are small, short-term (4 – 8 weeks) tropical climate patterns. They ring the tropics like a necklace – one region of cooler stormier weather, followed by another area of warmer, drier weather, followed in turn by another region of cool stormy weather. Like the larger patterns, they are a combination of wind and water temperatures. They move eastward around the tropics from the Indian Ocean to the Pacific and the shores of South America. At the American coastline, the

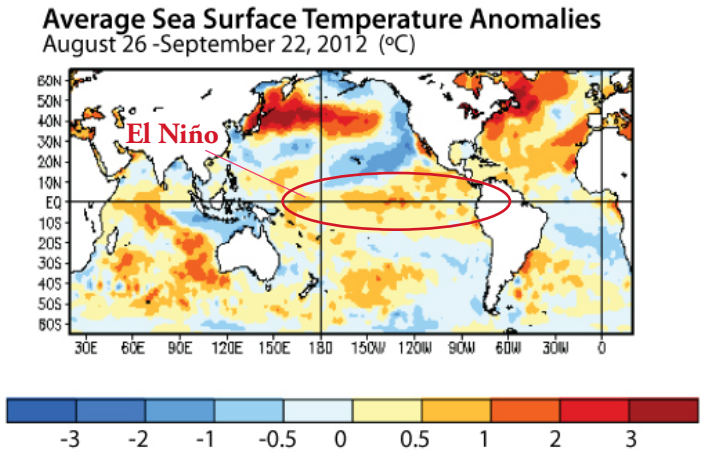


fig. 4 **Conditions in the Tropical Pacific are warm enough to be classified as a weak El Niño but have not lasted long enough to be official.**

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

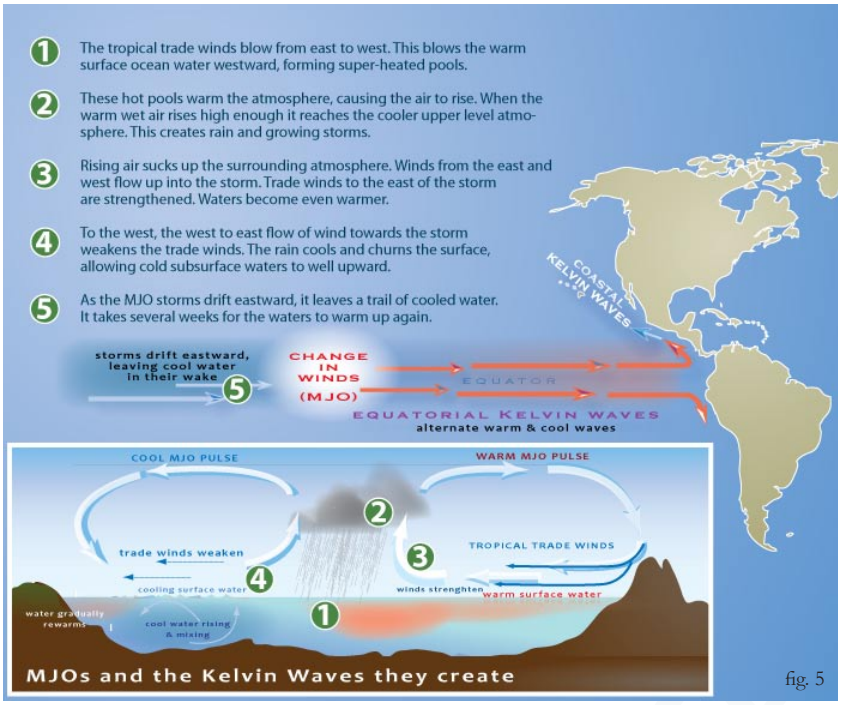


fig. 5

Kelvin waves, the warmed or cooled pools of water glide along the coastlines, but the MJO winds continue to flow east, into the Caribbean, Atlantic and finally to the shores of Africa.

