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World Reports Covering Climate, Behavior, and Commodities – Original Papers – Historical Perspectives – © Evelyn Browning Garriss

IN THIS ISSUE

- The volcanic debris from two 2011 polar eruptions are causing the extreme Arctic cold and East Coast precipitation. This should be the last year of these eruptions affecting weather.
- With the current long-term cooler trend of the long-term Pacific Decadal Oscillation, the warm tropical El Niño has been weakened. Peek-a-boo El Niño flicker from standard to Central Pacific (Modoki) formation, which affects western US precipitation. It currently is in Modoki (dry) configuration, but is warming to more standard El Niño conditions (wet) for March.
- The current long-term ocean patterns, a warm Atlantic Multi-decadal Oscillation and cool PDO phase, historically produce decades of more extreme weather for North and South America. Expect 15 to 20 years of more extreme climate.
- With the frozen Great Lakes expect a late spring planting evolving to a warm late spring in the Midwest. In similar years, the US and Canada produced near average crops except for California which has reduced production due to continued drought.
- Despite above-average February rainfall, the drought conditions in South America, particularly Brazil continue. Coffee, sugar cane and soybean production is reduced and Brazil's major cities of Sao Paulo and Rio de Janeiro are facing potential water rationing.

CONTENTS

North American Planting Season: Springtime in an Era of More Extreme Weather

SUMMARY

Expect a cold early spring to evolve into a warm spring season, with dry conditions in California and parts of the West. The warm Atlantic and cool Pacific are shaping the weather toward extremes.

How did you enjoy your Valentine's Day? Hopefully your romance was pleasant because if you were in North America, your weather certainly wasn't. It began a period of record-breaking extremes. Temperatures soared in the West, increasing the drought, while temperatures plunged to astonishing lows in the Midwest and East. It seemed as if all the moisture that California longed for was accumulating as snow in the streets of Boston.

It is the temperatures, particularly eastern temperatures, which have made headlines. North America has been so bipolar that in late February Anchorage, Alaska (25°F/- 3.9C) was ten degrees warmer than Atlanta, Georgia (15°F/-9.4°C). El Niño conditions then produced Southern rain that raced up the East Coast, creating ice storms and wind chilled enhancement of the freezing cold. At least 20 people died from hypothermia including nine people in Tennessee, six in Pennsylvania, two in Illinois and one each in Indiana, Ohio and Kentucky.

The good news is that this weather was predictable. It is following a historic pattern

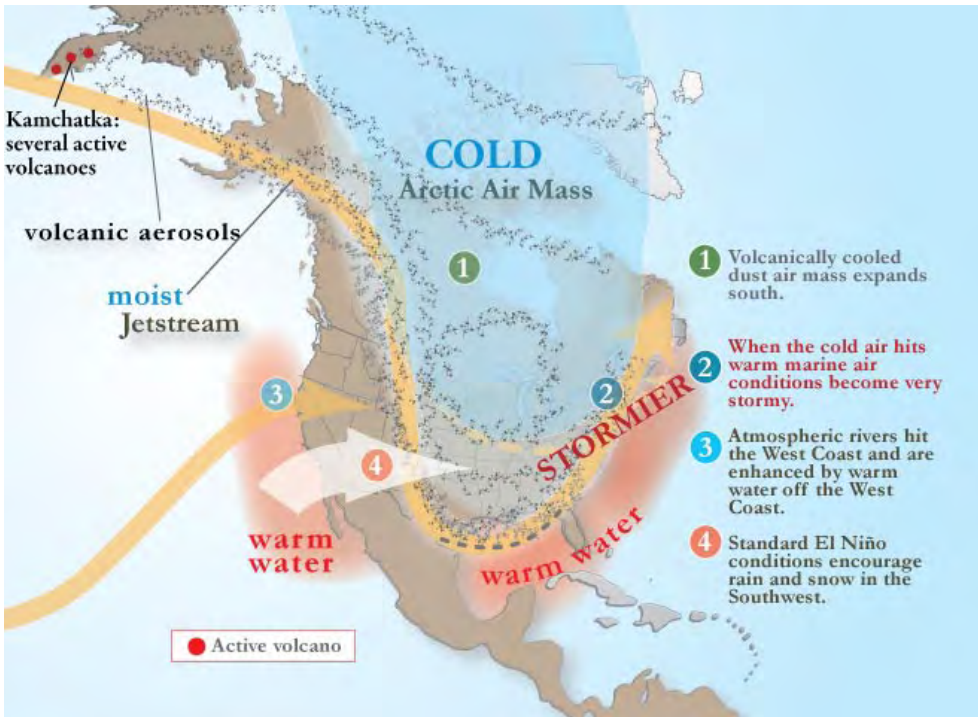


fig. 1 The factors shaping late winter and early spring in North America © Evelyn Browning Garriss

This newsletter contains articles, observations and facts to support our contention that humanity is significantly influenced by changing climate.

Our calculations show the 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.

common for years with polar eruptions and weak El Niño conditions. The bad news is that the predictable weather is truly miserable and very extreme. This winter followed the historical pattern for years with volcanically cooled polar air, a weak El Niño and hot Atlantic waters off the East Coast.

