



# The Pacific Tradewinds Quarterly

The official newsletter of the Schools of the Pacific Rainfall Climate Experiment

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## Australia Floods: La Niña to Blame

Tuesday, January 11, 2011

By Damian Carrington

The devastating flooding in Queensland is the result of Australia being in the grip of an unusually strong "La Niña", a periodic climate phenomenon that brings more rain to the western Pacific, and less to South America along the eastern Pacific.

"The Queensland floods are caused by what is one of the strongest – if not the strongest – La Niña events since our records began in the late 19th century," said Prof Neville

Nicholls at Monash University and president of the Australian Meteorological and Oceanographic Society. "The La Niña is associated with record warm sea-surface temperatures around Australia and these would have contributed to the heavy rains." Warmer oceans produce damper air and hence more rain. This is driven onshore by the stronger east-to-west trade winds characteristic of La Niña.

These weather patterns led to December being the wettest ever recorded in Queensland and to Australia



Homes in the town of Ipswich, west of Brisbane, are inundated by flood waters.

Blue underlined text is clickable in the electronic version of the newsletter.

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Photo: EPA Source: <http://tiny.cc/wqz3f>

having its third wettest year. The Australian Bureau of Meteorology predicts that La Niña is likely to persist into the southern hemisphere autumn, raising the possibility of further torrential downpours.

La Niña, "the girl" in Spanish, is named in reference to its counterpart, El Niño – "the Christ Child". Here the climatic conditions are reversed, with warmer, wetter weather over South America which is usually first noticed at Christmas by fishermen off Peru. La Niña occurs at intervals between a few years and a decade and generally lasts for a year or two. What causes the switch is not known, but it is thought to arise from the complex interaction of ocean and atmospheric circulations.

"This is one of the strongest La Niña events in the past half century," said Bill Patzert, a climatologist at Nasa's Jet Propulsion Laboratory. "Impacts include heavy rains and flooding, which has damaged crops and flooded mines in Australia and Asia. It also has resulted in flooding in northern South America and drought conditions in Argentina. This powerful little lady is spreading her curses and blessings across the planet. She's the real deal."

A silver lining in the storm clouds brought by La Niña is the relief of the decade-long drought much

of Australia has endured. There was a dramatic recovery in water storages across the Murray-Darling Basin in eastern Australia from 26% full at the start of 2010 to 80% at the start of 2011. However, elsewhere in the country, south-western Australia suffered its driest year on record in 2010, continuing decades of drying.

"The extent to which any of this – the floods, warm oceans, or very strong La Niña – is linked to global warming is unknown, because the requisite studies to test this have simply not been done yet," said Nicholls.

But as a general point, said Prof Vicky Pope, head of climate change advice at the Met Office, a warmer world is a wetter world. "As the average global temperature increases one would expect the moisture content of the atmosphere to rise, due to more evaporation from the sea surface. For every 1C sea surface temperature rise, atmospheric moisture over the oceans increases by 6-8%. Also in general, as more energy and moisture is put into the atmosphere [by warming], the likelihood of storms, hurricanes and tornadoes increases."

Source: [guardian.co.uk](http://www.guardian.co.uk) © Guardian News and Media Limited 2011 (<http://www.guardian.co.uk/environment/2011/jan/11/australia-floods-la-nina>)

