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A Quarterly Bulletin of the Pacific El Niño/Southern Oscillation Applications Climate (PEAC) Center Providing Information on Climate Variability for the U.S.-Affiliated Pacific Islands

http://www.prh.noaa.gov/peac

CURRENT CONDITIONS

El Niño conditions matured during the first few months of 2010, and by the end of June 2010, the Pacific Basin entered a La Niña. The climate state of the Pacific Basin progressed to moderate to strong La Niña conditions from August through the end of the year. December's standardized Tahiti-minus-Darwin sea-level pressure (The NOAA version of the Southern Oscillation Index -- SOI) value of +3.2 is the highest monthly value of the SOI in the CPC archive, which goes back to 1951. The weather patterns across Micronesia were generally those expected during moderate to stronger La Niña events. Examples include very strong and persistent easterly surface winds and a westward displacement of tropical cyclone activity. The strength of the low-level easterly winds in the central equatorial Pacific was the highest in the CPC archived record. The CPC archive of low-level winds in the equatorial Pacific begins in 1979, and contains information from ships, buoys and weather satellites. In response to these strong easterly low-level wind anomalies, the sea level across Micronesia rose during the latter half of 2010, from near normal at the beginning of the year, to several inches above normal by the end of the year. Additional alterations to the weather patterns were observed that are typical during years that follow El Niño (regardless of whether the climate state enters La Niña or returns to ENSO-neutral). These include a substantial reduction of tropical cyclones in the western North Pacific basin, a near elimination of the normal monsoon trough in Micronesia, increased rainfall over Indonesia, reduced rainfall over the equatorial portion of the central and western Pacific to about 150°E, and a reduction of annual rainfall at most sites (see Figure 1 on page 2). A deep collapse (the biggest ever observed) in the number of tropical cyclones in the North Pacific Basin during 2010 was far beyond what is normally seen during similar years (see the discussion on tropical cyclone activity on page 3).

In American Samoa, the 2010 annual rainfall was near normal. The start of the 2010-2011 rainy season in American Samoa was generally tranquil and a bit drier than average. A tropical cyclone (TC08P – Wilma) hit American Samoa on January 23rd, 2011, and the island experienced wind gusts up to 70mph. During 2011, it is anticipated that the most likely scenario would be for the current La Niña conditions to slowly fade back to ENSO-neutral by June or July. In this scenario, Guam and the CNMI would probably have near normal rainfall for the foreseeable future.

In the state of Hawaii, recent near-normal rainfall has eased drought conditions in most areas. With the beginning of the wet season in October 2010, pastures and general vegetation conditions have greatly improved. A record daily maximum rainfall total of 5.41 inches fell at the Honolulu International Airport on Sunday, December 19th, breaking the old record of 5.28 inches set in 1955. This one day event doubled December's monthly rainfall total to 11.73 inches, set the monthly percent of normal precipitation to a whopping 412%, and pushed the annual total much closer to normal.

The following comments from the 06 January 2011 **EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION** were posted on the U.S. Climate Prediction Center web site on:

"ENSO Alert System Status: La Niña Advisory

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°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.

The current ENSO model forecasts have not changed significantly compared to last month. La Niña is currently near its peak and is expected to persist into the Northern Hemisphere spring 2011 at a lesser intensity. Thereafter, there remains considerable uncertainty as to whether La Niña will last into the Northern Hemisphere summer (as suggested by the NCEP CFS 10 February 2011…

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.enso-update@noaa.gov**."

SEA SURFACE TEMPERATURES

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°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.

SOUTHERN OSCILLATION INDEX

The 3-month average of the Southern Oscillation Index for the 4th Quarter of 2010 was +2.2, with monthly values of +1.8, +1.5, and +3.2 for the months of October, November and December 2010, respectively. These recent positive SOI values, in addition to negative sea surface temperature readings, indicate the presence of moderate to strong La Niña conditions in the tropical Pacific Ocean.

Normally, positive SOI values in excess of +1.0 are associated with La Niña conditions, and negative SOI values below -1.0 are associated with El Niño conditions. Low SOI values suggest a weak coupling between the ocean and the atmosphere. The SOI is an index representing the normalized sea-level pressure difference between Darwin, Australia and Tahiti, respectively.