Why the Weather Is More Extreme – Short Term

EXTREME REPORTING – The United Nations IPCC (International Panel of Climate Change) chose to focus on extreme weather in their 2012 report. This led 220 authors from 62 countries to focus on and report extreme weather events. This international project has increased the search for, reporting on and availability of data on extreme weather events. Some increase in extreme event numbers can be credited to this growth of scientific reporting.

EXTREME COLD – As regular readers are familiar with, our current weather has been partially shaped by recent volcanic activity – specifically – the large eruptions of two polar volcanoes. In 2011, Mt. Grímsvötn in Iceland and Sheveluch volcano on Russia's Kamchatka Peninsula. While these eruptions were not tremendously powerful, they were both large enough to enter the stratosphere. There the volcanic ash and chemical aerosols lingered for three years, increasingly cooling the polar air mass.

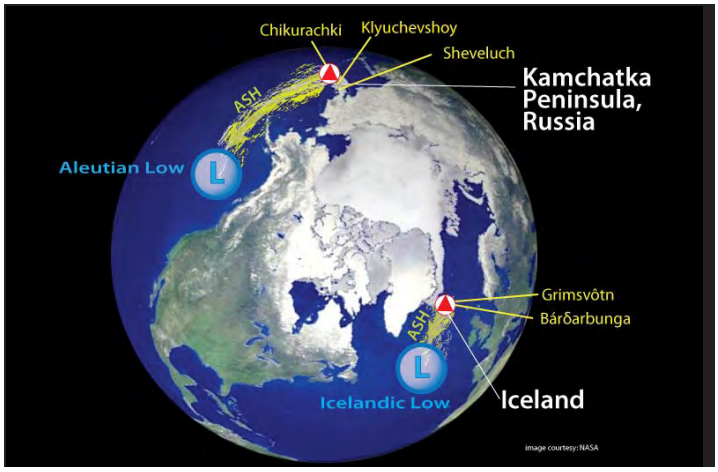


fig. 3 Volcanic ash and aerosols flow toward permanent low pressure systems, where they enter, and distort, the polar jet streams.

© Evelyn Browning Garriss

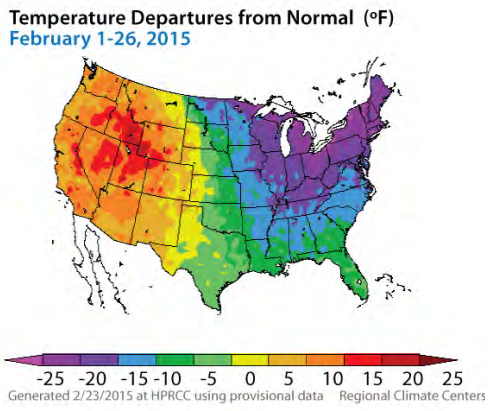
Recent volcanic activity has not been as powerful, but we are seeing constant activity in both Russia and Iceland. In Russia, several volcanoes are currently active. Sheveluch, Klyuchevskoy and Chikurachki have had a series of 5 – 7 km eruptions in February. While this is not high enough to change the climate for years, it is entering passing fronts. Some of the intensely cold air that has hit the US and Canada have been cooled by these eruptions. Meanwhile, in Iceland, Bardarbunga volcano continues to leak lava and gas at low levels. Unfortunately, much of this debris is in altitudes that a recent report published by the October 31 issue of *Geophysical Research Letters* noted is poorly covered by satellite observations.

The last time we saw this pattern of eruptions in both the Polar Regions of the North Atlantic and Pacific was back in the 1780s, so we are seeing patterns that haven't existed in centuries. The dust and chemicals blocked out incoming sunlight, decreasing the Arctic's summertime warming. Indeed, the end of the summer found 1.5 million sq. km (more than 579,000 sq. miles) more sea ice than two years previously. Winter has allowed this cold to shift south, creating extreme, even record-breaking cold from Michigan to Miami. Only the fact that the North Atlantic Oscillation is currently positive, shifting weather patterns eastward quickly, has kept this year from being a repeat of last year's awful polar vortex weather.

EXPECTED WEATHER

Mid February - Mid March

ACTUAL WEATHER



figs. 2A-B *top: http://www.hprcc.unl.edu/products/maps/acis/MonthTDeptUS.png*

EXTREME PRECIPITATION – Yankees are tough, if you live in New England you are used to harsh winters. What you are not used to is the incredible amount of snow that has been accumulating. However, as the upper right raindrop picture in Figure 4 shows, volcanic debris collects water from the atmosphere. These form micro-droplets, so light and small that they can float in the upper atmosphere for years. They form incredibly dense clouds. When the clouds of droplets finally gather enough moisture to precipitate out, they create mega-storms and blizzards.

Earlier this year, the Great Lakes retained the warmth from summer and created **lake-effect snow.** The cold Arctic air hit the warm, wetter lake air like a car crash and areas around the lakes, particularly Buffalo, New York, were buried with as much as 7 feet (2.1 meters) of snow. Now the Great Lakes are largely frozen. The cold air travels further east and hits the Atlantic Ocean air mass. Now it is the East Coast that is repeatedly being buried in snow. Boston, for example, has had four significant snowstorms since late January, amounting to 100 inches (245 centimeters) of snow accumulation at Logan Airport, more than three times the normal 30.2 in (77 cm) accumulation.

