



The Pacific Tradewinds Quarterly

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

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

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"There Once Was An Island"

April 10, 2012

For many people in North America, Europe, and other industrialized Western cultures, it is easy to dismiss global warming. The melting Arctic ice and rising tropical oceans are far, far away, and most of us do not feel the impacts of a changing climate on our daily lives. Our homes are not at the mercy of the tides, we do not rely on changing rainfall patterns for all of our fresh water, and our livelihood does not depend exclusively on the land or sea. Climate change is seen as "somebody else's problem"—if it's even seen as a real problem at all.

One way to change hearts and minds is tell the stories of "somebody else" and the problems they are facing. People need to know that global warming is not just a bunch of numbers from a computer model, but something that is causing real harm to real

people right now. This is why documentaries like *There Once Was An Island: The Henue*



Traditional dance on the island of Takuu. "Dance performances fill 20 or 30 hours a week" (Wane 2005)

Nnoho are so important. This film shows the plight of the people of Takū Atoll as they are forced to deal with the consequences of sea level rise.



A group of dancers.

Photograph by thereoncewasanisland.com

As the film begins in 2006 we are introduced to Takū, a small atoll 250 kilometers northeast of Bougainville Island, Papua New Guinea. There is no electricity or running water on the atoll, and the only contact with the outside world is through a battery operated radio and a supply ship that makes irregular visits. The people of Takū live the traditional Polynesian communal lifestyle, and their isolation means that they must be almost entirely self-reliant. However, their home and their entire culture are being threatened as the ocean is slowly swallowing the atoll. In some areas of the atoll there is only water where there used to be houses. The beach is getting smaller, making it more difficult to launch the fishing canoes. The taro garden is struggling. People are erecting small sea walls to help tame the tides.

At a village meeting, there is much dis-

Continued on next page

“There Once was an Island”

cussion about what to do. The Bougainville regional government is planning on relocating the people of Takū to Bougainville Island, but the villagers are divided. Some want to relocate, but many do not want to leave the only home and way of life they have ever known, and a few are in denial that there is a problem at all. Before a decision is made, the villagers want to hear from scientists about what they can expect in the future.

It is a full two years later in before two scientists, a geologist and an oceanographer, visit the atoll with the filmmakers. They begin taking observations and having meetings with the people. Survey measurements made by Scott Smithers, the geologist, show that the taro garden is now below sea level, and salt water intrusion is killing the plants. John Hunter, the oceanographer, notes with alarm that what used to be high tide is now considered low tide. The scientists inform the villagers that their problems will only get worse as the sea level continues to rise.



High tides regularly hit the poorly maintained sea walls designed to keep the sea from salinating the land.

Photograph by thereoncewasanisland.com

The most dramatic part of the movie occurs in December 2008 while the scientists are visiting. The swell from a distant storm combines with a spring tide, and for three days unusually large waves sweep across the atoll and inundate much of the village. The school is destroyed. Many lose their homes and possessions. Much of the food supply is washed away. The village calls to Bougainville for help, but the crew of the supply ship is on strike so no assistance is forthcoming.

This devastating flood, along with what the scientists have been saying, shows the villagers how precarious their life on the atoll is. One

man, who at the beginning of the movie said he would never leave, has decided that the only future his family has is to relocate to Bougainville. He and his wife worry about the new way of life that awaits them and their children, and how they will be treated because they are outsiders. Another man thinks adaptation is the answer, and he wants to rebuild the village “the way it should have been” by building on higher ground and using stilts to raise the homes above the rising tides. As the movie ends, we do not yet know the ultimate fate of the people of Takū.



Endar, one of the central figures in the documentary.

Photograph by thereoncewasanisland.com

I watched *There Once Was An Island* along with Maegan Rowilson, your new SPaRCE Coordinator, here in Norman at the Sam Noble Oklahoma Museum of Natural History. The movie was shown as part of the museum’s “Warrior Spirits” exhibit, which features a display of art and other artifacts from the island of New Guinea, as well as several Pacific-themed events. We at SPaRCE headquarters are delighted that people in Oklahoma have this opportunity to learn a little about the Pacific Islands!