## The Strongest La Niña on Record?

Wednesday, January 12, 2011

By Neville Nicholls

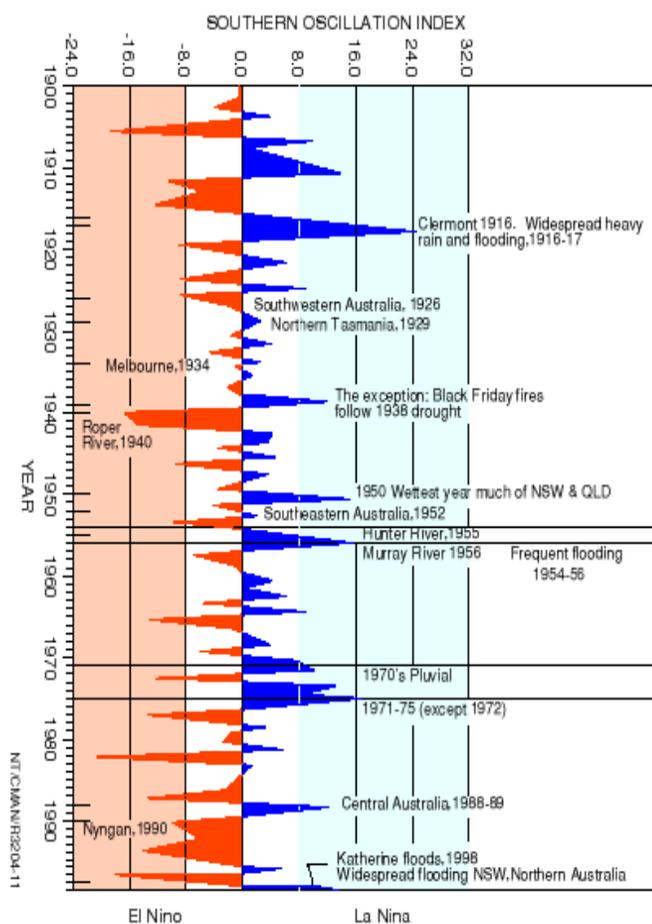
The second half of 2010, and the start of 2011, has seen devastating floods across much of northern and eastern Australia, a pattern typical of a strong La Niña event. After the 2009 El Niño event, the world moved into a La Niña around April 2010. But how strong is this event?

Climate scientists usually examine sea surface temperatures in the central and eastern equatorial Pacific (the so-called NINO indices) to determine when we are in an El Niño or La Niña episode.

Temperatures in this region are usually lower than normal during a La Niña episode. But these tem-

peratures have several failings, if we want to use them to rank La Niña episodes. Firstly, they are not readily available back more than about 60 years, so it is difficult to use them, for instance, to compare 2010 with events early in the 20th century.

Secondly, the general ocean warming we have seen over the past 50 or so years, due to anthropogenic enhancement of atmospheric greenhouse gases, confounds the use of these temperatures to compare a recent episode of cool temperatures with cool temperatures earlier in the record – the global warming may have offset some cooling associated with the strong, recent La Niña. This would bias any comparison between the 2010 event and earlier



Time-line showing major Australian flood episodes as a function of the Southern Oscillation Index. Extended periods of high SOI in 1916/17, the mid-1950s, and the early to mid-1970s, were periods of widespread, frequent flooding.

Source: Australian Government Bureau of Meteorology (<http://www.bom.gov.au/lam/climate/levelthree/c20thc/flood.html>)

events, prior to the strong global warming of the second half of the 20th century.

But we can use the Southern Oscillation Index, or SOI to compare the strength of La Niña episodes across time. The SOI is the standardised difference in surface atmospheric pressure between Tahiti and Darwin. Monthly SOI values are available at [www.bom.gov.au/climate/current/soihtml.shtml](http://www.bom.gov.au/climate/current/soihtml.shtml). Positive values of the SOI (low pressures at Darwin and high pressures at Tahiti) indicate a La Niña event.

There is no *a priori* reason to expect that global warming has necessarily led to long-term SOI changes that would confound our results if we use

the SOI to compare historical and recent La Niña events. And values of the SOI are available from the end of the 19th century.

The SOI values confirm that we are in the middle of either the strongest La Niña event on record, or the second strongest. The SOI values for October 2010 and December 2010 were each the largest positive values on record for those months, as was the three-month average October-December 2010. If we take a longer perspective (July-December) then 1917 was stronger than 2010, but 2010 was still the second strongest in the historical record. Using either the October-December or the longer July-December periods, the strong La Niña events on 1973 and 1975 were both ranked as weaker than the 2010 event.

So, it is not surprising that we are seeing a great deal of rain and floods across much of Australia. It is worth pointing out that the Bureau of Meteorology seasonal forecast issued on 23 September indicated a strong chance of wet conditions for the period October-December across northeast Australia. These forecasts are based, partly, on the current state of the El Niño – Southern Oscillation, and it was clear months ago that we were in a La Niña. So an increased likelihood of wet conditions was certainly on the cards.

Of course we cannot make a definitive statement about the relative strength of the 2010 La Niña until the event concludes. This will, presumably, be sometime in 2011. But on the data available up to now, there is no doubt that this has been a super strong La Niña. And since La Niña events are generally followed, some months later, by global cooling, we can expect cool temperatures for quite some time.

*Neville Nicholls is president of the Australian Meteorological and Oceanographic Society. This article first appeared [here](#).*

## Google Offers New Look at Tuamotu Atolls

*New aerial photos taken by kites bring new clarity*

**Tuesday, November 9, 2010**

PAPEETE, Tahiti— Frank Taylor, author of the Google Earth blog, recently supplied Google with aerial imagery that's much higher-resolution than the usual fare obtained from cameras in orbit.