Russian volcanoes are triggering a positive PNA pattern – As noted in January's *Browning Newsletter,* the debris from

fig. 4A-B

Russian volcanoes in Kamchatka are cooling the air in the North Pacific. This cooling strengthens a semi-permanent air pressure storm region called the Aleutian Low. The Aleutian Low is a key area for steering the polar jet stream and when it is strong, it veers the jetstream north along the West Coast. Unfortunately, this keeps polar storms from hitting the Western US. This, in turn, reduces rain and snowfall and creates warmer temperatures that evaporate the already low levels of moisture.

When coupled with other air pressure patterns this makes a pattern known as a positive Pacific North American **(PNA)** pattern that encourages cold air to plunge east of the Rockies. The Russian volcanoes have been erupting at a moderate to low level for over a month and the Aleutian Low has been very strong most of January and February. This has created a very strong PNA pattern, or as the media is currently calling it, a "Siberian Express".

THE STRONG ICELANDIC LOW – This winter a strong, cold Low Pressure area south of Iceland has lingered, creating a weather pattern known as a Positive North Atlantic Oscillation. While there is no scientific consensus, there is a theory that the gasses from the still erupting Bardarbunga volcano in Iceland may be responsible for the cooling and strong low pressure.

A positive NAO creates a faster polar jet stream over the Atlantic. This means the storms that the PNA sinks into the East are moving out to sea fairly quickly. This is very different from last year when the "Polar Vortex" weather lingered. Instead of a prolonged cold, we are seeing wave after wave of cold fronts hit and zip eastward. Despite the fact that the fronts are colder than last year, this has shifted the cold east, allowing most of the US to be warmer than last year and makes the Northeast, Mid-Atlantic and eastern Great Lakes areas colder..

Here's the good news – Most of the volcanic debris will precipitate out this year. While polar volcanoes remain a concern (the Kamchatka volcanoes and Iceland's Bardarbunga eruption remain extremely active at a low level), this level of extreme cold in the Arctic air mass should fade.

It will be a relief to go back to worrying about polar bears, not the Polar Vortex.

Why the Weather Is More Extreme – Long-Term

ATLANTIC HEAT – As has been noted multiple times, since 1995 the Atlantic has been in the warm phase of the long-term Atlantic Multidecadal Oscillation. This means the Atlantic Thermohalene Current, the complex network of currents, including the Gulf Stream, are flowing faster and carrying more tropical warmth north. The water heats the air over the Gulf and Northern Atlantic and these air masses

fig. 5 Frequent Russian volcano activity is strengthening the Aleutian Low, triggering a positive PNA/Siberian Express. ©Evelyn Browning Garriss

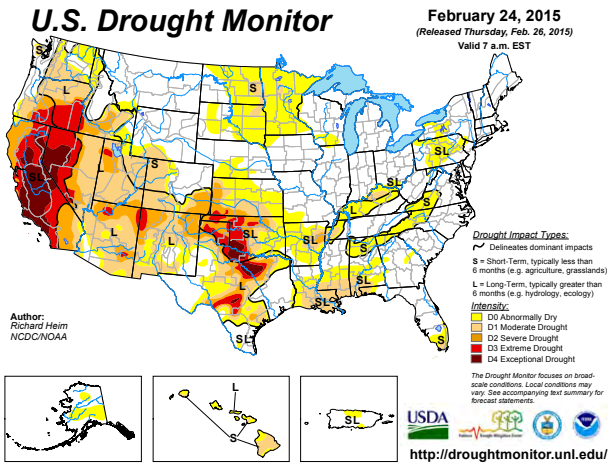


fig. 6 The heat from the positive PNA pattern has increased Western drought. Now 54.1% of the contiguous US is dry or in drought.

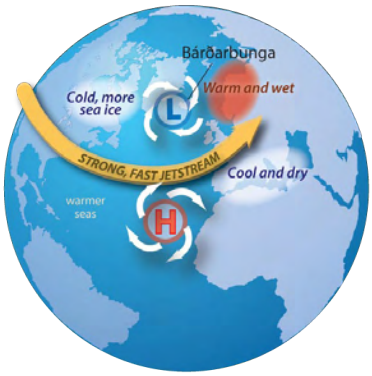
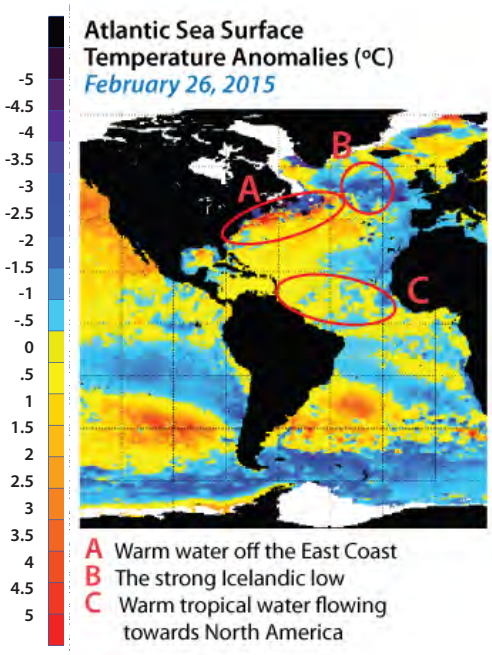


fig. 7 NAO to the rescue! The strong Icelandic Low has been moving the cold weather out to sea, otherwise US weather would be even colder *© Evelyn Browning Garriss*



figs. 8A-B The fast flow of Atlantic currents has heated the North Atlantic *left: http://www.ospo.noaa.gov/Products/ocean/sst/anomaly/index.html*