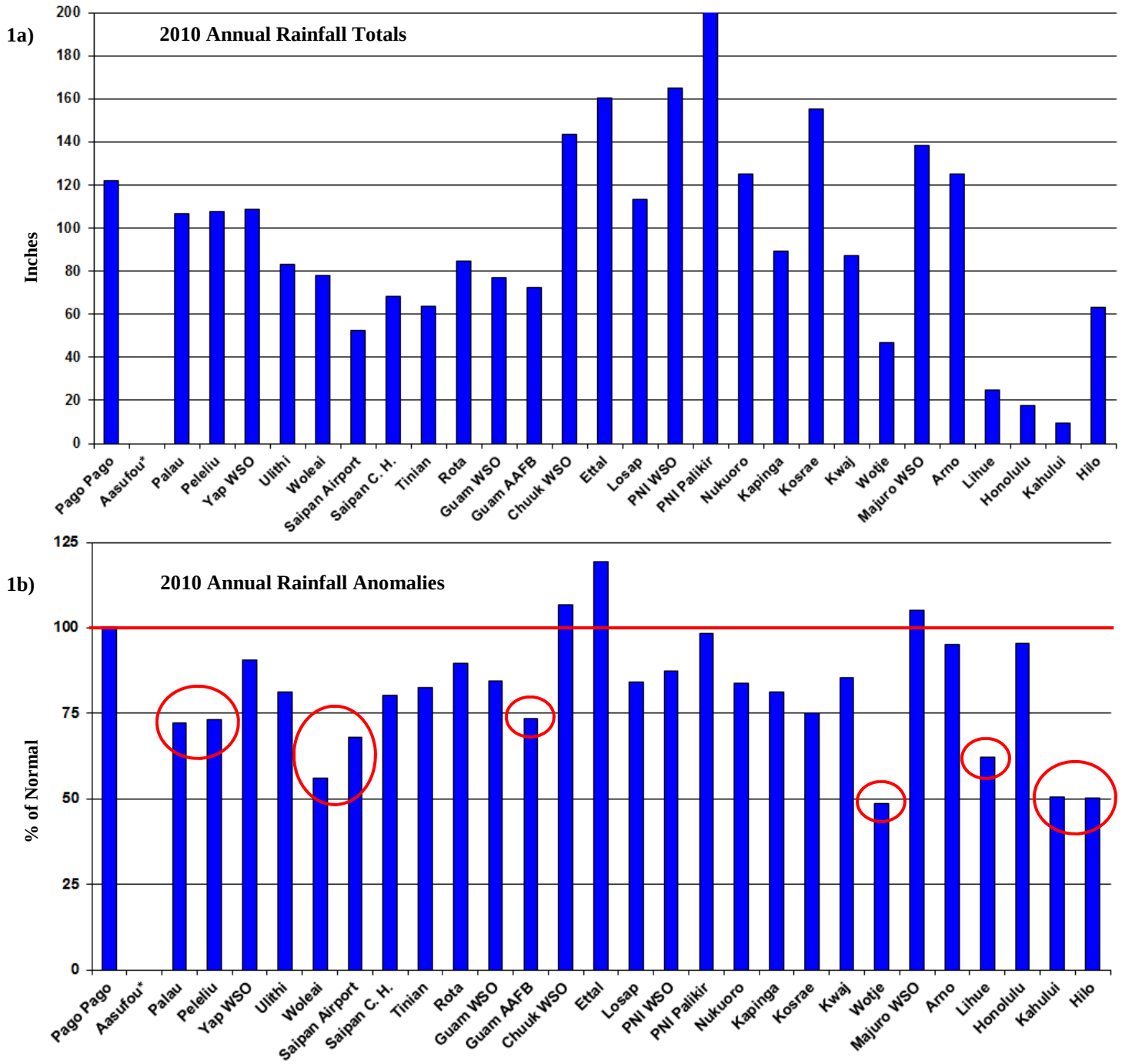

Figure 1, above. 2010 rainfall totals (a) in inches and (b) anomalies (expressed as % of normal). In 1b, solid line indicates normal rainfall (100%) and circles indicate rainfall less than 75% of normal. *Aasufou data not available.

