



The Pacific Tradewinds Quarterly

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

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Global Precipitation at Your Fingertips, Part II: Data Access

By Zhong Liu

NASA Goddard Space Flight Center, Goddard Earth Sciences Data and Information Services Center and George Mason University; Center for Geospatial Science and Systems

In Part I, the concept of measuring precipitation from space using sensors from satellites, such as TRMM and geostationary satellites, was introduced. A brief description of several satellite-gauge precipitation products was given as well along with a short discussion about product accuracy. Finally examples of the precipitation products were presented.

Accessing precipitation data products can be a challenging task for many. For example, to generate a global or regional precipitation map, users will have to first locate and download a file from a data archive center, set up a computing environment, learn the data format, and write their own software for data processing and display if it is not provided. All these could be a burden to them, especially for non-professional users and those in developing countries.

The NASA Goddard Earth Sciences

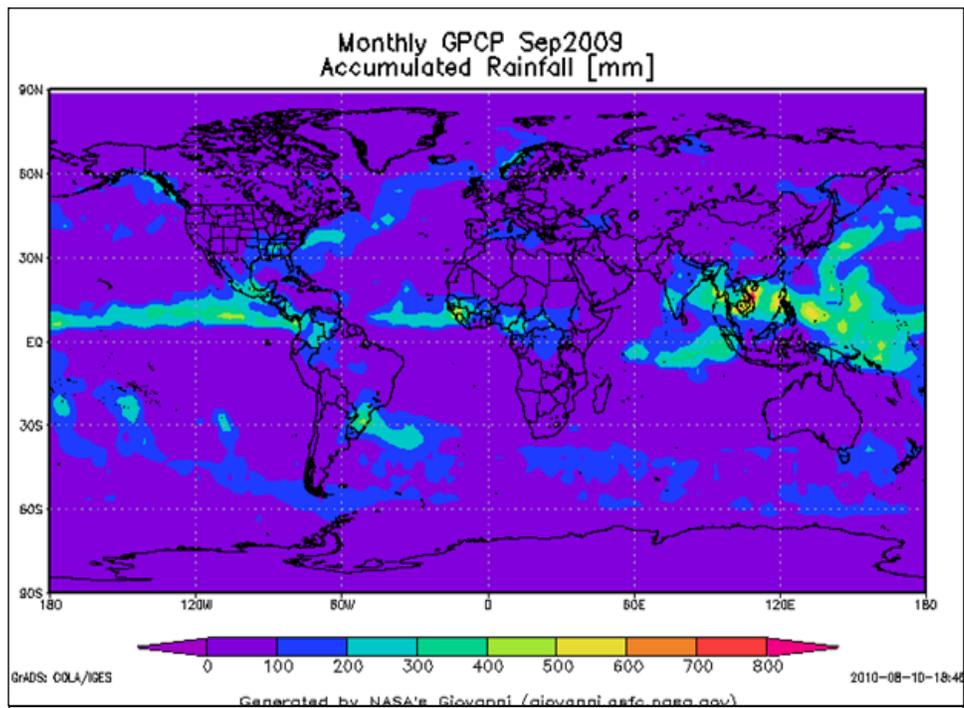


Figure 1. An example of TOVAS output window. Users can further refine a map or plot, such as, using a different unit or modifying a color bar.

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Data and Information Services Center (GES DISC) is the archive site of TRMM and other global precipitation data products. To facilitate data access, GES DISC has developed the TRMM Online Visualization and Analysis System (TOVAS; URL: <http://disc2.nascom.nasa.gov/tovas/>), as a part of the GES DISC Interactive Online Visualization and Analysis Infrastructure or "Giovanni" (URL: <http://disc.gsfc.nasa.gov/giovanni>). With a web browser and few mouse clicks, an individual can easily obtain global Earth science data visualizations and analyses without downloading data and software. The principle design goal for Giovanni was to provide a quick and simple interactive means for scientific data users to study various weather and climate phenomena by trying different combinations of parameters measured by different instruments, arrive at a conclusion, and then generate graphs suitable for a report or publication. Alternatively, Giovanni can provide a means to ask relevant "what-if" questions and receive rapid results that would stimulate further investigations. These procedures would all be done without having to download and preprocess large amounts of data.