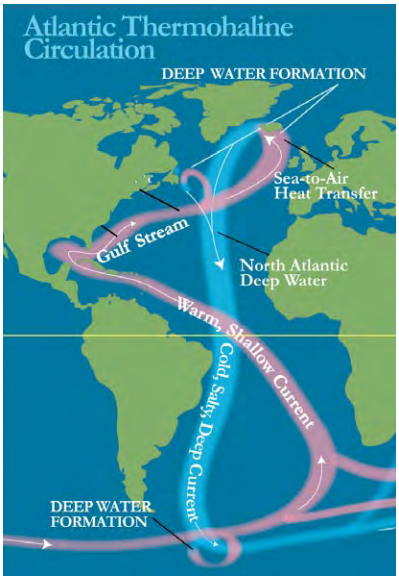
shape North American weather east of the Rocky Mountains.

The results of this heat are:

1. **Hotter springs, summers and early autumns for the in Eastern and Central North America** – During spring and summer, warm air wafts inland from the Atlantic and Gulf of Mexico, heating adjoining land masses. Currently the heat is being tempered by the volcanically cooled Arctic air mass. However, the first decade of this century saw record heatwaves throughout North America and Europe.

2. **Stormier late autumns, winters, and early spring in the Midwest and eastern North America** – At the subtropical latitudes, the prevailing winds are westerly, blowing from west to east. Land cools quicker than water, so this means the cooled continental air masses are blown into the hot Atlantic air mass, creating Nor'easters. The warmer Gulf heats the South more quickly, creating more storms further north in the Midwest.

THE TURBULENT PACIFIC – Another frequent point that the *Newsletter* has been mentioning is that the Pacific is in a long-term negative phase of the Pacific Decadal Oscillation. This phase cools waters in the Tropical and Eastern Pacific while warming waters in the west and closer to the poles. Notice, this pattern is a trend. It



can be and currently is being interrupted by warm El Niño conditions. However, it tends to weaken warmer climate patterns and strengthen cooler ones.

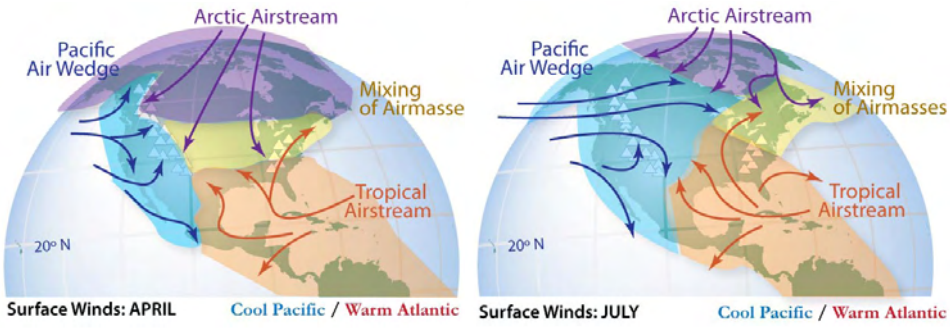
1. **The Negative PDO weakens warm El Niño conditions** – In spring and early summer, it looked as if a very strong El Niño would develop in the Pacific. Then, in July, the area cooled, stalling the development of an El Niño. October saw more warming while January had more cooling in the waters off South America. The Central portion of the El Niño zone remained warm. This has created conditions similar to a Central Pacific or Modoki El Niño.

As noted last month, El Niño Modokis produce very different weather than standard El Niños. The standard El Niño conditions produce abundant rainfall in western North America. Modoki conditions don't.

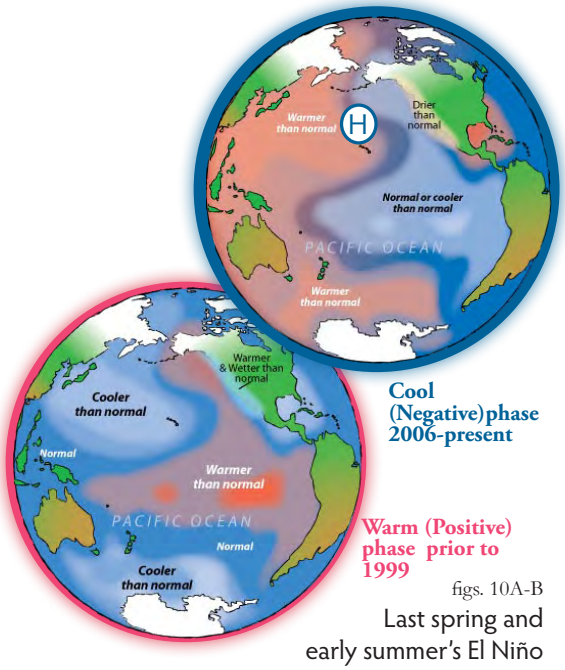
Officially this is not an El Niño event. El Niño events have a precise definition and have to last 5 consecutive seasons, approximately 7 months in a row. The Japan Agency for Marine-Earth Science and Technology states in their February 19 forecast that their model recognizes the current conditions as El Niño Modoki or Central El Niño conditions. This has had a profound impact on North American weather, severely reducing Western rainfall.