TROPICAL CYCLONE

The PEAC archives western North Pacific tropical cyclone numbers, track coordinates, and 1-minute average maximum sustained wind taken from operational warnings issued by the Joint Typhoon Warning Center (JTWC) of the U. S. Air Force and Navy, located at Pearl Harbor, Hawai'i. Western North Pacific tropical cyclone names are obtained from warnings issued by the Japan Meteorological Agency (JMA), which is the World Meteorological Organization's Regional Specialized Meteorological Center (RSMC) for the western North Pacific basin. The PEAC archives South Pacific tropical cyclone names, track coordinates, central pressure, and 10-minute average maximum sustained wind estimates from advisories issued by the Tropical Cyclone Warning Centers at Brisbane, Nadi, and Wellington. The numbering scheme and the 1-minute average maximum sustained wind estimates are taken from warnings issued by the JTWC. There are sometimes differences in the statistics (e.g., storm maximum intensity) for a given tropical cyclone among the agencies that are noted in this summary.

Tropical Cyclone Summary

As mentioned earlier, there was a deep collapse in the number of tropical cyclones in the North Pacific Basin during 2010. Both the western North Pacific and eastern North Pacific cyclone totals were far below normal. The 14 named tropical cyclones that occurred in the western North Pacific was the lowest total in the modern record, which extends back to 1959 (the year that the JTWC was established on Guam). The JTWC numbered 19 tropical cyclones during all of 2010 (a record low). Of these 19 numbered cyclones, 14 were given names by the Japan Meteorological Agency. To qualify for a name, a cyclone must attain at least tropical storm intensity. Tropical depressions with lesser winds may earn number designators from the JTWC, but are not named by the JMA. Of the 19 cyclones numbered by the JTWC, eight were typhoons, six were tropical storms, and five were tropical depressions. On average there are 18 typhoons, 10 tropical storms, and 3 tropical depressions in the western North Pacific. The eastern North Pacific also saw a substantial reduction of tropical cyclone activity. The National Hurricane Center (NHC) in Miami named only 7 cyclones there (a record low). The 2010 cyclone summary for the eastern North Pacific included 3 hurricanes, 4 tropical storms, and 5 tropical depressions. The Central Pacific Hurricane Center in Honolulu had only one cyclone to deal with during 2010. This unusual cyclone (Tropical Storm Omeka) formed late in the year (mid-December) to the west of Hawaii in a relatively rare sub-tropical weather pattern similar to the pattern that spawned Typhoon Dolphin in 2008. Thus, the total number of named tropical cyclones in the North Pacific was 22. This is far below the typical value of approximately 45, and is an unprecedented low value in the modern-day time series, which dates back to 1966 when satellite imagery made counts of cyclones in the eastern North Pacific more reliable. There is currently no generally accepted explanation for the dramatic decline in North Pacific tropical cyclones. Some climate simulations of a warmer world indicate reduced tropical cyclone activity in the Pacific, but given the high activity of the decade of the 1990s followed by the low activity of the 2000s, it is difficult to attribute the recent reduction of activity to global warming.

PEAC Center Tropical Cyclone Outlook

The PEAC tropical cyclone outlook[1] for the first half of 2011 (the quiet half of the typhoon season) is for below normal tropical cyclone activity in the western North Pacific basin. The continuation of the La Niña weather pattern of anomalous low-level easterly winds coupled with anomalous westerly winds in the upper troposphere should continue to prevent the normal development of the monsoon trough, and inhibit tropical cyclone development through at least June 2011. Thereafter, the weather patterns should return to a state that is closer to normal, and the distribution of tropical cyclones in the western North Pacific should return to a more normal distribution. The extreme reduction and westward displacement of tropical cyclones seen in 2010 is not expected to repeat during 2011. Normally, above average cyclone activity for Micronesia is seen when the state of the Pacific climate is entering El Niño. Two agencies[1] that publish long-range outlooks of TC activity for the western North Pacific have not yet done so. These outlooks are generally available by April 1st, and will be reported in the next PEAC Newsletter.

At the time of this writing, American Samoa has just experienced the passage of a tropical cyclone, Wilma (TC 08P). This cyclone passed very near to Pago Pago on 24 January 2011. The cyclone intensity was not extreme. It was somewhere at or just below minimal hurricane intensity. A discussion of the impact of this (and any additional) cyclone on American Samoa will appear in the next PEAC Newsletter.

[1]The PEAC tropical cyclone forecasts for 2010 are provisional. The PEAC considers input from three seasonal outlooks for tropical cyclone activity in the western North Pacific basin: (1) The City University of Hong Kong Laboratory for Atmospheric Research, under the direction of Dr. J. C-L. Chan; (2) The Benfield Hazard Research Centre, University College London, Tropical Storm Risk (TSR) research group, UK, led by Dr. Adam Lea and Professor Mark Saunders (http://www.tropicalstormrisk.com); and, (3) an experimental typhoon outlook produced by Paul Stanko (forecaster at the Guam WFO).