These MJOS can have a major impact on tropical weather. As Australian scientists first noted, they can provide favorable winds for tropical storms. Starting in late August, we had a strong MJO pulse in the middle of the Atlantic that generated tropical storm after tropical storm. From Isaac to Nadine, the Atlantic hurricane season lit up.

Normally El Niños suppress or stop the development of tropical storms in the Atlantic, but in a clash between a small but strong stormy pulse of the MJO and August's new and still weak conditions, the MJO won.

Earlier, in July, a warm dry MJO drifted over India. For weeks, it weakened India's monsoon, leaving the nation with a 22% shortfall of rain.

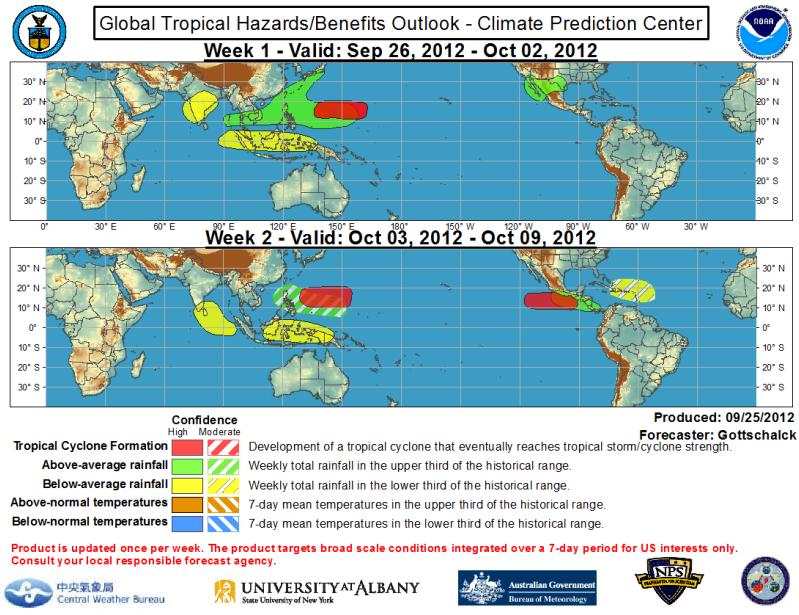


fig. 6 **The impact of MJOs on global weather over the next two weeks.**

http://www.cpc.ncep.noaa.gov/products/precip/CWlink/ghazards/index.php

Now a cool, stormy MJO is flowing through the middle of the growing El Niño, off the coast of South America at around 120°W. east of Polynesia. This has interrupted the El Niño's warming. Indeed, some models, immediately noting its impact, are now projecting only a weak El Niño event.

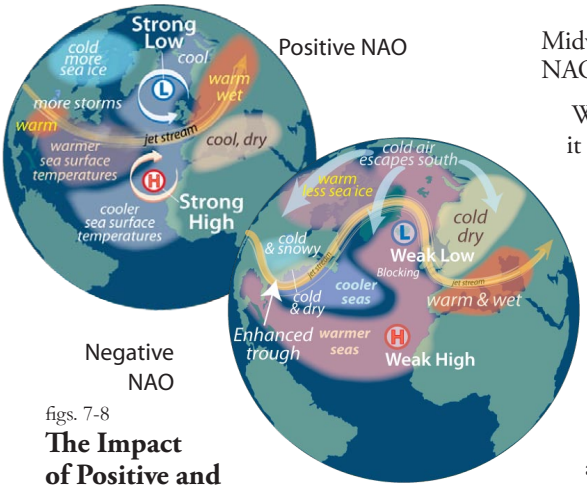
Is this the final word? Or will the models once again project a moderate event once the current MJO moves on. The US Climate Projection Center Global Tropical Hazards Outlook provides the best clue. This service locates the impact of MJO pulses on tropical weather.

Despite the various MJO pulses, the tropics now show weather patterns typical of an El Niño. India and Indonesia are facing drier conditions while the Philippines and Eastern Mexico have a high risk of heavy rains and tropical storms. Even though, as of this writing, the El Niño conditions are not an "official" event, they are shaping global weather and dominate the tropics.