The imagery arrived a few days ago on Google Maps and Google Earth, cnet reports on its website.

[PIR editor's note: The Tuamotus, located to the northeast of Tahiti in French Polynesia, are a widely-scattered archipelago of 78 atolls and the largest island chain in the world.]

Taylor is on a five-year sailboat trip called the Tahina Expedition.

The process has however some complications satellites don't have to worry about. "Due to the sun getting low in the sky, we weren't able to cover a large part of the village," Taylor said of shots from Manihi atoll in French Polynesia now arriving in Google Maps.

"There were telephone/electric poles and wires and trees in the village, so we had to avoid getting the kite string caught in those", Taylor added.

The French Polynesian atoll already had in fact some imagery, according to cnet.

Manihi located in the North of Tahiti is mostly known for pearls.

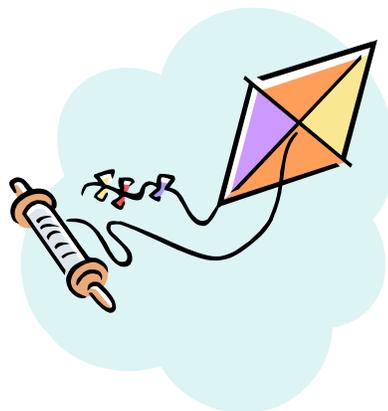
Reprinted From: *Pacific Islands Report* (<http://pidp.eastwestcenter.org/pireport/2010/November/11-18-00.htm>)

Original Source: *Tahitipresse*: <http://www.tahitipresse.pf/index.cfm?lang=2>  
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New kite-photos of French Polynesia's Tuamotu islands have debuted on Google Earth, showing much clearer aerial views of the islands than previously available via satellite imagery.

*Photo courtesy of Tahitipresse*



## Invasive Caterpillar Worries Marshalls Biologists

*Critter poses threat to native vegetation*

**Wednesday, November 24, 2010**

MAJURO, Marshall Islands— We discovered a new species of caterpillar," states Chief of Agriculture Henry Capelle.

This new species might have a dangerous impact on

the Marshallese environment.

"We've seen it causing damage to one of our local trees the Kaar and it destroys the flora, says Capelle. More studies will be conducted as soon as we get the relevant information from the experts in Fiji Suva office."

This 3 inch brown caterpillar pest was discovered

with the assistance of Nancy Vander Velde and her College of the Marshall Islands Environmental Science Class. The class made a field trip to the container yard of Delap Dock, near the Ports building.

The discovery was made when the staff at Resources and Development noticed the kaar tree covered with these brown caterpillars in early October. "If we hadn't been on the field trip, says Professor Vander Velde, the infestation could have become much worse before it was found and dealt with."

Capelle thinks the species might have come through on one of the container ships.

According to Vander Velde, consultation with other entomologists confirmed that no one has discovered these species in any other part of Micronesia. Aubrey Moore from University of Guam has stated that they could possibly be tent caterpillars. And Dr. Marc Epstein from the California Department

of Food & Agriculture, Plant Pest Diagnostic Laboratory in Sacramento, confirmed the family the caterpillars are from, but could not yet confirm their specific species.

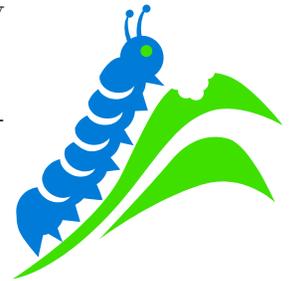
"Invasive species are a huge problem worldwide, says Vander Velde, and can cause millions, even billions of dollars of damage to crops and the environment."

So far, the pests are being treated by Quarantine using a chemical pesticide called "Methomyl."

"We need more study on the new species and how to tackle it before it is widely spread," says Capelle.

Reprinted From: *Pacific Islands Report* (<http://pidp.eastwestcenter.org/pireport/2010/November/11-29-16.htm>)

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## Brain Teasers

### Sudoku

Complete the grid such that every row, every column, and the nine 3x3 blocks contain the digits from 1 to 9.