TOVAS consists of a web landing page, a graphic user interface (GUI) for precipitation products, and an output window for plots and data. From the landing page, users can access different precipitation products and services. A summary of the available precipitation products is given in Table 1. From the GUI, users can select an area of interest, a parameter, a plot type, a time period, etc. After clicking the Generate Plot button, users will see a separate new window (Fig. 1) that contains the

Temporal Resolution	Products
3-hourly	3B43RT (near-real-time), 3B42
daily	3B42RT (derived), 3B42 (derived)
Monthly	3B43 (satellite-gauge combined), 3A12 (TRMM microwave imager), 3A25 (TRMM precipitation radar), GPCP (satellite-gauge combined), GPCC (gauges), Willmott (gauges)

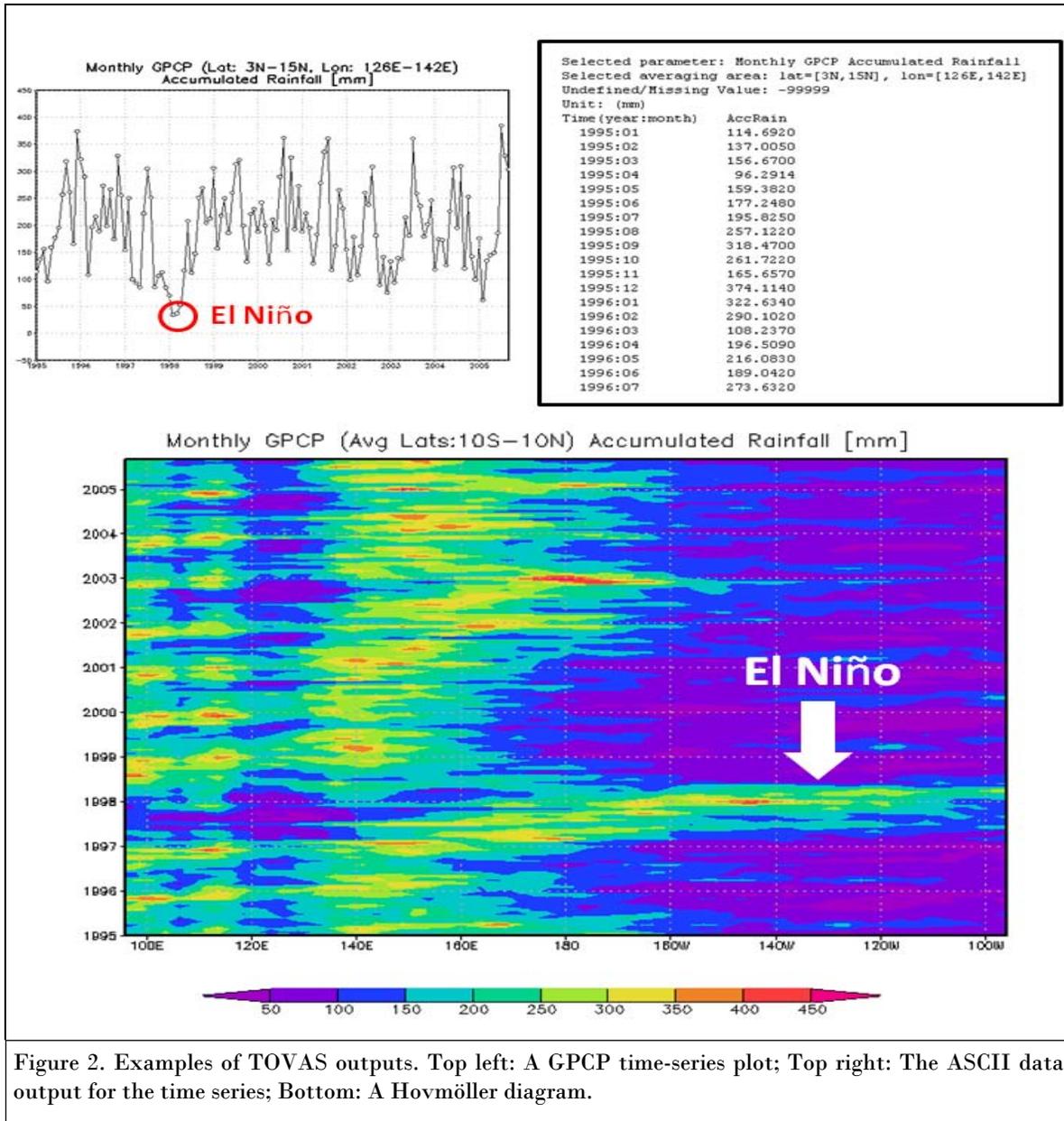
Table 1. List of TOVAS global precipitation products.