The El Niño zone waters off of South America are slowly warming increasing the possibility of standard El Niño conditions returning. Indeed, most agencies see a probability of this happening and overall, the odds are roughly 50 – 60% of weak standard El Niño conditions reoccurring and lingering at least until mid-spring. Indeed some models, ever hopeful, seem to predict El Niño conditions lingering through summer.

2. **The overall Pacific cooling trend strengthens cooling events** – This cooling trend strengthens cool oscillations in the Pacific. This not only means that it strengthens the impact of cool La Niñas, as the devastating droughts of 2011 – 2012 showed, but also the impact of the small cool Madden Julian Oscillations (MJOs).



figs. 9A-B The surface winds that shape spring and summer weather. *Based on Bryson and Hare, 1974*



figs. 10A-B

Last spring and early summer's El Niño conditions, as well as the current conditions have temporarily created a positive PDO

A Madden Julian Oscillation is a relatively small wind and water pattern that drifts eastward through the tropics from the Western Indian Ocean through the Pacific to the shores of South America. They then enter the Caribbean Sea and drift across the Atlantic until they collide with Africa.

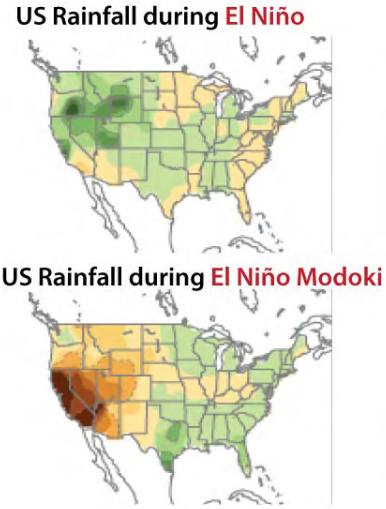
A warm area typically follows a cool MJO, which is, in turn, followed by another cool oscillation. Each MJO normally lingers in any one area 4 – 6 weeks. The warm MJOs are regions with weak winds and the underlying water bakes in the sun. (Scientists call these warm pools of water Kelvin Waves.) This pattern drifts eastward and is usually followed by a region of strong winds, which create storms and cool the underlying waters.

The fronts of the cold MJOs are the nesting grounds of tropical storms. When the cooler air crashes into the warmer water ahead of it, it creates storminess. If the winds are just right, these storms begin to rotate and form tropical storms/typhoons/hurricanes. If they aren't, then the rotation of the Earth allows the moisture to stream away from the equator, toward the poles. These are called atmospheric rivers.

Typically these "rivers" are huge bands of water vapor, 250 to 350 miles-wide that carry 7 to 15 times as much as the mouth of the Mississippi River. The ones that usually hit the West Coast pass through Hawaii first, earning the name "Pineapple Express". Historically they are especially heavy when the Pacific is experiencing standard pattern El Niños. We saw them in December and another in early February. These brought some welcome water to California's reservoirs. As the Pacific appears to be shifting back to a more standard El Niño condition, in increases the probability of another blast in March.

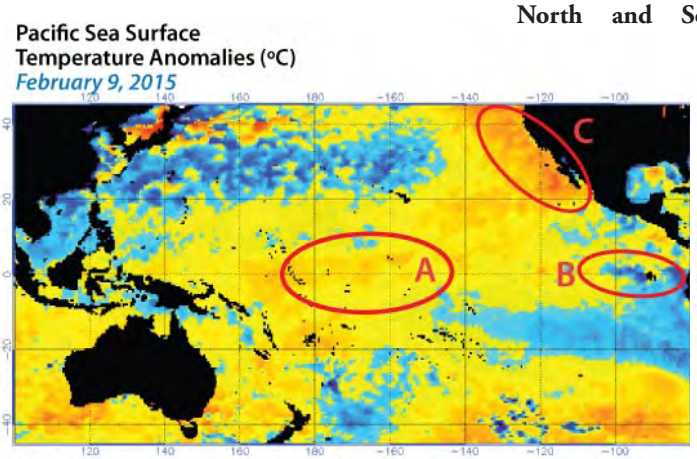
A Miracle March would bring much needed moisture, but it would not end the long-term drought conditions in the West. The immediate impact would bring reservoirs closer to normal. However, the high temperatures are melting the snow that California and much of the West needs for future moisture. Typically the snowpack melts slowly, feeding Western rivers and water systems over the spring and summer dry seasons. This year, the snowpack is dismal.