With the location of an MJO in the middle of the growing El Niño, there may be some confusion in the models, especially the dynamic models. This is delaying the official pronouncement that the warm conditions in the Pacific are an El Niño event. But at this point, the weak El Niño conditions are evolving into a moderate El Niño that should peak in November and December. When compared to other historical El Niños, it appears that the event will barely qualify as moderate, lasting through winter but not through the entire spring.

The Super Hot North Atlantic

The debate in the Pacific is how hot the El Niño will make the ocean. There is no debate on how hot this year's rapidly flowing Atlantic Thermohalene currents (which include the Gulf Stream and other northward flowing currents) have made the North Atlantic. This month NOAA announced that the Northeast Atlantic waters off North America experienced the fourth warmest August ever, the third warmest summer, and the warmest first 8 months of the year on record. Waters off the US coast recorded surface temperatures 11°F (6.1°C) above historical average and



figs. 7-8 **The Impact of Positive and Negative NAOs on winter weather.**

© Browning Newsletter

bottom temperatures reached 9°F (5°C) above average at the bottom. The waters further from shore were not as warm (3.6°F or 2°C) but still notably warmer than normal.

This warm water will not cool off rapidly. It will continue to affect the North American weather for the rest of the year. The impact will be twofold:

- Any cool continental air mass that flows eastward into the Atlantic air mass will create heavy rains and snows.
- Historically, when the North Atlantic is warm, it tends to create a negative NAO pattern. The NAO alternates between positive and negative throughout most winters. However, when the North Atlantic is warm, winter cold fronts tend to plunge deeper into the Midwest, East and South, a negative NAO weather pattern.

When the NAO is strongly negative, it pours cold air into the United States even during El Niño events. During the winter of 2009/2010, the Midwest and Northeast shivered through unusually cold weather despite a relatively strong El Niño. In short, NAOs from the Arctic have a stronger impact on Midwestern and Eastern weather than El Niños. El Niños have their greatest impact on western and southern weather.

Putting the Factors Together

This means there are this winter's weather will be determined by the answers to two questions –

How strong will the El Nino be?

According to the International Research Institute, working with the US Climate Prediction Center, the majority of climate models now expect a weak El Niño, which will grow through November/December and linger until the end of winter in February. The dynamic models, which examine the current changes in the El Niño, expect a warmer event than the statistical models.

Notice, the models are quite different from last month, when most models expected a warmer, more moderate and longer lasting event. Which model is more accurate? To understand, you need to know a little about the models.

The statistical El Niño models reflect the past, when the Pacific Decadal Oscillation was in its warm phase and El Niños occurred every four to five years. Now the PDO is in its cool phase. It is cycling from El Niños to La Niñas and back again, more rapidly. Statistical models by their nature underestimate how strong El Niños are in this new environment. They are biased to expect the Pacific to remain neutral for a year after a La Niña.

Dynamic models are more reliable, since they quickly reflect every change. However, this makes them more vul-

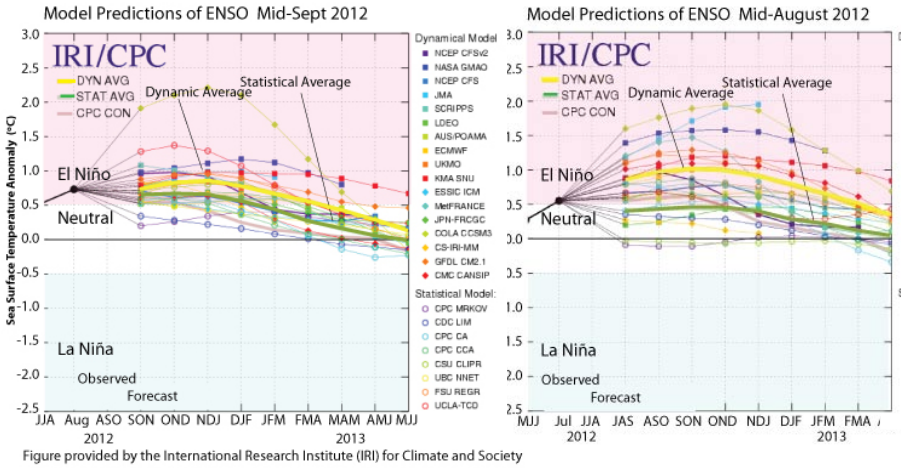


Figure provided by the International Research Institute (IRI) for Climate and Society

figs. 9-10 **This month's El Niño models** *(left)* **project a weaker event than last month's models did. Blame the MJO!**