Output Type	Description
Area Plot	Area plot averaged or accumulated over any available data period within any rectangular area
Time Plot	Time series averaged over any rectangular area
Hovmöller Plots	Longitude-time and latitude-time plots
Anomaly Plot	Area plot averaged over any available data period within any rectangular area
Normalized Anomaly Plot	Area plot averaged over any available data period within any rectangular area. Normalized anomaly is defined as (rainfall – climatology)/climatology
Animations	Animations available for area plots
ASCII Output	ASCII output available for all plot types, suitable feeding GIS or other applications

Table 2. Functions supported by GIOVANNI TOVAS.

plot. In this case, the plot is the answer to the first question in Part I: how much precipitation fell last month around the entire globe? If you want to know precipitation in your area of interest, simply use the mouse to select the area in the map selection area. To compute a long term average is simple: select Rain Rate (mm/day) and a time period. The result will be a map of the average rain rate for that period. If you want to know the total rainfall amount for a specific time period, simply select Accumulated Rainfall (mm) and the result will give you the total rainfall map.

Selecting "Time Series, Area-averaged" from Plot Type will generate a time-series plot, such as the one in Fig. 2 (top left). The El Niño event described in Part I is marked with a red circle. Users can output the data in ASCII (top right in Fig. 2) and import it to a spreadsheet, such as Microsoft Excel, for further processing. A Hovmöller diagram is for tracking time evolution of physical parameter and is often used in meteorology and climate research. TOVAS provides this function as well. Fig. 2 (bottom) is an example of the strong El Niño event in January 1998 marked with a white arrow. It is seen that precipitation moved gradually from west



to east over the equatorial Pacific Ocean. A summary of the available functionality is in Table 2.

Finally we introduce an ancillary tool for investigating weather phenomena, the Hurricane Data Analysis Tool (HDAT, URL: <http://disc.gsfc.nasa.gov/HDAT>). After you obtain a rainfall map (e.g. Typhoon Melor in Part I) and you would like to know the related weather event, HDAT can provide this information. The image at the bottom in Fig. 3 contains the infrared (IR) dataset described in Part I. In Fig. 3, it is seen that

Melor just became a typhoon while its neighbor, Typhoon Parma, on the left had become a super typhoon.

Similar to TOVAS, HDAT allows users to conduct online visualization and analysis of several remote sensing and model datasets for educational activities and studies of tropical cyclones and other weather phenomena. HDAT includes data from TRMM, the NASA Quick Scatterometer (QuikSCAT) and NCEP Reanalysis, and the NCEP/CPC half-hourly, 4-km Global (60°N - 60°S)

IR Dataset.

Basic functions of HDAT include selection of area and time of interest, single imagery, overlay of two different products, animation, a time skip capability, and different image size outputs. Users can save an animation as a file (animated GIF) and import it in other presentation software, such as Microsoft PowerPoint. Since the tool can directly access the real data, more features and functionality can be added in the future.

We hope you enjoy our precipitation products and tools. Please let us know if you encounter any problems or difficulties. You could send inquiry email to Dr. George Huffman (george.j.huffman@nasa.gov) for science issues or me (Zhong.Liu@nasa.gov) for TOVAS/HDAT questions. Happy exploration!