LOCAL SUMMARY AND FORECAST

American Samoa: For 2010, rainfall at American Samoa ended near its average annual value (1971-2000 average). The year started with some very wet conditions (28.30 inches of rainfall at Pago Pago during January 2010). Thereafter, the rainfall was near normal throughout much of the dry season. The year ended dry, with November and December particularly so. Gusty trade winds were noted over much of the recent dry season. Hurricane Wilma passed directly over American Samoa at the end of January 2011. It appears that Wilma was of severe tropical storm intensity when it passed; peak measured winds were 50 kt with gusts to 70 kt. Wilma became a very powerful 115 kt (Saffir-Simpson Category 4) hurricane 2.5 days after passing American Samoa when it was located well to the south of the Fiji Islands. More complete storm data should be available for the next newsletter.

American Samoa Rainfall Summary 4th Qtr 2010						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
Pago Pago WSO	**Inches**	15.33	9.15	4.34	**28.82**	**122.23**
	% Norm	86%	67%	68%	**80%**	**100%**

Climate Outlook: American Samoa is now entering the heart of its rainy season. The first two months of the rainy season (November and December 2010) were drier than normal. January 2011 may be wetter than normal, thanks in part to the passage of Cyclone Wilma over the island. Climate models favor near normal to above normal rainfall over the next three-month period. The next dry season (June - September 2011) is currently anticipated to have near normal rainfall. The risk of a damaging tropical cyclone is typically below normal during a La Niña event. However, the recent direct hit of Cyclone Wilma on American Samoa illustrates that the risk of a tropical cyclone at a given location is likely never zero during its cyclone season. For the remainder of the cyclone season (through June 2011) we are cautiously optimistic that there will be no additional adverse impacts from tropical cyclones in the Samoa region. The cyclones should favor the Coral Sea, and be a threat primarily to the east coast of Australia across to Fiji and New Caledonia.

Predicted rainfall for American Samoa from January 2011 through December 2011 is:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]
January - March 2011 (Heart of Rainy Season)	**100% (37.31 - Pago Pago)**
April - June 2011 (Onset of Next Dry Season)	**100%**
July - September 2009 (Heart of Next Dry Season)	**100%**
October - December 2009 (Onset of Next Rainy Season)	**120%**

[1] Forecast rainfall quantities represent BEST ESTIMATES given the probabilistic forecast for each particular season and station.

LOCAL SUMMARY AND FORECAST

Guam/CNMI: Throughout Guam and the CNMI, the weather and climate of 2010 was dull and uneventful. Rainfall throughout the region was generally below normal for most months. During the rainy season (roughly July through November) there was an unusual lack of tropical cyclone activity, and there was a notable lack of episodes of southwest monsoonal winds and squalls. An episode of hazardous surf at the end of December was responsible for a tragic accident at the reef line of Tumon, Guam, which claimed the life of two canoe paddlers. Also on Guam during 2010, there were two separate freak accidents in which weakened tree limbs broke and fell on individuals, resulting in death in both cases.

The dry season is now underway on Guam and in the CNMI. Dry weather began early, with November and December having well below normal rainfall totals. Two slow-moving shear line passages produced some heavy showers that pushed the rainfall total in January 2011 above the totals seen for both November and December. The average monthly rainfall on Guam follows a sinusoidal pattern with a peak

Guam and CNMI Rainfall Summary 4th Qtr 2010						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
Guam						
GIA (WFO)*	**Inches**	13.54	4.38	4.09	**22.01**	**76.81**
	% Norm	112%	53%	76%	**86%**	**84%**
AAFB**	**Inches**	9.20	4.03	2.59	**15.82**	**72.28**
	% Norm	71%	44%	43%	**57%**	**73%**
Dededo (Ypapao)	**Inches**	11.80	5.67	2.63	**20.10**	**74.99**
	% Norm	92%	62%	44%	**72%**	**76%**
Ugum Watershed	**Inches**	17.45	7.33	5.54	**30.32**	**78.82**
	% Norm	134%	81%	86%	**106%**	**76%**
Sinajaña	**Inches**	16.32	4.97	4.02	**25.31**	**79.88**
	% Norm	136%	61%	75%	**99%**	**84%**
CNMI						
Saipan Intl. Airport	**Inches**	3.59	5.10	1.86	**10.55**	**52.47**
	% Norm	33%	88%	48%	**52%**	**68%**
Capitol Hill	**Inches**	7.68	5.78	4.06	**17.52**	**68.29**
	% Norm	64%	79%	85%	**73%**	**76%**
Tinian Airport	**Inches**	8.71	3.98	3.05	**15.74**	**63.45**
	% Norm	73%	55%	64%	**65%**	**82%**
Rota Airport	**Inches**	10.02	6.36	2.50	**18.88**	**84.87**
	% Norm	79%	74%	44%	**70%**	**90%**