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

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

figs. 11-13 *, **Moderate eruptions in the North Pacific will bring more moisture to the west.**

© Browning Newsletter

nerable to the pulses of small Madden Julian Oscillations. When a warm/dry pulse travels through El Niño, they overestimate the event's strength. When a cooler/stormy pulse flows through, they underestimate.

The probability is that the El Niño event will be a combination of these predictions – moderate, but barely moderate. Its impact will shape western and southern weather, but have only a moderate impact on the Midwest. Its impact on the Northeast, which should peak late December/early January, will be minimal. At this strength, it should last through winter, but only through the early portions of spring.

How negative will the NAO be?

Climate bureaus have a great deal of difficulty predicting the NAO. Indeed, even two-week projections tend to have a relatively high failure rate.

If one examines history, the warm Atlantic correlates with frequent negative NAO patterns during wintertime. This summer we saw more negativity, with Arctic winds strongly blowing the sea ice south into the heated waters of the Northern Atlantic and Pacific. (This helped create record melting for Arctic ice.) While the science models are still out, the history suggests that this winter will average a negative pattern.

Combining a moderate-to-weak El Niño with a negative NAO

Overall, when the two are combined, the results are that normally that the El Niño will be strong enough to dominate the West and South, affect the Midwest and only slightly influence the Northeast. Meanwhile the NAO should be strong enough to affect the Midwest, have an even greater impact on the Mid-Atlantic/South and dominate most of the Northeast, particularly in early and late winter.

In the five most similar years, we saw the following patterns 80% of the time:

MID-AUTUMN: The clash of retreating summer warmth and encroaching cold fronts usually creates a wet mid-season, particularly in the South, the Central Plains and along the West Coast. Normally El Niño warmth begins to appear in the Pacific Northwest and Western Canada and, in 60% of similar years, the Great Lakes are relatively dry.

LATE AUTUMN: In most similar years, November was normal to near normal with warmer than average temperatures in the northern tier of states and the Southwest. The Northeast and Southern Plains usually had heavier precipitation. It is notable that most models expect the El Niño to be nearing its peak strength.

WINTER: Expect a wetter, colder winter than last year. The temperatures in Western Canada, as well as northern states west of the Great Lakes may be warmer than normal, but not as much as last year. Meanwhile, whether the El Niño is weak or moderate, it normally has an energetic southern branch of the jet stream that streams through the southern states, bringing a more active storm track from California through the Gulf Coast to the East Coast. The Southern Plains are normally cool and the stronger the El Niño, the colder the South and Mid-Atlantic will be. The Northeast typically is near normal, with a cold late winter.

A MAP

SUMMARY

History and a China/US agricultural analogy map from the 1950s and 60s show that the phase changes of the PDO are more disruptive for Chinese agriculture than for US.

Since 2006, I have been warning my readers that the Pacific reached a tipping point. From 1976 to 1998, the ocean was in the warm phase of the Pacific Decadal Oscillation (PDO). This meant the eastern and tropical waters were warmer than normal. This had important implications. Warm waters heat the atmosphere and warmer air holds more moisture. With warmer waters off the coasts of the Americas, prevailing westerly winds carried the moisture inland. This brought bountiful rainfall to Canada, the US and Argentina and they were breadbaskets for the world.