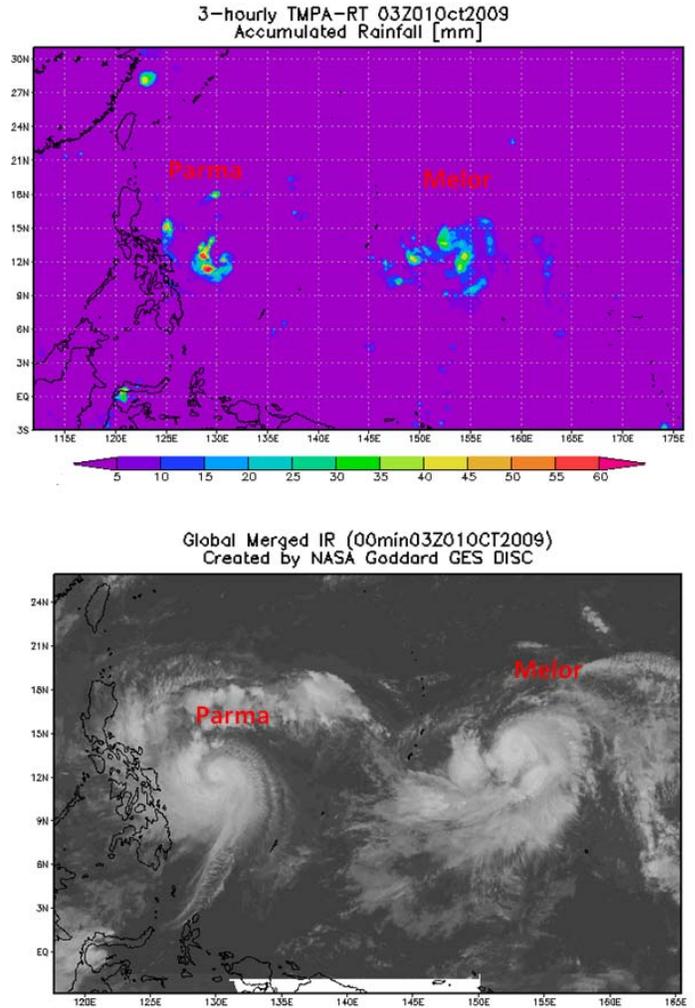
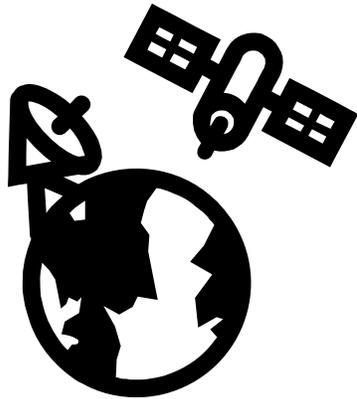


Figure 3. Top: a rainfall map for Typhoons Parma and Melor. Bottom: An example of the merged IR product from the Hurricane Data Analysis Tool.

Fiji to Study Migration of Humpback Whales

Country maintains vast whale sanctuary

Monday, August 16, 2010

A three-year survey on the migration patterns of humpback whales in Fiji waters is set to get underway, after the project was approved for funding by the Australian Marine Mammal Centre.

Sightings of the whales will be recorded and photographs and sound recordings collected in an effort to help establish migration patterns, breeding grounds, and the population structure.

[PIR editor's note: In 2003, the [Environment News Service](#) reported that "the government of Fiji has declared the island nation's Exclusive Economic Zone

(EEZ) to be a whale sanctuary. The sanctuary covers 1.26 million square kilometers of waters used by migrating humpback whales for breeding and calving.]

Aisake Batibasaga from Fiji's Department of Fisheries says the project will also help researchers to understand the impact of whaling on the population.

The project aims to be relatively low-cost and easy to replicate so the survey can be continued over a long period of time.

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U.S. Weather Agency to Build New Offices in Pohnpei

National Oceanic and Atmospheric Administration gets lease

Friday, August 27, 2010

Palikir, Pohnpei—A one year lease agreement, automatically renewable for a maximum period of 20 years, was signed by Pohnpei and the U.S. [National Oceanic and Atmospheric Administration](#) (NOAA), on behalf the National Weather Service in the Pacific region.

This lease authorizes NOAA to build, operate, and maintain a U.S. National Weather Service office on the three parcels of land located in Kolonia town, which it currently occupies.

[PIR editor's note: Kolonia is located on the northern side of Pohnpei with the largest population estimated at 6,000 people. Total land area is 0.58 square miles.]

As a result of this agreement, Pohnpei agrees to make available the land to NOAA at no cost.

NOAA plans on building two new structures, removing the old ones as it builds the new ones.

One of the new buildings will function as the office and operations center and the other will be a new upper air inflation building which will allow for atmospheric soundings and weather balloon launches

to gather data. The weather service personnel can then use the collected data to create a "snapshot" of the current state of the atmosphere.

In exchange for the lease, NOAA will make available to Pohnpei, without compensation, the services and related programs of the U.S. National Weather Service.

Such services include supporting the Federated States of Micronesia (FSM) National Weather Service and providing equipment, training, and maintenance support for local personnel.

The Weather Service Office in Pohnpei currently employs 12 people and no change is expected as a result of the new construction.

The agreement was signed by Pohnpei Gov. John Ehsa and Ralph "Jeff" Ladouce, director of the U.S. National Weather Service Office in the Pacific Region.