Along with the movie Dr. Kevin Kloesel, a climatologist here at the University of Oklahoma, gave a presentation about climate change and answered questions from the audience. Global warming has become so controversial, especially in the United States, that what most people know about the subject comes from uninformed or unreliable sources. Watching the movie and being able to interact with Dr. Kloesel was a good opportunity for people in the audience to learn about climate change and to see that it is not just an abstract problem but something that is already affecting people around the world.

By Michael Klatt

Pacific nation may move entire population to Fiji

March 9, 2012

Fearing that climate change could wipe out their entire Pacific archipelago, the leaders of Kiribati are considering an unusual backup plan: moving the populace to Fiji.

Kiribati President Anote Tong told the Associated Press on Friday that his Cabinet this week endorsed a plan to buy nearly 6,000 acres on Fiji's main island, Viti Levu. He said the fertile land, being sold by a church group for about \$9.6 million, could be insurance for Kiribati's entire population of 103,000, though he hopes it will never be necessary for everyone to leave.

"We would hope not to put everyone on one piece of land, but if it became absolutely necessary, yes, we could do it," Tong said. "It wouldn't be for me, personally, but would apply more to a younger generation. For them, moving won't be a matter of choice. It's basically going to be a matter of survival."

Kiribati, which straddles the equator near the international date line, has found itself at the leading edge of the debate on climate change because many of its atolls rise just a few feet above sea level.

Tong said some villages have already moved and there have been increasing instances of sea water contaminating the island's underground fresh water, which remains vital for trees and crops. He said changing rainfall, tidal and storm patterns pose as least as much threat as ocean levels, which so far have risen only slightly.

Some scientists have estimated the current level of sea rise in the Pacific at about 2 millimeters

(0.1 inches) per year. Many scientists expect that rate to accelerate due to climate change.

Fiji, home to about 850,000 people, is about 1,400 miles south of Kiribati. But just what people there think about potentially providing a home for thousands of their neighbors remains unclear. Tong said

he's awaiting full parliamentary approval for the land purchase, which he expects in April, before discussing the plan formally with Fijian officials.

Sharon Smith-Johns, a spokeswoman for the Fijian government, said several agencies are studying Kiribati's plans and the government will release a formal statement next week.

Kiribati, which was known as the Gilbert Islands when it was a British colony, has been an independent nation since 1979.

Tong has been considering other unusual options to combat climate change, including shoring up some Kiribati islands with sea walls and even building a floating island. He said this week that the latter option would likely prove too expensive, but that he hopes reinforcing some islands will ensure that Kiribati continues to exist in some form even in a worst-case scenario.

"We're trying to secure the future of our people," he said. "The international community needs to be addressing this problem more."

Tong said he hopes that the Fiji land will represent just one of several options for relocating people. He pointed out that the land is three times larger than the atoll of Tarawa, currently home to more than half of Kiribati's population.



A man fishes on a bridge on Tarawa atoll, Kiribati.

By Richard Vogel, 2004 AP photo

Hawaii Tornado Brings Hail, Dampens Vacations



For about a week, Hawaii's famous sunny weather has been replaced with thunderstorms, golf-ball pieces of hail, and the arrival of what weather officials say was the first tornado in four years to hit the islands.

Image: KABC

March 10, 2012

By: Audrey McAvoy and Treena Shapiro

The tornado formed as a waterspout offshore. After 7 a.m., it pushed more than a mile inland, tearing off part of a roof and carrying it several hundred yards through the coastal town and Honolulu suburb of Kailua. No one was injured.

A 30-minute hail storm Friday over windward Oahu was "unprecedented" for Hawaii, said Tom Birchard, senior meteorologist for the National Weather Service in Honolulu. Not only is it highly unusual for hail to fall over Hawaii, but stones that measured as large as three inches are record-breaking, he said.

Small stones were reported to have fallen on other islands over the course of about a week of heavy rains that closed schools, caused sewage spills, flooded homes and dampened vacations. There were landslides, power outages and roads blocked by trees, boulders and mud.

The weather service estimates the tornado had wind speeds of 60 to 70 miles per hour and stretched 20 yards wide. The twister damaged or destroyed several roofs and toppled trees and power lines.

The last tornados to hit Hawaii were waterspouts that traveled over Kauai's south side in 2008 and Lanai in 2006. Both caused less damage, however, as they struck less densely populated areas.