On the other hand, regions on the western shores of the Pacific had cooler temperatures. These were the times of Australia's "Big Dry"

Then, starting in 1999 and finally tipping in 2006, the PDO started to shift. Now the western and higher latitude waters are warmer than before and the eastern and tropical waters are cooler. This has made major changes in precipitation patterns. This in turn has created difficulties for agriculture in many regions. Areas are seeing

fig. 14 **China/North America climate analogues**

© Browning Newsletter, data CIA

wetter or drier conditions than they have seen in decades.

These conditions are not unprecedented. The last time we saw climate similar to this decade was in the 1950s. Nations can go through past weather records and literally see both the past and their future.

One of the interesting documents from the 1950s and 60s is an old CIA map that showed the climate of China in those days, comparing it to equivalent agricultural areas in the US. At the time it was created, China was a mystery, closed off from much of the world with little document sharing. Experts used these to try to estimate day-to-day existence in China, such as annual crop and harvest conditions.

Basically, the US and China are two nations of a similar size (China 3.69 million square miles vs. US 3.68 million square miles) positioned along similar latitudes. Their lands include similar agricultural zones. Indeed, some growing regions are "twins" with similar weather and growing conditions. For example, North Texas and Yunnan province are "twins", with ample rain and good monsoons during El Niños and drought stricken during La Niñas.

Of course, the parallels have limitations. Approximately 40% of US land is arable while only 11% of China can be farmed. So even relatively small weather changes affect a greater proportion of Chinese crop productivity. China's farmland is in its densely settled eastern provinces while the majority of US farmland is in the relatively underpopulated central regions. Still, it gives an insight to see the agricultural parallels of the two nations.

Notice China has no direct analogy for the rich US Midwestern farmlands – no "twin" for Iowa and Illinois, the heart of US agriculture. Their most intensely cultivated lands, the North China Plains and Sichuan, are equivalent in climate to Kansas, Kentucky, Oklahoma, portions of the Southeastern US and East Texas.

Another, important factor, is that there is no region in China equivalent to the Iowa/Nebraska area that remains agriculturally stable during swings of the Pacific Decadal Oscillation. As a nation dominated by monsoons, the transfer of winds and moisture between oceans and land, China is much more vulnerable to the water temperature changes in the Pacific. This means the nation's agriculture is at risk for more disruption when the PDO switches phases, unfortunate for a nation where (according to World Bank statistics) 39.6% of the population is still in agricultural employment. Meanwhile in the US, a large portion of the Midwest is dominated by continental climate and has good rainfall most of the time, even when the Atlantic and/or Pacific change. Even when these areas are disrupted by weather, as they were this year, only 2% of the US employment depends on agriculture.

History shows that while the US and China are agriculturally equivalent in many ways, changes in the PDO are more disruptive and challenging for China.

SOUTH AMERICAN WEATHER OUTLOOK

SUMMARY

The developing El Niño will be good for coffee, soy and corn crops in Southern Brazil and Argentina. However, the same El Niño, when combined with the high temperatures in the Atlantic brings a year of drier weather to Brazil's cocoa and sugarcane growing northeastern regions.

Two years of La Niñas and approaching El Niño conditions have produced poor harvests and high global food prices. Throughout the world, food importers are turning towards South America and speculating on the conditions of its next harvest. The weather outlook in Argentina and Brazil is crucial.

Understanding South American Weather

The long lean continent of South America stretches from 12.45°N to 67.57°S, meaning its climate ranges from tropical to subtropical. This means most of Brazil's climate is dominated by tropical climate – rainforests and monsoon lands. Argentina is on the southern edge of the monsoon lands, with its southern region subtropical, dominated by the prevailing westerlies and the rain shadow cast by the Andes Mountains.

In northern South America, the location of the ITCZ (Intertropical Convergence Zone) shapes the precipitation. The ITCZ is where trade winds from the northern and southern hemisphere converge. Located around the equator, it is where the direct rays of the sun heat the Earth. The hot air rises until it reaches an altitude that cools it enough that all its moisture rains out. Cooler air flows in from the north and south to replace the rising air. In South America, the ITCZ is over land and the cooler air flows in from the Atlantic Ocean, so it is basically a monsoon.