At the end of the 20-year term of the agreement, NOAA will have the option to request a succeeding lease agreement of up to another 20 years.

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Move Afoot to Protect Pacific Wetlands

Five countries subscribe to plan

Friday, September 3, 2010

Wellington, New Zealand—A new plan to conserve Pacific wetlands has been developed to promote the wise use of water-based ecosystems throughout the region.

The three year plan is based on the international [Ramsar Convention](#), where countries commit to the conservation projects.

The [Secretariat of the Pacific Regional Environment Programme's](#) Ramsar officer for Oceania, Vai Jungblut, says wetlands include a range of habitats.

"You have everything from upland fresh water swamps, fresh water lakes, and crater lakes. You have rivers, you have streams, you have ground water aquifers, you have ponds, you have coral reefs, you have mangroves, you have sea grass meadows, and you have lagoons. There's quite a

wide range of habitats that fall in the term 'wetlands'."

[PIR editor's note: [Solomon Times](#) notes that "in the Pacific, wetlands are critical to the livelihood of families and communities. They have an immense value in providing fish and other foods, as well as supply a vast range of products such as building materials, handicrafts, medicines, cosmetics and ornamentation for Pacific peoples."]

Vai Jungblut says he hopes the plan will strengthen laws covering these areas and improve communication between government agencies.

He says Fiji, Marshall Islands, Palau, Papua New Guinea, and Samoa are already parties to the plan, and he is also helping Tonga, Niue, and Kiribati prepare to join the international agreement.

Reprinted from: *Pacific Islands Report* (<http://pidp.eastwestcenter.org/pireport/2010/September/09-06-16.htm>)

Source: *Radio New Zealand International*: <http://www.rnzi.com/>

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Search on for Hydropower Site in Solomon Islands

Six sites eyed on Guadalcanal's Tina River

Tuesday, September 28, 2010

By Jemima Garrett

Melbourne, Australia - The Solomon Islands government hopes to have a decision on a site for the proposed Tina River hydropower project within a month.

Key stakeholders, including donors, the Solomon Islands government, and landowners are meeting in Honiara to examine the options. They are considering 6 sites for the Tina River hydro project.

Mines and Energy Minister Mark Kemakeza said project would provide cheaper and more reliable electricity and slash Honiara's carbon emissions by up to 70 per cent.

[PIR editor's note: *Pacific Scoop* reports that "the cost of electricity in Honiara is amongst the most expensive in the world at approximately US\$ 0.55 per kilowatt

hour. Unreliable power supply has affected the operations of schools, hospitals, health clinics, and businesses around the capital."]

Stakeholders are considering the geology of the different sites, ease of access and the social and environmental impacts.

Energy Director John Korinihona says a decision on the site is expected within a month, and the government hopes to see the plant finished within 4 years.

Reprinted from: *Pacific Islands Report* (<http://pidp.eastwestcenter.org/pireport/2010/September/09-30-09.htm>)

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Aussie Firm to Fight Deforestation in Solomons

Shift2Neutral to protect vast forest resources

Tuesday, September 28, 2010

Honiara, Solomon Islands—An international organization, [Shift2Neutral](#), has partnered with a local Solomon Islands group to try and start a Carbon Project to protect millions of hectares against deforestation.

A Memorandum of Agreement (MOA) has been signed by Shift2Neutral and the Founder of the Solomon Islands Carbon Project, Mr. Charles Stennett Kereau. The MOA sets out key initiatives and drivers to protect natural land and forests in the Solomon Islands, and to work together to cease the decline of the environment at local and national levels.

The long term goal of the Solomon Islands Carbon Project and Shift2Neutral is to halt unsustainable deforestation and allow the local society to protect the ecosystems on which we all depend. Shift2Neu-

tral and the Solomon Islands Carbon Project believe this can be achieved with real benefits to local stakeholders.

"We must recognize the rights of indigenous peoples and the local communities involved, [and] protect their native and indigenous environment and culture through mechanisms that provide assistance to them and the protection of their land," the group said in a joint statement.

"Regardless of national or international policies, deforestation cannot be combated effectively unless local landowners and residents have a desire and need to protect the forests."

Reprinted from: *Pacific Islands Report* (<http://pidp.eastwestcenter.org/pireport/2010/September/09-30-17.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.