3. **Overall – the negative PDO creates more extreme weather in North and South America** – Between strengthening the Atmospheric River phenomenon, which concentrates the streams of tropical moisture, creating more floods and blizzards, and drying the western coasts of the Americas, the negative PDO tends to create more extreme weather patterns. The cooler air masses off the West Coast, during non-El Niño years, are carried east by the prevailing westerly winds and crash into the hot wet air from the Gulf and Atlantic, creating more severe storms.



figs. 12A-D A cool MJO has cooled the Eastern Tropical Pacific making the conditions like an El Niño Modoki. Will the more normal El Niño conditions return? *http://www.jamstec.go.jp/frcgc/research/d1/iod/enmodoki_home_s.html.en*

Both the warm phase of the Atlantic AMO and the cooler trend of the PDO are long-term oscillations that are expected to last another 15 – 20 years. This indicates a



A Central Pacific El Niño conditions B Cold water from a Cool MJO
C Warm water off the North American coast from previous El Niño-like conditions.

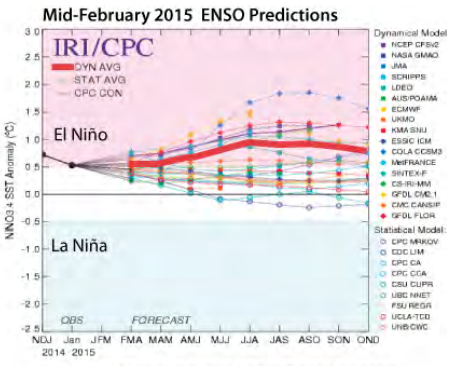
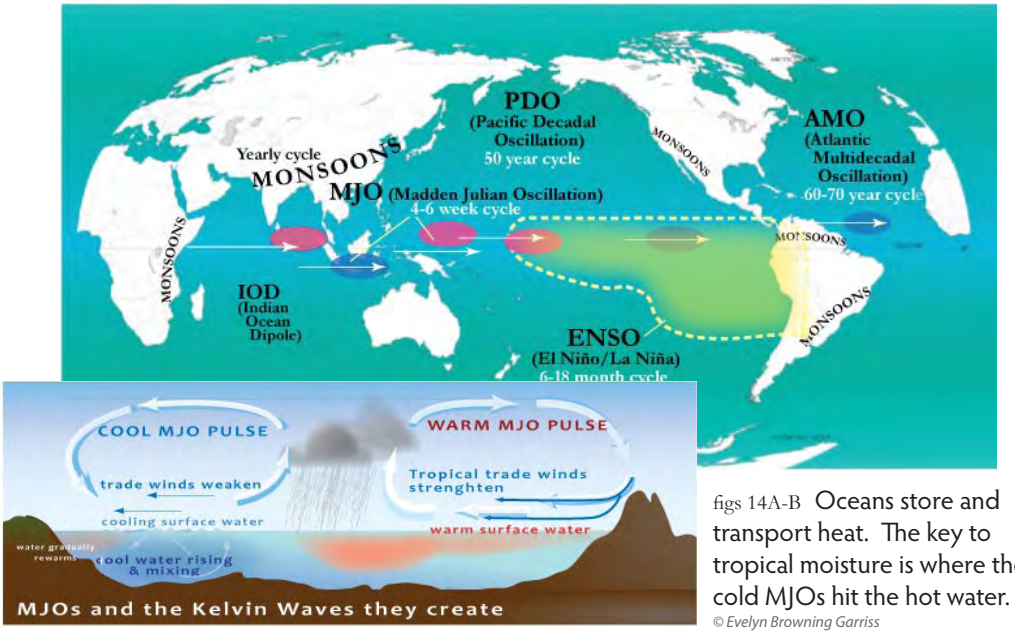


Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 February 2015).

fig. 11 Current conditions are similar to Central or Modoki El Niño conditions. *http://www.ospo.noaa.gov/Products/ocean/sst/anomaly/index.html*

fig. 13 The majority of international models indicate El Niño conditions should linger until mid-spring but do not say if the event would be standard or a Modoki *http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.pdf*



figs 14A-B Oceans store and transport heat. The key to tropical moisture is where the cold MJOs hit the hot water.
© Evelyn Browning Garriss

historically falls in the central and southern area while the state's major reservoirs are in the north. Southwestern areas further east, including Texas, should see more rain. Whether the drought in these areas end will be determined by how long Modoki-like conditions linger and how soon they return.

As for specifics, spring is always the hardest month to read. It is filled with the greatest northern and southern surges of the polar jet stream and sweeping fronts. Typically the "average temperatures" east of the Rockies are made of dramatic swings of extremely warm and cold

pattern of more extreme weather will probably continue for one to two more decades.

What These Extreme Weather Patterns Mean for Spring

In the past, climate conditions similar to those shaping this year created a colder and less stormy early spring but in 60% of those years, late springtime was warm in the Midwest and wet in most of the Great Plains and central Prairie Provinces. In 80% of similar years, California experienced another round of moisture but not enough to end the current drought conditions.

The current cold has frozen more than 80% of the Great Lakes, insuring that the lakes act as a refrigerator for the Midwest and Ontario in early springtime. Despite the official forecast that this would be an average year for icing, it is only slightly below where it was at this point last year.