*GIA-Guam International Airport
**AAFB-Anderson Air Force base

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of near 15 inches during September, and a minimum of approximately 3 inches during March. At the CNMI locations north of Guam, the average rainfall tracks the same sinusoidal curve as on Guam, but each month has less rainfall (e.g., at Saipan, the average monthly rainfall is 1-2 inches less than it is on Guam).

Climate Outlook: During years that begin in La Niña and then transition towards ENSO-neutral, the spring rainfall is typically near normal or above normal. Guam and the CNMI are now entering the heart of their dry season. March is typically the driest month of the year in this region, with 3 to 4 inches of rainfall on Guam and only about 2 to 3 inches on Saipan. During April through June, the average rainfall increases by about 1 inch per month (e.g. on Guam: March = 3inches, April = 4 inches, May = 5 inches, and June = 6 inches). In July, the rainy season usually begins and the monthly rainfall jumps to 9 or 10 inches. These typical values are anticipated this year during these months.

Guam and the CNMI depend on tropical cyclone activity for much of their rainy season rainfall. Following an El Niño event, and during most La Niña years, the weather is tranquil (inhibited monsoon with a reduction of tropical cyclones). The odds are reduced (i.e., from 20% to 10 %) for the occurrence of a tropical cyclone. The chances for extremes of rainfall (4 or more inches of rain in 24 hours) are similarly reduced. Rainfall is reduced the most during the years that follow El Niño; it is near normal during La Niña; and, the wettest years tend to occur when La Niña wanes to ENSO-Neutral or the beginning of another El Niño. During 2011, it is anticipated that the most likely scenario would be for the current La Niña conditions to slowly fade back to ENSO-neutral by June or July. In this scenario, Guam and the CNMI would probably have above normal rainfall during the 2011 dry season (i.e., January through June).

Predicted rainfall for the Mariana Islands from January 2011 through December 2011 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]	
	Guam/Rota	Saipan/Tinian
January – March 2011 (1st Half of Dry Season)	**120% (13.40 inches)**	**120% (9.29 inches)**
April – June 2011 (2nd Half of Dry Season)	**110%**	**110%**
July - September 2011 (Onset of Next Rainy Season)	**100%**	**100%**
October - December 2011 (2nd Half of Next Rainy Season)	**110%**	**100%**

[1] Forecast rainfall quantities represent BEST ESTIMATES given the probabilistic forecast for each particular season and station.

Federated States of Micronesia

Yap State: During 2010, all Yap island locations had annual rainfall that was near normal to slightly below normal. The weather was unremarkable, and there were no serious impacts by tropical cyclones. Water supplies from rain catchment, wells, and surface reservoirs were adequate throughout the year. Some of the atolls in the southeastern part of Yap State (e.g., Woleai) were dry during 2010. The dryness in this region may have been an influence of La Niña to keep the normal monsoon trough out of the region and replace it with a weak ridge of high pressure. Woleai (and likely other southern and southeastern atolls of Yap State) had 2010 annual rainfall amounts reduced to nearly half of normal.