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



Math Quiz

1. Find a number whose double exceeds its quarter by 7.
2. Are there more inches in a mile or Sundays in a thousand years?
3. A farmer was asked how many chickens he had sold at market that day. His reply was: "I've had four customers today, and each bought half of my remaining chickens, plus a half chicken." The farmer sold all of his chickens at market that day. How many chickens did the farmer sell?

Look for answers in the next newsletter!

Previous newsletter puzzle answers:
Sudoku Math Quiz

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

The temperatures were -6, -2, 2, 6, 10 degrees C. Each day increased by a steady 4 degrees.

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

What's Going on with SPaRCE

Greetings friends! As always, I hope this newsletter finds you safe and well. I hope you enjoyed the cover article from our good friend, Zhong Liu about the TRMM Online Visualization and Analysis System (TOVAS). He was kind enough to offer to write the follow up article to George Huffman's article in the last newsletter. I hope some of your students can use this data in their class projects.

If you did not receive the last newsletter please let me know and I'll send one your way. Also, if you have any questions about any of the topics discussed in this (or any other) newsletter, please send me an email (or letter through post) and I'll be happy to help you. Be sure to keep collecting your rainfall and temperature data so you and your students can use it in the activities.

Also, I would love to hear more from our participants. If you have some spare time feel free to send me an email (nikkiacton@gmail.com) and tell me a bit about yourself, students, and your school. If anyone needs instrument replacements please let me know as soon as possible.

-Nikki Acton, on behalf of the SPaRCE crew.

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.

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



Classroom Science Focus

Climatology

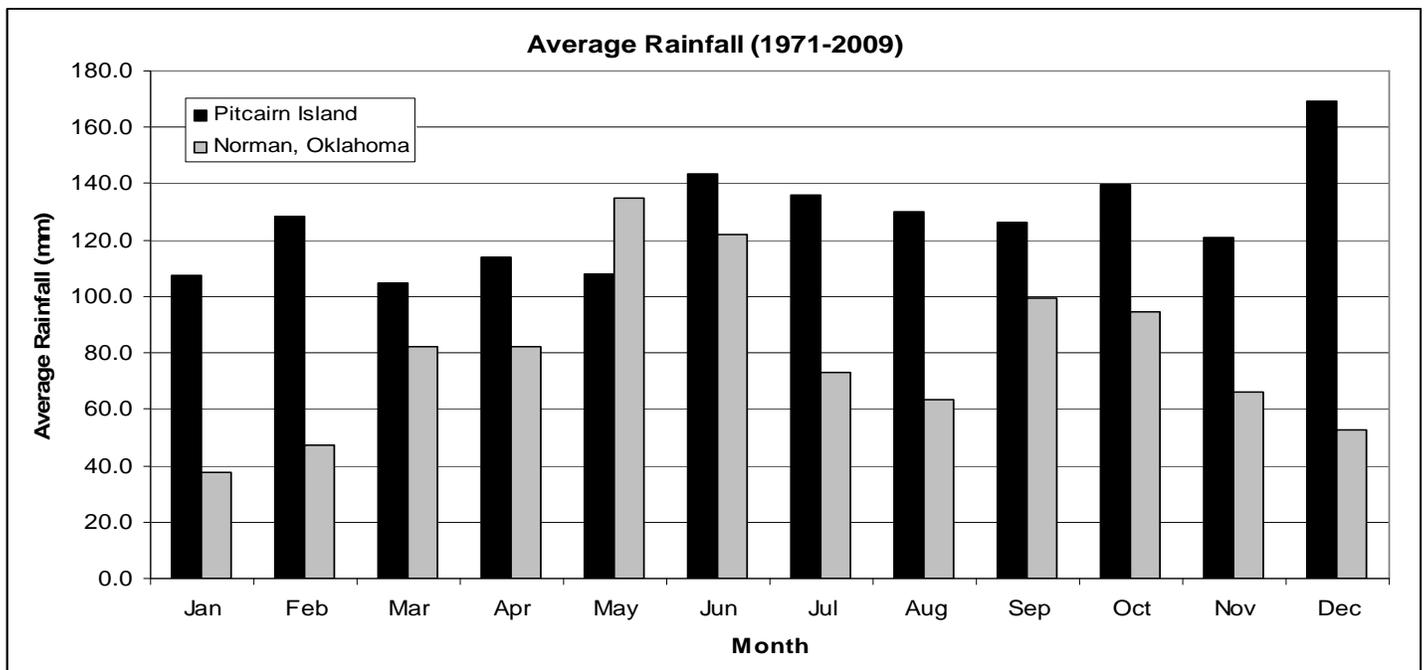
Climatology is commonly defined as the long-term average of a given variable, often over time periods of 20-30 years. Climatology graphs may be computed for a variety of time ranges such as daily, weekly, and yearly. A monthly climatology, for example, will produce a mean value for each month over a specified time range (usually around 30 years for scientific reports). Not only can you use different time scales, you can use different weather variables such as temperature, humidity, wind speed, wind direction, and others can be used to create a climatology graph.