For the seven-day period ending Friday, the highest rainfall level was nearly 46 inches in Hanalei on Kauai.

While there were reports of hotels crowded by guests stranded from canceled flights, George Costa, director of Kauai's Office of Economic Development, said hotels were faring well as rain subsided Friday. "There are several road closures due to landslides and most of the inconvenience is being experienced by the resort staff not being able to report to work," he said.

Gov. Neil Abercrombie declared a disaster for Oahu and neighboring Kauai, which were the first islands to see the brunt of the storms. Nearly 100,000 gallons of a heavy mixture of storm water and untreated wastewater spilled into streams during five different sewer spills on Oahu, city officials said.

The Coast Guard warned mariners to brace their vessels for gusty trades forecast, and a small craft advisory was issued for all waters around the islands, which will be vulnerable to a line of thunderstorms producing strong winds of nearly 40 mph or greater and possible waterspouts.

At least six boats broke away from their moorings, and one boat sank after being struck by lightning Monday.



In this handout photo provided by the County of Maui, Maui Fire Department personnel are shown looking at flooded home along the Kamehameha V Highway Highway on Molokai in the County of Maui, Hawaii, Thursday, March 8, 2012. Parts of Hawaii continue to get drenched by thunderstorms and heavy rains that has caused large hail, closed schools, sewage spills and ruined vacations.

(AP Handout Photo/County of Maui, Kahiwa McVay) (AP / AP)

Cameron's Historic Dive Cut Short by Leak; Few Signs of Life Seen

"Gotta leave something for the next one," the explorer-filmmaker said.



Explorer-filmmaker James Cameron emerges from his sub after returning from Challenger Deep.

Photograph by Mark Thiessen, National Geographic

March 26, 2012, Monday noon

By Ker Than

In what he called a "heckuva ride," James Cameron came "screaming back up" from Earth's deepest point in about 70 minutes Monday, breaking the Pacific Ocean surface.

The filmmaker and National Geographic explorer's solo sub dive—the deepest ever—had taken him nearly 7 miles (11 kilometers) underwater to the Mariana Trench's Challenger Deep, southwest of Guam.

Emerging from his cramped "pilot sphere" after surfacing, Cameron flashed two thumbs up.

"It was bleak," Cameron said. "It looked like the moon."

As for life-forms, he said, "I didn't see a fish. ... I didn't find anything that looked alive to me, other than a few [shrimplike] amphipods in the water."

"I didn't feel like I got to a place where I could take interesting geology samples or found anything interesting biologically."

This may be, in part, because a hydraulic fluid leak convinced Cameron to end the mission after about three hours. Previous projections had him surveying and sampling Challenger Deep and its life-forms for as long as six hours.

"I saw a lot of hydraulic oil come up in front of the port. The port got coated with it," he explained.

Cameron had planned to collect rock and animal samples with the sub's mechanical arm, but with the leak, "I couldn't pick anything up, so I began to feel like it was a moment of diminishing returns to go on."

Finally, he said, "I lost a lot of thrusters. I lost the whole starboard side. That's when I decided to come up. I couldn't go any further—I was just spinning in a circle."

Earlier, an issue with the sub's sonar system had scuttled the launch of a baited, unmanned "lander."

The lander was supposed to touch down at Challenger Deep hours before Cameron's arrival and attract deep-ocean predators and scavengers.

But without the sonar system working properly, finding the lander would have been difficult, explained Doug Bartlett, chief scientist for the Deepsea Challenge project, a partnership with the National Geographic Society and Rolex.

Before the launch, "we decided he's not going to just happen upon" the lander without using sonar, said Bartlett, a marine biologist at the Scripps Institution of Oceanography in San Diego, California. "He's not going to have that much bottom time. So it's just not worth it" to deploy the lander.

Cameron remained optimistic. "Next dive," he said. "Gotta leave something for the next one."

Scripps's Bartlett had emphasized that Monday's dive was only the beginning and could "represent a

Continued on next page

Cameron's Historic Dive Cut Short by Leak; Few Signs of Life Seen

turning point in how we approach ocean science.

"I absolutely think that what you're seeing is the start of a program, not just one grand expedition."

On descent and ascent, the sub was "screaming down, and then screaming back up," Cameron said. We took off so fast from the bottom the whole thing was just shaking."