Yap State Rainfall Summary 4th Qtr 2011						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
Yap Island						
Yap WSO	**Inches**	17.33	8.64	6.48	**32.45**	**108.77**
	% Norm	123%	32%	78%	**73%**	**91%**
Dugor	**Inches**	14.57	5.93	8.32	**28.82**	**102.11**
	% WSO	122%	65%	93%	**96%**	**85%**
Gilman	**Inches**	16.23	8.40	10.75	**35.38**	**103.26**
	% WSO	136%	93%	120%	**118%**	**86%**
Luweech	**Inches**	16.02	8.48	6.17	**30.67**	**108.29**
	% WSO	134%	93%	69%	**102%**	**90%**
Maap	**Inches**	12.73	4.51	9.05	**26.29**	**90.20**
	% WSO	106%	50%	101%	**88%**	**75%**
North Fanif	**Inches**	15.64	7.68	11.18	**34.50**	**105.48**
	% WSO	131%	85%	124%	**115%**	**88%**
Rumung	**Inches**	13.60	10.64	10.01	**34.25**	**109.58**
	% WSO	114%	117%	111%	**114%**	**91%**
Tamil	**Inches**	12.60	6.76	7.52	**26.88**	**91.35**
	% WSO	105%	75%	84%	**90%**	**76%**
Outer Islands						
Ulithi	**Inches**	13.34	9.58	5.10	**28.02**	**82.98**
	% Norm	131%	124	67%	**110%**	**81%**
Woleai	**Inches**	9.65	8.12	6.92	**24.69**	**77.85**
	% Norm	71%	75%	60%	**69%**	**56%**

Climate Outlook: Yap State is entering its dry season. The months of February through April are the heart of the normal dry season. During 2011, it is anticipated that the most likely scenario would be for the current La Niña conditions to slowly fade back to ENSO-neutral by June or July. In this scenario, near-normal to above-normal rainfall is likely for most islands of Yap State through the dry season (February

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through May). The rainy season should begin on time in late May or early June. Tropical cyclone activity should be reduced through the first half of 2011, and then become near normal for the remainder of 2011.

Predicted rainfall for Yap State from January 2011 through December 2011 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]	
	Yap and Ulithi	Woleai
January – March 2011 (Heart of Dry Season)	**120% (22.60 inches)**	**100% (26.48 inches)**
April – June 2011 (Onset of Rainy Season)	**110%**	**100%**
July – September 2011 (Heart of Next Rainy Season)	**110%**	**100%**
October – December 2011 (End of Next Rainy Season)	**120%**	**100%**

[1]Forecast rainfall quantities represent BEST ESTIMATES given the probabilistic forecast for each particular season and station.

Chuuk State: Annual rainfall throughout Chuuk State was near normal to slightly above normal during 2011. As with any normal year, there were some months with very little rainfall (e.g., 2.46 inches at Chuuk WSO in February) and some months with large rainfall totals (e.g., 22.64 inches at Chuuk WSO in August. The weather was generally tranquil during 2010, with few extremes of wind or rainfall. Sea level became higher than normal during 2010 because of La Niña, and some minor coastal inundations at high tide were noted in the latter months of the year. Similar to the dry conditions experienced during 2010 in the southeastern atolls of Yap State, the western atolls of Chuuk State (e.g., Polowat) were also quite dry during 2010. The influence of La Niña to replace the normal summer and fall monsoon trough with a weak ridge of high pressure probably contributed to the dry conditions in this region of Micronesia.

Chuuk State Rainfall Summary 4th Qtr 2010						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
Chuuk Lagoon						
Chuuk WSO	**Inches**	15.79	7.04	9.20	**32.03**	**143.55**
	% Norm	118%	68%	85%	**93%**	**107%**
Piis Panew*	**Inches**	9.47	4.22	5.52	**19.21**	**82.56**
	% WSO	71%	41%	51%	**56%**	**61%**
Western Atolls						
Polowat	**Inches**	2.76	2.78	2.94	**8.48**	**56.88**
	% Norm	23%	30%	32%	**28%**	**47%**

* Values estimated: new observer in training.

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Chuuk State Rainfall Summary 4th Qtr 2010						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**1st Half**
Southern Mortlocks						
Lukunoch	**Inches**	12.48	11.45	12.50	36.43	**151.02**
	% WSO	93%	111%	115%	105%	**112%**
Ettal	**Inches**	15.48	9.62	15.94	41.04	**160.42**
	% WSO	115%	93%	147%	119%	**119%**
Ta	**Inches**	15.08	6.94	14.10	36.12	**139.14**
	% WSO	112%	67%	130%	104%	**104%**
Northern Atolls						
Fananu	**Inches**	13.48	6.14	3.58	**23.20**	**90.85**
	% WSO	100%	59%	33%	**67%**	**68%**
Onoun	**Inches**	18.51	7.21	4.51	**30.23**	**115.64**
	% WSO	138%	70%	42%	**87%**	**86%**
Northern Mortlocks						
Losap	**Inches**	14.51	8.38	8.33	**31.22**	**113.08**
	% WSO	108%	81%	77%	**90%**	**84%**
Nama	**Inches**	10.22	6.67	8.55	**25.44**	**112.51**
	% WSO	76%	65%	79%	**74%**	**84%**
Namoluk	**Inches**	10.16	9.90	8.52	**28.58**	**127.97**
	% WSO	76%	96%	79%	**83%**	**95%**