		4	8	3	1	9		
			6		2			
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			4		3			
		6	7	1	9	5		

Puzzles devised by © Kevin Stone  
[[www.brainbashers.com](http://www.brainbashers.com)]



### Math Quiz

- Dave did such a good job of the housing estate, he was asked to paint the room numbers on all of the doors of the fourth floor of the local hotel. He painted all of the numbers from 400 to 499. How many times did he paint the number 4?
- Which is larger, the number of seconds in a day or the number hours in 10 years?

Look for answers in the next newsletter!

Previous newsletter puzzle answers:

Sudoku	Math Quiz																																																																																	
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## What's Going on with SPaRCE: Unusual Blizzard and Snowstorm in Oklahoma

By Michael Klatt

Wednesday, February 9 2011

Although it doesn't compare to the extreme rainfall and Tropical Cyclone Yasi that have recently devastated Queensland in Australia, we're having our own unusual weather at SPaRCE headquarters during the middle of the Northern Hemisphere winter. Winter in Oklahoma is certainly colder than what Pacific Islanders are accustomed to, but it's mild compared to many places in the United States. Our daily temperature range in the winter is typically -5 C to 10 C, although we can have days that are much colder or much warmer. We can get all types of weather in the winter: sun, rain, freezing rain, sleet, snow, even severe thunderstorms with hail and tornadoes—and sometimes all in the same day! In most winters it doesn't snow very often. When it does snow the amount is usually small (5 cm or less), and within 2-3 days all of the snow has melted.

However, this season has certainly not been like most Oklahoma winters. As I write this, I'm at home because most offices and schools in the state, including the University of Oklahoma, are closed for the day. In Norman we had 15 cm of snowfall overnight, with even more snow to our north; one location in northeast Oklahoma reported over 60 cm of snow. Daytime temperatures across the state are well below freezing (-5 C to -10 C) with extremely cold temperatures (-20 C and colder) expected tonight. This one event is notable by itself, but it comes on the heels of even more extreme weather just last week. Last Tuesday we experienced a true blizzard with winds of 65-70 km/h and snowfall totals of 30 cm or more, followed by several days of extremely cold weather and additional snow on Friday. Most businesses and schools were closed at least two days, and many were closed through Friday. The snow from last week didn't even have a chance to completely melt before the latest storm today. The quick succession of these storms has been just as unusual as their severity.

While those of us in Oklahoma are struggling to deal with the snow and cold, many people around the world experience weather like this and even worse all winter long. Do they shut down their offices and schools for three months? Of course not, and the difference is adaptation: how plants, animals, and people adjust over time to the environment where they live. For example,

in areas where extreme winter weather is common, houses are built with more insulation, cities have large fleets of snow plows, and drivers have the experience to safely drive on snow and ice. The tables are turned in the Summer, because in Oklahoma we have adapted in various ways to extreme heat and humidity. What is considered a dangerous heat wave in many places is a typical July or August day in Oklahoma.

People who think that we cannot reduce greenhouse gas emissions enough to prevent further climate change stress adaptation as a response. If you live on an atoll you might adapt to a rising sea level by raising your home on stilts. However, if sea level rises far enough the only possible adaptation will be to leave your home and abandon the atoll. For plants and animals, who don't have the advantage of technology, adaptation is even more difficult. For example, a coral reef cannot move north or south to escape rising ocean temperatures. The fish that depend on the reef can migrate, but if they cannot find a new reef they will not survive. Humans, of course, are also affected by the adaptability of the species that we depend on—and all of the species that they depend on. So, while adaptation is important, we must recognize that it cannot be our only solution to global warming.



Nikki standing in an almost 1 meter deep snow drift after the second unusual 2011 snowstorm in Oklahoma.

## Classroom Science Focus

# How does soil effect floods?

### Objectives

Students will understand the following:

1. Different types of soil have different capacities for retaining rainwater.
2. If the soil in an area will not hold enough rainwater, flooding problems will ensue.
3. Soil can be tested for its water-retaining capacity.

### Procedures

1. Present the following scenario to your students. The class is a team of "consulting engineers" for a new housing development to be built in the next county. Many of the county's citizens are protesting the development. They are saying that the soil in that area will not hold the rain and there will be flooding problems for all dwellings in that area. But others believe this is just an excuse to delay and block the development.
2. Tell students that their challenge is to aid in the decision-making process by testing different samples of soil to see how much water the soil will absorb.
3. Divide your class into small groups, distributing materials to each group.
4. Students should first test each type of soil in its dry state by measuring the same amount of each soil, in turn, into a funnel lined with filter paper, and then pouring a measured amount of water through it. They should use the same amount of water for each type of soil. The water that drains through each type of soil should be collected in another measuring cup and the amount recorded.
5. Have students repeat the test using the same types of soil in their saturated states.
6. Discuss with the class which soil held the most water when dry and which saturated soil held the most water. Which type of soil would be most likely to cause flooding problems?
7. Have each student write a lab report describing the soil tests, including an explanation of how communities and developers would use such tests.