Further west, in the Pacific, the cold water in the El Niño zone is beginning to warm. If this continues, the Modoki conditions will expand to a standard El Niño. This is already allowing more moisture to hit the West Coast and Southwestern states. A full warm-up could even present "Miracle March" conditions, enough to provide more mountain snow but not enough to end California's estimated 11 trillion gallon deficit (according to NASA). Unfortunately for the Golden State, with the exception of occasional atmospheric rivers, most of the moisture

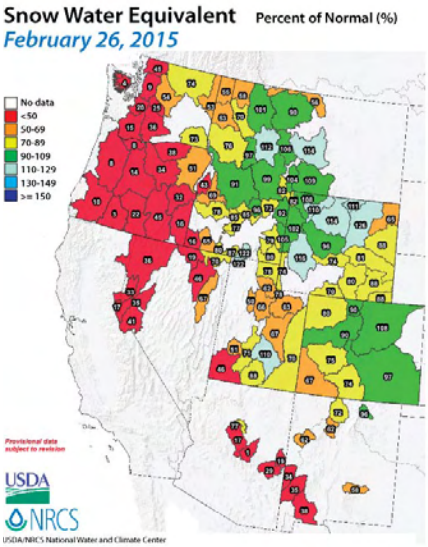


fig. 16 The West Coast has very little snow pack *http://www.wcc.nrcs.usda.gov/ftpref/data/water/wcs/gis/maps/west_swepctnormal_update.pdf*

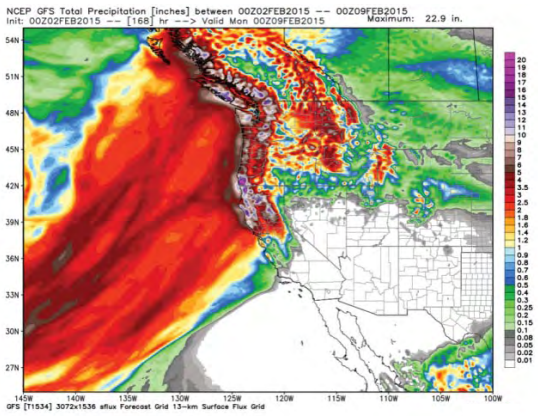


fig. 15 The gift from cold MJOs, The February 2 Pineapple Express rainfall in the West
courtesy NCEP

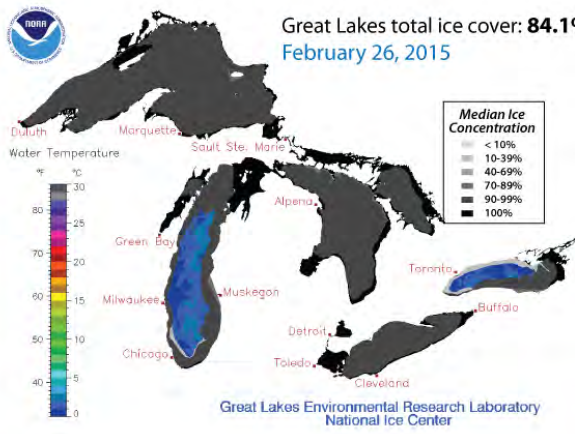


fig. 17 The icy Great Lakes will be like a refrigerator, cooling the Midwest in early spring
http://coastwatch.glerl.noaa.gov/glsea/cur/glsea_cur.png

temperatures. The maps in Figure 17 do not have any events that occurred 80% of the time except for the Midwestern to Mid-Atlantic warm that occurs in late spring. All other events occurred during 60% of similar years.

One last thing to add – typically in years with these conditions, (and El Niño fading by summer) US and Canadian crop output, (with the exception of California) got a late but strong start and had near average production. Credit for that, however, usually goes to the adaptability of North American farmers and ranchers, not to the variable conditions of volcano-weather springs.

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

Mid February - Mid March

Mid-March through April

‡ A moderate Russian volcanic eruption will make this region colder. *If El Niño conditions continue.

figs 18A-D

News Notes

North America is not the only area being lashed by strong storms. On February 20, Australia was lashed by not one, but two powerful cyclones in a rare double-whammy by Mother Nature. The negative phase of the Indian Ocean Dipole has shifted more moisture towards Australia, saving the continent from the usual El Niño deadly drought conditions, but the price has been simultaneous storms on the Northern and Eastern shores. Category 4 Cyclone Lam hit the Northern Territory and six hours later Category 5 Cyclone Marcia swept and then slammed into Queensland. Fortunately, no deaths were reported, but the two cyclones left roughly 50,000 people without power. Marcia damaged about 1,500 homes and left a hundred families without a place to stay. Commodity investors were relieved to learn that Marcia caused minimal disruptions to ship loading and coal-hauling rail lines and little damage to the sugar industry. (Indeed, the rains it brought for the sugar crops are appreciated.)

While Australia has had storms, South America has had drought. Even though February rainfall amounts were above average, the severe deficits and evaporating summer heat made the Brazilian drought more severe. Combine that with the El Niño Modoki conditions that reduced the normally higher rainfall that El Niños normally deliver, and the drought worsened. It has already affected coffee and sugar cane prices, cutting the sugar harvest by 10%. Now it has reduced the soybean forecast from a harvest of 95 million tons to just 89 million tons.