Climate Outlook: During 2011, it is anticipated that the most likely scenario would be for the current La Niña conditions to slowly fade back to ENSO-neutral by June or July. In this scenario, easterly low-level winds should continue to dominate the flow throughout Chuuk State for the next several months. Heavy rainfall should be confined to an east-west band known as the trade-wind trough or Inter-Tropical Convergence Zone (ITCZ). The location of the ITCZ in the spring produces a gradient of rainfall within Chuuk State, with higher amounts to the south of the Chuuk Lagoon area (e.g., Ettal and Lukunoch) and lower amounts to the north (e.g., Fananu and Namonuito Atoll). Rainfall could therefore be heavy across central and southern portions of Chuuk State in the spring (April and May) with above normal rainfall seen across Chuuk Lagoon and in the southern Mortlocks. Thereafter, near normal rainfall is anticipated .

Predictions for Chuuk State from January 2011 through December 2011 at the top of page 7.

Pohnpei State: Weather conditions on Pohnpei Island and most atolls of Pohnpei State were tranquil and unremarkable during 2010. One of the atolls of Pohnpei State, Kapingamarangi, is near the equator, and became very dry in the last few months of 2010. The rainfall there was 0.72 inches, 1.10 inches, 2.07 inches, and 0.76 inches during September, October, November and December, respectively. The 4-month

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Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]			
	Chuuk Lagoon, Losap, and Nama	Polowat	Northern Atolls and Islands	Southern Mortlocks
Jan – Mar 2011	**95% (24.48 inches)**	**90% (23.19 in)**	**90% (23.19 in)**	**100% (25.77 in)**
Apr – Jun 2011	**120%**	**100%**	**100%**	**120%**
Jul – Sep 2011	**100%**	**95%**	**100%**	**100%**
Oct – Dec 2011	**100%**	**95%**	**100%**	**100%**

[1] Forecast rainfall quantities represent BEST ESTIMATES given the probabilistic forecast for each particular season and station.

total of 4.65 inches was only 17% of the normal 4-month total of 27.65 inches. Because of these very dry conditions, the WFO Guam in coordination with the WSO Pohnpei, issued weekly special drought statements for this island. The dry conditions at Kapingamarangi and at other islands close to the equator (e.g., Tarawa and Nauru) occurred because of the La Niña-related westward extension along the equator of cold sea surface temperatures. A bit further north, at Nukuoro (approximately 4° N latitude), there was a brief period of very dry weather during November, when only 1.08 inches (9%) was experienced. Thereafter, moderate rainfall returned to Nukuoro. At Pohnpei Island (approximately 7° N latitude)

Pohnpei State Rainfall Summary 4th Qtr 2010						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
Pohnpei Island						
Pohnpei WSO	**Inches**	12.22	14.23	11.85	**38.30**	**165.11**
	% Norm	73%	90%	78%	**80%**	**87%**
Palikir	**Inches**	13.35	12.89	22.17	**48.41**	**200.87**
	% Norm	74%	76%	135%	**94%**	**98%**
Kolonia Airport	**Inches**	11.95	11.96	14.03	**37.94**	**141.59**
	% Norm	87%	93%	112%	**97%**	**91%**
Atolls of Pohnpei State						
Nukuoro	**Inches**	10.48	1.08	3.85	**15.41**	**125.29**
	% Norm	97%	9%	32%	**44%**	**84%**
Pingelap	**Inches**	13.95	10.22	8.97	**33.14**	**131.31**
	% Norm	94%	72%	67%	**78%**	**74%**
Mwoakilloa	**Inches**	14.09	13.66	16.84	**44.59**	**138.69**
	% Norm	97%	101%	130%	**109%**	**87%**
Kapingamarangi	**Inches**	1.10	2.07	0.76	**3.93**	**89.33**
	% Norm	23%	25%	9%	**18%**	**81%**

LOCAL SUMMARY AND FORECAST

and at other atolls of Pohnpei State further off the equator (e.g., Pingelap, and Mwoakilloa), the rainfall was near normal during 2010. As usual, Palikir topped the list of rainfall totals in Pohnpei State during 2010 with 200.87 inches (98%). This was the highest annual total rainfall observed throughout Micronesia during 2010. A few miles away at WSO Pohnpei, the rainfall total during 2010 was 165.11 inches (87%).