The Earth is tilted. The most direct sunlight is over the Northern Hemisphere in June, the equator in September, the Southern Hemisphere in December and back over the equator in March. This means the ITCZ is over Venezuela in June, the equator in September, Southern Brazil and Bolivia in December and back over the equator in March. Monsoon winds bring most of the wet season moisture from the Atlantic to Southern

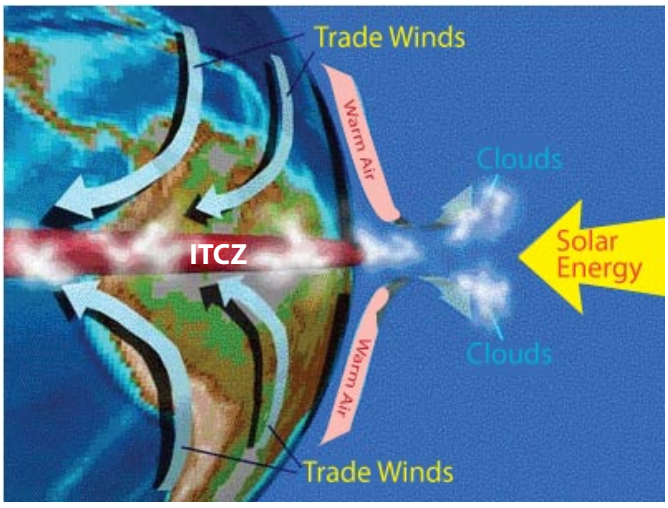


fig. 15 **In South America, trade winds carry Caribbean and Atlantic moisture inland to the ITCZ.** *courtesy NASA*

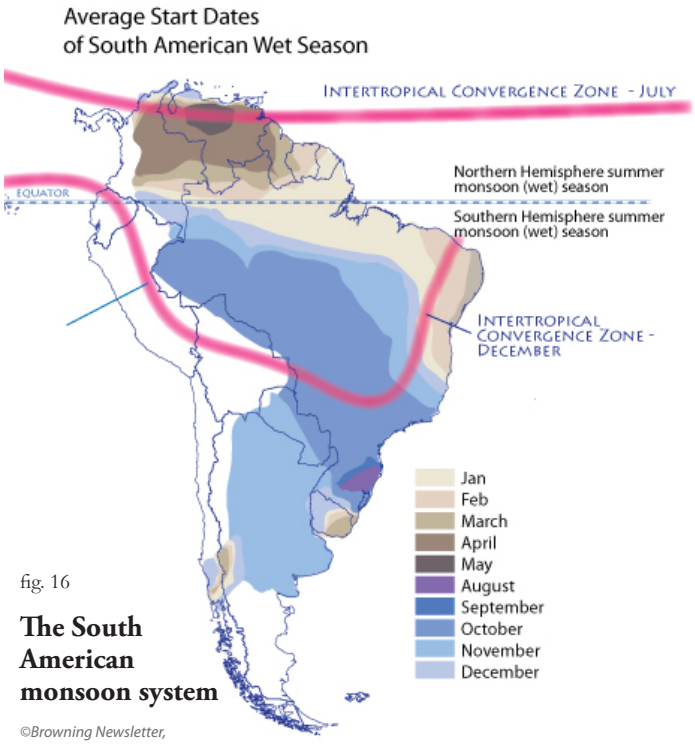


fig. 16

The South American monsoon system

©Browning Newsletter, Based on work by Brant Liebmann and Carlos Mechoso in The South American Monsoon

Brazil and Argentina in the Southern Hemisphere spring and summer and to Venezuela and northern Brazil in the Northern Hemisphere spring and summer. The regions over the equator tend to have year-round rainfall and are rainforests.

Further south, large portions of Argentina have subtropical climate, dominated by westerlies. This puts Patagonia and western regions in the mountains' "rain shadow", the dry area on the leeward side of the Andes Mountain. As a rule, the stronger the westerlies, the longer the rain shadow and the drier Argentina becomes.