As the 57-year-old explorer emerged from the sub's coffin-tight 43-inch-wide (109-centimeter-wide) cockpit, a medical team stood at the ready.

But if recent test dives—including one to more than five miles (eight kilometers meters) down—are any indication, Cameron should be physically fine, despite having been unable to extend his arms and legs for hours, MacInnis told National Geographic News before the dive.

In addition, the sub's pilot sphere has a handlebar, which Cameron could use to pull himself up occasionally during the dive. "Usually, shifting position is all that's required to buy yourself another few hours," he said.

Because Cameron had prepared extensively for the dive, he should be in good psychological health, said Walter Sipes, an aeronautics psychologist at NASA's Johnson Space Center.

Still, if Cameron plans to conduct more dives—which the team has indicated he will—Sipes recommends he get plenty of rest in between or risk mental fatigue.

"When you start to get fatigued, you start making mistakes," he added. "And since he's down there solo, he can't afford that. He's a [potential] single-point failure."

By returning humans to the so-called hadal zone—the ocean's deepest level, below 20,000 feet (6,000 meters)—the Challenger Deep expedition may represent a renaissance in deep-sea exploration.

While remotely operated vehicles, or ROVs, are much less expensive than manned subs, "the critical thing is to be able to take the human mind down into that environment," expedition member Patricia Fryer said, "to be able to turn your head and look around to see what the relationships are between organisms in a community and to see how they're behaving—to turn off all the lights and just sit there and watch and not frighten the animals, so that they behave normally.

Andy Bowen, project manager and principal developer of the Nereus, an ROV that explored Challenger Deep in 2009, said a manned mission also has the potential to inspire public imagination in a way a robot can't.

At a time of fast-shrinking funds for undersea research, "what scientists need is the public support to be able to continue exploration and research of the deep ocean," a biological oceanographer Lisa Levin, also at Scripps said.

"He's down there on behalf of everybody else on this planet," MacInnis said. "There are seven billion people who can't go, and he can. And he's aware of that."



The Deepsea Challenger being hoisted by a crane after Monday's Mariana Trench dive.

Photograph by Mark Thiessen, National Geographic.

Answers to “Ask a Meteorologist”

How come there are two barometric highs every 24 hours—one between 9 AM and 10 AM and a second one between 10 PM and midnight? What is the mechanism?

- Ted Brattstrom, Ka'u High and Pahala Elementary School, Pahala, Hawaii

This is a very interesting (and observant!) question, Ted. Air is a fluid just like water, and the atmosphere acts like an ocean of air in many ways—meteorologists have more kinds of waves than surfers do. What you have discovered is the atmospheric tide. Just like the ocean tide causes a rise and fall of water height, the atmospheric tide causes a rise and fall of air pressure. In both cases this is just a regular change in the amount of “stuff” at a location. If you wanted to, you could measure sea level changes using a barometer, and we talk about heights in the atmosphere—but measuring that is a lot more difficult than using a tidal gauge.

Three main things cause ocean and atmospheric tides: the sun's gravity, the moon's gravity, and heating from the sun. The importance of each one is different for water and air, so ocean tides and atmospheric tides aren't exactly the same. The sun's and moon's gravitational forces cause "bulges" in both the ocean and atmosphere, and as they move around the local sea level and barometric pressure will change. Solar heating causes tidal forces by reducing the density of both water and air (as a fluid warms, its density decreases). Because the moon moves around the earth, its gravity has a much greater effect on tides than the sun's gravity. However, the density of air is very sensitive to changes in temperature, so the position of the sun has the greatest effect on atmospheric tides. Water density, on the other hand, is not very sensitive to changes in temperature, so ocean tides are mainly caused by the moon.

As you've observed, there are two atmospheric high tides a day at around 10:00 in the morning and 10:00 at night, with two low tides in between. The difference between tides reaches a maximum of about 1.5 millibars (~0.04" Hg) at the Equator. Changes in the weather will cause much larger differences than that, so you'll need a few days of fair weather and a sensitive barometer to observe the tide.

Thanks for the question, Ted!

Please welcome the new additions to the SPaRCE Program!