In the last issue of the Pacific Tradewinds Quarterly (Volume 18, Issue 3) we discussed the difference between weather and climate and how to calculate averages. This Classroom Science Focus lesson will focus on comparing the climatology of Pitcairn Island and the location of SPaRCE Headquarters in Norman, Oklahoma, USA.

Using the equation to calculate the average, you can create a climatology graph like the one below. This graph compares the monthly average rainfall for Pitcairn Island and Norman, Oklahoma. First, you will need to calculate the total for every month of data you have available (for the graph below we have data for 1971-2009, using SPaRCE and other data in the [PACRAIN database](#), contact us if you need copies of your data). After you have done this for each month, calculate the average of each month. Lastly, plot your averages on a bar graph. You can create your graph by hand using pencil and paper or by computer if you have access to a computer and graphing software.

Plotting the average rainfall for two or more locations creates a visual representation of rainfall (or other weather variable) in which one can compare historical climatology. From this graph you can see that Pitcairn receives more rainfall per year than we do in Oklahoma. Oklahoma's rainiest month is May and it is the only month where Pitcairn has historically received less rainfall than Oklahoma. Pitcairn's rainiest month is December while in Oklahoma it is one of the driest months.

Now you can use your SPaRCE data that you have collected to create a climatology graph! Be sure to send us a copy of your graphs so we can put them in the next newsletter.



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ENSO Discussion

issued by The Climate Prediction Center/NCEP 7 October 2010

Synopsis: La Niña is expected to last at least unto the Northern Hemisphere spring 2011.

La Niña continued during September 2010 as reflected by the large expanse of below-average sea surface temperatures (SSTs) across most of the equatorial Pacific Ocean. All weekly Niño SST index values were between -1.3°C and -1.8°C at the end of the month. In addition, the subsurface heat content (average temperatures in the upper 300m of the ocean) remained below-average, reflecting a shallower-than-average thermocline in the central and eastern Pacific. Convection remained enhanced over Indonesia and suppressed over the western and central equatorial Pacific. This pattern was linked to a continuation of enhanced low-level easterly trade winds and anomalous upper-level westerly winds over the western and central equatorial Pacific. Collectively, these oceanic and atmospheric anomalies reflect the ongoing La Niña.

Consistent with nearly all of the forecast models, La Niña is expected to last at least into the Northern Hemisphere spring 2011. Just over half of the models, as well as the dynamical and statistical averages, predict La Niña to become a strong episode (defined by a 3-month average Niño-3.4 index of -1.5°C or colder) by the November-January season before beginning to weaken. Even though the rate of anomalous cooling temporarily abated during September, this model outcome is favored due to the historical tendency for La Niña to strengthen as winter approaches.

Likely La Niña impacts during October-December 2010 include suppressed convection over the central tropical Pacific Ocean, and enhanced convection over Indonesia. La Niña is associated with suppressed hurricane activity across the central and eastern tropical North Pacific.

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 4 November 2010. To receive an e-mail notification when the monthly ENSO Diagnostic Discussions are released, please send an e-mail message to: ncep.list.ensupdate@noaa.gov.

Get to Know: Austin Spires

Hello! I'm Austin Spires, and I have been working for the Oklahoma Wind Power Initiative, within the same office as SPaRCE, since this September. I work as a technology commercialization analyst for OWPI, developing implementation strategies for the great products that come out of this office. I recently graduated from OU this year with a degree in Geography, and I'm excited to put my degree to good use within the confines of OWPI.

For as long as I can remember, I've been interested in the environment, particularly in ways that mankind can live in a fulfilled state while reducing negative environmental impacts; the work that OWPI and SPaRCE does fits in well with these interests. It's exciting to work around the driven and visionary people in these offices.

When I'm not working, I try to enjoy the outdoors as much as possible. My hobbies include cooking, exercising, building things, spending time with friends, and playing musical instruments – all in various eclectic combinations. Doing these things outdoors only improves the experience.