Basically, the variations in northern South American weather come from the strength of the monsoon and the timing of the onset of the wet season. The variations in southern portions of the continent come from the strength of the westerlies. Argentina's agriculture varies according to which weather dominates its croplands, the monsoonal moisture or the dry fringes of the rain shadow.

The Upcoming South American Growing Season

The study of long term trends of South American weather, particularly in the monsoon regions is hampered by a lack of temperature and precipitation measuring stations and the short or incomplete records of those stations that do exist. However, one of the best studies of South American climate, ***The South American Monsoon*** by NOAA's Brant Liebmann and UCLA's Carlos R. Mechoso, notes that the continent's weather responds to signals from MJOs (Madden Julian Oscillations), El Niños and Atlantic sea surface temperatures.

Basically, the rains in Argentina and Southern Brazil are sensitive to warm El Niños and cool La Niñas. La Niñas create droughts in Argentina and, if they are strong enough, as they were last year, interfere with Brazilian agriculture. By contrast, El Niños increase precipitation. Similarly, rainfall in this region tended to fluctuate in 30 – 60 day cycles that correlate with MJOs.

El Niños and La Niñas also affect the monsoons in northern South America, but their effect is the opposite of what happens further south. In the north, La Niñas are good for rainfall and El Niños bring drought.

This region is also sensitive to variations in Atlantic sea surface temperatures. The warmer the Atlantic is, the drier the north is. This is particularly true for western regions of the Amazon, where years of hot Atlantic waters have been associated with extremely damaging droughts and fires. Part of this is because if the Atlantic is hot enough, it shifts the ITCZ north. The monsoon starts later and the moisture-laden winds from the Caribbean don't penetrate as deeply into the Amazon.

Conclusions

When one examines the current factors shaping global and South American weather, it immediately becomes obvious that the rest of 2012 will be good for agriculture in southern South America and stressful for the northern regions.

In the South, the developing El Niño will strengthen the southern monsoonal rains and provide plentiful moisture to the coffee, corn and soybean growing regions in Argentina and Brazil. These countries are beginning their planting seasons early. There are indications that they intend to profit from today's high commodity prices and plant "fencepost-to-fencepost".

The outlook is bleaker for northern growing regions. The fast flow of the Gulf Stream and this year's record high temperatures in the Atlantic have shifted the monsoon rainfall and large portions of Brazil, particularly Southeastern Brazil have had severely reduced rainfall. Now, with the onset of an El Niño, the area, which grows cocoa, sugarcane and bananas can expect continued dry weather and drought.

The expected moderate to weak strength of the El Niño may lessen its impact on these northern regions, but since these areas are also negatively affected by the Atlantic temperatures, there is little sign of relief. Meanwhile, the weakened strength of the potential event should have little negative impact on the upcoming soy and corn crop in the south.

In short, while northeastern Brazil faces problems with precipitation, the more productive southern regions should have good growing conditions. This should provide a good enough grain and oilseed harvest to help bring down prices in the coming season.

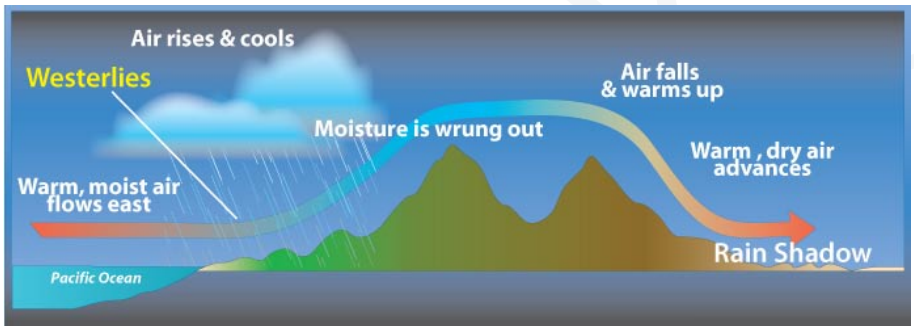


fig. 17 **The Andes cast a rain shadow that dries large portions of Argentina.**

©Browning Newsletter

News Notes

The rainy season has hit southern South America with a bang. On the third week of September, an extratropical cyclone with 140 km (87-mile) an hour winds tore across the heart of the continent. It killed five people in Paraguay and wreaked havoc in Argentina and Uruguay and Bolivia. Asuncion, the capital of Paraguay and Montevideo, Uruguay's capitol, sustained heavy damage and even the President of Uruguay was injured by flying debris from a twister. Ten percent of Uruguay was left without power.