- Pohnpei Catholic School— Pohnpei, Federated States of Micronesia
 - Kimbe Secondary School— Papua New Guinea
 - Okkodo High School— Guam
 - Tailulu College— Tonga
 - Ka'u High & Pahala Elementary School— Hawaii
 - Sasina Primary School— Samoa
-

Contribute to the Newsletter!

Put Your Story in the SPaRCE Newsletter!

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.

Ask A Meteorologist!

Do You Have Questions?
We Want To Answer Them!

If you or your students have any questions relating to science or weather 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.



Activities Page

Water Word Search



- BOTTLE
- DRAIN
- DRIP
- ICE
- LIQUID
- POOL
- RIVER
- SPLASH
- SWIM
- WAVE
- COLD
- DRINK
- GLACIER
- ICEBERG
- OCEAN
- RAIN
- SEA
- STEAM
- TIDE
- WET

Joke Section

What do you call it when it rains chickens and ducks?
Foul (Fowl) Weather!

What happens when it rains cats and dogs?
You have to be careful not to step in a puddle.

Why don't mother Kangaroos like rainy days?
Their kids have to play inside.

Think Quest ©Copyright 2010

http://library.thinkquest.org/3805/jokes/joke_menu.htm

Science Kids © 2012. All Rights Reserved.
<http://www.sciencekids.co.nz/quizzes/wordsearch/water.html>

Sudoku

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

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



Puzzlers

- There are three switches downstairs. Each corresponds to one of the three light bulbs in the attic. You can turn the switches on and off and leave them in any position. How would you identify which switch corresponds to which light bulb, if you are only allowed one trip upstairs?
- Why did weathermen draw a little picture of a ship on a map of the Atlantic Ocean?

Look for answers in the next newsletter!

Previous newsletter puzzle answers:

Sudoku

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

Math Quiz

42. The lowest common denominator of 2, 3, and 7 is 2 x 3 x 7 or 42.
- Stan was 5 years old and Bob was 15 years old.



Puzzles devised by © Kevin Stone
www.brainbashers.com

Classroom Science Focus: Desalination

Earth's water is in constant motion, with no beginning or end. The continuous movement is referred to as the water cycle, also known as the hydrologic cycle. When water from oceans and other bodies of water is heated by the sun, evaporation occurs and condenses into clouds, returning to earth in the form of rain and snow. As the water evaporates, salt remains in the ocean. When the water returns to earth through precipitation, it's fresh water that's free from salt.

Materials:

- Salt Water
- Heavy ceramic cup or mug
- Large glass bowl (large enough to fit the cup inside)
- Plastic cling wrap or plastic bags
- A rock or small weight
- Sunlight

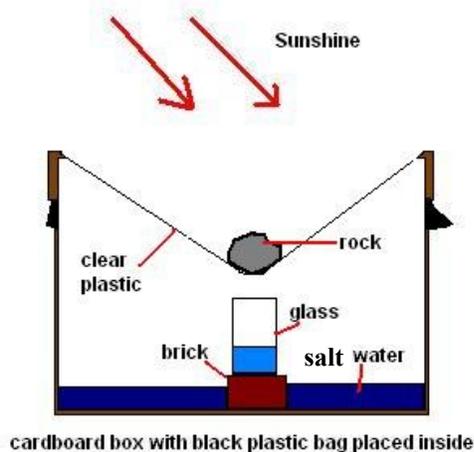


Image from: http://2.bp.blogspot.com/_X7IYGjOz8_0/SIJU9-ae62I/AAAAAAAAAHl/ZuOiNbyxTkI/s400/cardboard+distiller2.JPG

plastic wrap. You should see drops of water formed and flowing downward slowly into the cup where the water was placed. Once the cup has some water in it (there will be a small amount) you can pull back the plastic wrap and remove the cup.