### Adaptations

Adaptations for older students:

Have students find documentation for soil testing that has been done in their own community and report their findings to the class.

### Evaluation

You can evaluate your students on their lab reports using the following three-point rubric:

Three points: accurate and complete description of each soil test; clear explanation of how tests would be used; careful and error-free writing

Two points: satisfactory description of each soil test; explanation of how tests would be used lacking in clarity; some writing errors

One point: sketchy description; unclear explanation or no explanation; numerous writing errors You can ask your students to contribute to the assessment rubric by determining what information should be included in the description of each soil test.

Additional materials such as exercise extensions, suggested readings, links, and vocabulary for this lesson can be found at:

<http://www.discoveryeducation.com/teachers/free-lesson-plans/flood.cfm>

Source: Discovery Education, Free Lesson Plans, Flood! (see above link for full online lesson)

### Materials

The following materials should be distributed to each group:

- Three soil samples: sand, agricultural soil (potting soil), and clay
- Water
- Three measuring cups
- Funnel
- Filter paper



## Schools of the Pacific Rainfall Climate Experiment

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## ENSO Discussion

Issued by The Climate Prediction Center/NCEP 6 January 2011

**Synopsis:** La Niña is expected to continue well into the Northern Hemisphere spring 2011.

A moderate-to-strong La Niña continued during December 2010 as reflected by well below-average sea surface temperatures (SSTs) across the equatorial Pacific Ocean. All of the Niño indices were  $-1.5^{\circ}\text{C}$  at the end of December, except for the easternmost Niño-1+2 region. The subsurface oceanic heat content (average temperatures in the upper 300m of the ocean) continued to reflect a large reservoir of below-average temperatures at depth in the central and eastern equatorial Pacific. Convection remained enhanced over Indonesia and suppressed over the western and central equatorial Pacific. Also, enhanced low-level easterly trade winds and anomalous upper-level westerly winds continued over the equatorial Pacific. Collectively, these oceanic and atmospheric anomalies reflect the ongoing La Niña.

Likely La Niña impacts during January-March 2011 include suppressed convection over the west-central tropical Pacific Ocean, and enhanced convection over Indonesia. Impacts in the United States include an enhanced chance of above-average precipitation in the Pacific Northwest, Northern Rockies (along with a concomitant increase in snowfall), Great Lakes, and Ohio Valley. Below-average precipitation is favored across the southwestern and southeastern states. An increased chance of below-average temperatures is predicted for much of the West Coast and northern tier of states (excluding New England), and a higher possibility of above-average temperatures is forecast for much of the southern and central U.S. While seasonal temperature and precipitation patterns in the U.S. are strongly influenced by La Niña, these signals can be modified by other factors, such as the Arctic Oscillation (AO)/ North Atlantic Oscillation (NAO).

This discussion is a consolidated effort of the National Oceanic and Atmospheric Administration (NOAA), NOAA's National Weather Service, and their funded institutions. Oceanic and atmospheric conditions are updated weekly on the Climate Prediction Center web site ([El Niño/La Niña Current Conditions and Expert Discussions](#)). Forecasts for the evolution of El Niño/La Niña are updated monthly in the [Forecast Forum](#) section of CPC's Climate Diagnostics Bulletin. The next ENSO Diagnostics Discussion is scheduled for 10 February 2011. To receive an e-mail notification when the monthly ENSO Diagnostic Discussions are released, please send an e-mail message to: [ncep.list.ensoupdate@noaa.gov](mailto:ncep.list.ensoupdate@noaa.gov).

Visit us on the web!

<http://sparce.evac.ou.edu/>



### Call for Newsletter Contributions

In order to get to know our schools and participants a bit better, please send us items to be published in the SPaRCE newsletter.

Here is a list of ideas:

- Accounts of extreme weather events
- School history
- Pictures of students taking measurements
- Activities using SPaRCE data
- Songs or poems about weather
- Any other interesting facts about your school or culture.

### Send in Your Questions!

If you or your students have any questions relating to science please send them to us here at SPaRCE. Once we receive a question we will publish the question and an answer in the next newsletter.