However, the greatest impact of the nation's worst dry stretch since the 1930s (which was the last time the Atlantic was this hot.) Brazil has the world's biggest water supply and the seventh biggest economy, but two weakened monsoons in a row has left taps running dry in Sao Paulo, its largest city. Reservoirs are at 10% or less, water pressures have dropped and entire sections of the metropolitan area are going hours and even days without water. There are widespread rumors that parts of the city may even be evacuated.

Water problems are not isolated to Sao Paulo. The country's southeastern states of Rio de Janiero, Minas Gerais, and Espírito Santo, have been affected too, meaning an estimated 36% of all Brazilians have faced problems with the water supply this year. An estimated 40 million people face water rationing. The peak of the wet season has passed, so the situation is not expected to ease. Experts warn that water stress was likely to continue in São Paulo for four to five years, threatening not only the city's economy but the rest of the country as well.

Never let a crisis go to waste. . . Like Brazil, Nicaragua, particularly western and southern Nicaragua, has had drought, but for years, not seasons. The drought has disrupted agriculture

which combined with poverty (it is the second poorest nation in the Americas, behind Haiti) and gangs has resulted in social unrest. Now China has finalized a contract to build a canal, bigger than the Panama Canal, across the nation to connect the Atlantic and Pacific. Chinese leader Xi Jinping's appointed company started work on the project on December 22 last year. There are concerns that the 173 mile (278 km) long canal, which will go through Lago (Lake) Nicaragua, will impact the water purity of the drought-prone region's main source of fresh water. However, for the Central American nation, the hope of the jobs that the canal and Chinese controlled ports at each end could offer is overwhelming. This will represent a major expansion of Chinese sea power.

Freeze alert – The Great Lakes have been freezing quicker than experts projected and as of February 24, had 14% more of its surface covered than last year. Since it appears that the first weeks of March will also be cold, experts are concerned that this may lead to a repeat of last year's deadly impact on Great Lake water fowl.

Last year, when up to 92% of the Great Lake surface froze over, tens of thousands of water fowl, particularly ducks and deep diving species died. Birds were cut off from their food supplies, forced into the crowded remaining open waters and forced to migrate south to unfamiliar territories. Studies of duck carcasses by the Field Museum the dead birds' average weights were 23.4 - 46.7% below published averages. Other studies revealed widespread disease as malnourished birds spread infections in the crowded open waters.

Some of these same problems are reoccurring and this is particularly serious because early March is the time of year when these ducks should be nearing their maximum weight, gorging themselves to ready their bodies for their migration back to their Arctic breeding grounds. Rehabilitation centers are asking for donations as they are receiving growing numbers of weakened and grounded birds found in people's yards.

Not all the weather news is earth bound.

This month, on March 20, there will be a solar eclipse and, some fear, an eclipse for solar energy supplies in Europe. In London, 85% of the sun will be obscured by the moon while in northern Scotland and other parts of Europe, more than 95% will be covered. The shadow will last for hours and cover nations from Norway to Spain, Greenland to Turkey. This will be the largest European eclipse since 1999, but unlike then, 3% of Europe's total electricity supplies are dependent on the sun. According to the European Network of System Operators for Electricity, this will be the first event significant enough to disrupt its grids. (England, which uses relatively little solar energy faces very little risk.) Operators have been preparing for months and plan to compensate for any drop in power with gas-fired generation. It should be an interesting test.

As February draws to an end, the sun has been unusually quiet. Indeed, many articles are announcing that this is the quietest cycle in a century. It has had fewer sunspots than any cycle since Cycle 14 in 1906 and its X-ray output has flat-lined. The sun spot cycle peaked at a relatively low level in April 2014 and its activity has strongly declined since then. History suggests that less solar activity means less energy and warming, but it is controversial in the global warming debate. At best, the current quiet has nothing to do with the current cold winter. The Earth retains an enormous amount of heat and it usually takes at least two, not one, quiet cycles to produce measurable amounts of cooling. However, what is not debatable is that the Earth's power grid is vulnerable to solar flares and the resulting emissions of ionized gas and energy – so quiet is a good thing.

If you are tired of the cold, I've got a vacation escape for you. It's a brand new tropical island –barely a month old. It's toasty warm, fresh from a volcano in the Polynesian nation of Tonga. Think of blue oceans and warm sands, really, really warm sands.

The island is the tip of an underwater volcano between two tropical islands, Hunga Tonga and Hunga Ha'apa. The islands are actually the rim of a giant caldera. Last December 19, the island began to erupt and by January 11, the ash and debris were disrupting Pacific airplane travel. Five days later, the island was born. It's a little larger than a square mile in diameter. It is mostly loose volcanic rocks, so it probably won't last, but for the moment, it is the youngest island in the world. Get it while it's hot!

Actually new islands are not that unique – there have been 5 born over the last 5 years, two in Japan, one in Yemen, one in Pakistan and the newest in Tonga. That's more than usual, the Earth is a bit restless.

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