7. You now have pure and clean water, free from any salt!

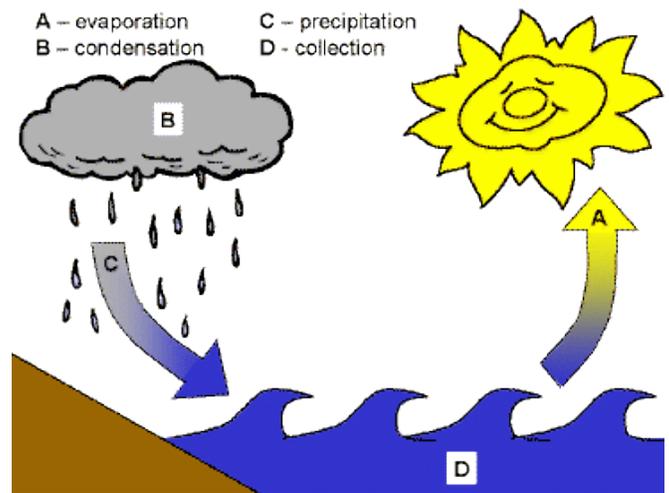
Explanation:

Water vapors form inside the bowl as the sun warms the water, evaporating it. The plastic wrap acts as a form of greenhouse, trapping the vapor inside and causing the humidity to rise to 100%. The top of the plastic wrap is much cooler because it's in contact with outside air. When the humid air inside rises and touches the top of the plastic wrap (the cooler area), the water vapor condenses and forms water droplets on the under surface of the wrap. As time passes, the water droplets around the plastic wrap grow larger and flow to the center of the wrap. As the droplets join together, they grow heavier and eventually drop into the cup, resulting in pure, clean, fresh water that's devoid of salt!

Experiment:

1. Pour the salt water into the cup or mug so that it's about 1 inch deep. And pour the salt water from the cup into the bowl.
2. Rinse the cup and dry it, ensuring it's free of any salt residue and place the cup in the center of the bowl.
3. Cover bowl top tightly with plastic cling wrap. Ensure there are no open spots around the rim.
4. Find a safe and clean place that gets LOTS of sunshine, such as on a window sill. Put the bowl down where it can get the most amount of sun.
5. Place a rock or weight on top of the plastic wrap, right above the cup. It should cause the plastic wrap to sag in the center above the cup. This step is essential to ensuring the water falls into the cup, so make sure it's right. Then wait for several hours.

6. Water condensation should form on the underside of the plastic wrap. You should see drops of water formed and flowing downward slowly into the cup where the water was placed. Once the cup has some water in it (there will be a small amount) you can pull back the plastic wrap and remove the cup.



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ENSO Discussion

Issued by the Climate Prediction Center/NCEP, 5 April 2012

Synopsis: La Niña is expected to transition to ENSO-neutral conditions during April 2012.

La Niña continued to weaken during March 2012, as below-average SSTs persisted primarily in the central Pacific. All Niño indices warmed considerably during the last two months. The oceanic heat content (average temperature in the upper 300m of ocean) anomalies also continued to warm, with alternating pockets of negative and positive temperature anomalies observed within the upper 100 m in the central and eastern Pacific. Significant anomalous low-level westerly winds developed in the western tropical Pacific in late March, associated with the MJO. This wind event may further warm the central and eastern Pacific in the next few months. Presently, however, the larger scale atmospheric circulation anomalies and the Southern Oscillation Index retain their La Niña characteristics. Accordingly, convection remains suppressed in the western and central Pacific and enhanced over Indonesia, Malaysia, and the Philippines. Collectively, these oceanic and atmospheric patterns indicate that a transition from La Niña to ENSO-neutral conditions is underway.

A majority of models predict ENSO-neutral conditions for March-May 2012, continuing through the Northern Hemisphere summer 2012. Based on the continued weakening of the negative SST anomalies during March 2012 and on the historical tendency for La Niña to dissipate during the Northern Hemisphere spring, expect La Niña to dissipate during April 2012. ENSO-neutral conditions should persist throughout the summer. Thereafter, there is considerable uncertainty in the forecast, which slightly favors ENSO-neutral or developing El Niño conditions over a return to La Niña conditions during the remainder of 2012.

Because atmospheric impacts often lag the demise of an ENSO episode, aspects of La Niña are reflected in the coming season. Over the U.S. during April - June 2012, La Niña has the following weak influences on the climate outlook— An increased chance of above-average temperatures in the south-central U.S. and below-average temperatures in the Northwest. Also, drier-than-average conditions are more likely across Utah and Colorado and along the western Gulf of Mexico.

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 3 May 2012. To receive an e-mail notification when the monthly ENSO Diagnostic Discussions are released, please send an e-mail message to: ncep.list.ensu-update@noaa.gov.