The hot temperatures in the Atlantic Ocean have created a year of "zombie" hurricanes, storms that just refuse to die. The first such storm was Hurricane Chris, described by Accuweather meteorologist Rob Miller as a zombie because, "the storm is alive, but it should not be." It developed at a record-breaking northern latitude in June, an area that was supposed to be too cool for a tropical storm. Now Nadine, which started on September 11, has revived and entered the top ten for long-lasting storms as she endlessly stumbles back and forth through the Atlantic. She would have to last until October 11 to outlast the longest Atlantic storm, the Puerto Rican Hurricane of 1899, which lasted 28 days.

The good news is that, with the disappearance of the mid-Atlantic MJO and the El Niño conditions, most experts expect the hurricane season quiet down. However, they warn that the season still has two months to go.

A recent study by the University of Southampton and associates in Venice has shown that sea surface temperatures in coastal waters are warming ten times faster than the rest of the globe. It turns out the "urban heat island effect" where concentrations of people and their use of energy creates local hot spots are warming nearby waterways as well. Cities as far apart as England and Korea are having the same heating impact. This not only has a profound impact on the local sea ecology but, as this summer has shown, hot waters reheat the land, causing even higher temperatures. Coastal property is roughly three times the global average and currently 1.6 people live along the coast. What scientists are showing is that this movement is not only producing greenhouse gases, it is putting us in hot water as well.

There has not been much coverage of the wildfire season in the Pacific Northwest, but it has been intense. Indeed, by mid-September, they were measuring smoke from those fires drifting over Baltimore. By September 19, the smoke was visible over the Atlantic Ocean, east of Nova Scotia.

September has set two conflicting ice records. In the Arctic, the sea ice had reached record low levels by the second week of the month. The amount of ice was 50% below average and at the lowest levels ever observed since records began in 1979. Part of the reason for these levels was due to the massive August cyclone that shredded records amounts of the ice pack.

Then, two weeks later, scientists announce that the Antarctic ice is reaching or breaking records for largest extent. Data from the University of Illinois Polar Research Group show Antarctic sea ice extent reached 16.22 million square kilometers this week. That is not only the largest extent ever reached so late in Antarctica's cold season (seasons are reversed in the southern hemisphere), but also the second largest extent logged at any time dating back to 1979, when records began. The largest extent on record - 16.23 million square kilometers - occurred around September 20, 2007 and could be eclipsed soon.

There is good news for polar bears, long the symbol of the perils of global warming, according to Professor Susan Crockford, zoologist and evolutionary biologist at the University of Victoria, Canada. In a July article on her website, polarbearscience.com, Crockford reports that polar bears have successfully adapted to severe climate change many times in the past and will likely adapt to future climate change as well. Ironically, the colder, thicker ice that some people call for hurt the ringed seal populations, which in turn negatively affects the polar bear population even more than periods of widespread melt.

The opinions expressed are those of the writer, and although they are based on extensive studies of physical data and phenomena, many statements published here are not entitled to be regarded as rigorously proved in a scientific sense. Some decades must pass before these issues are resolved.

Meanwhile, decisions must be based on the best available information and estimates.

This newsletter will **not** contain:

- *Analysis of, or recommendations concerning, any investment possibilities.*
- *Recommendations on any particular course of action.*

The **Browning Newsletter** is published monthly at an annual subscription rate of $250 for print OR email version, $270 for both formats. Subscriptions should be directed to:

The Browning Newsletter
PO Box 1777
Burlington, VT 05402

1-802-658-0322
kelly@fraser.com