Climate Outlook: Easterly low-level winds should continue to dominate throughout Pohnpei State for the next several months, as the current La Niña slowly fades back to ENSO-neutral by June or July. In this scenario, the trade-wind trough (also called the ITCZ) becomes established across Pohnpei State in the spring. Thus, during the first half of 2011, it is likely to be wetter than normal for most islands and atolls of Pohnpei State except for Kapingamarangi. Normally, February is the driest month for most Pohnpei locations. Then, as the ITCZ strengthens in the spring, abundant rains commence. May is typically the wettest month for most locations on Pohnpei Island. This year should be no exception, with abundant rainfall that is anticipated to be above normal, especially for the 3-month period of April through June. Thereafter, near normal rainfall is anticipated on Pohnpei Island. At Kapingamarangi, where it has been very dry for the past several months, near-normal rainfall should return by April. The risk on Pohnpei Island, or any of the atolls of Pohnpei State, of hazardous effects from tropical cyclones is anticipated to be very low during 2011.

Predicted rainfall for Pohnpei State from January 2011 through December 2011 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]	
	Pohnpei Island and atolls	Kapingamarangi
Jan - Mar 2011	**100% (33.93 inches)**	**70% (24.22 inches)**
Apr - Jun 2011	**120%**	**85%**
Jul - Sep 2011	**100%**	**90%**
Oct - Dec 2011	**100%**	**100%**

[1] Forecast rainfall quantities represent BEST ESTIMATES given the probabilistic forecast for each particular season and station.

Kosrae State: Kosrae is typically one of Micronesia's wettest locations, with an annual average rainfall of over 200 inches. During 2010, Kosrae locations fell short of their normal high rainfall values. Two months (February and September) were particularly dry. Water resource managers began to worry during February 2010 when it was very dry (only 2.24 inches at the Kosrae airport). Higher monthly amounts of rainfall returned thereafter to alleviate concerns about water supplies. The annual total rainfall of 155.08 inches at the Kosrae Airport during 2010 was only 75% of normal. Per-

LOCAL SUMMARY AND FORECAST

sistent below normal rainfall at Kosrae during the last four months of 2010 may have been related to La Niña, which caused below-normal to far-below-normal rainfall in a long east-west band near the equator across most of the Pacific.

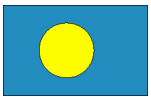
Kosrae State Rainfall Summary 4th Qtr 2010						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
Airport (SAWRS)	**Inches**	13.80	11.70	10.99	**36.49**	**155.08**
	% Norm	85%	74%	76%	**78%**	**75%**
Utwa	**Inches**	12.51	12.05	11.04	**35.60**	**175.93**
	% WSO	77%	76%	76%	**79%**	**85%**
Tofol	**Inches**	11.98	13.69	7.78	**33.45**	**150.62**
	% WSO	74%	86%	54%	**72%**	**73%**
Nautilus Hotel	**Inches**	12.47	14.06	12.88	**39.41**	**161.81**
	% WSO	77%	88%	89%	**85%**	**78%**

Climate Outlook: Although La Niña is expected to fade to ENSO-neutral by June or July, a weather pattern of persistent trade winds should continue to dominate at Kosrae. During persistent trade-wind conditions, the trade-wind trough (or ITCZ) sharpens, with its associated east-west band of concentrated cloudiness located so as to produce abundant rainfall on Kosrae. The months of March through June (normally the wettest of the year on Kosrae) are anticipated to have near normal rainfall. Normal monthly rainfall values at Kosrae are typically between 16 and 20 inches for all months of the year. No adverse tropical cyclone activity is expected for Kosrae State during 2011.

Predicted rainfall for Kosrae State from January 2011 through December 2011 is as follows:

Inclusive Period	**% of long-term average / Forecast rainfall (inches) [1]**
January – March 2011	**95% (46.94 inches)**
April – June 2011	**110%**
July - September 2011	**100%**
October - December 2011	**100%**

[1] Forecast rainfall quantities represent BEST ESTIMATES given the probabilistic forecast for each particular season and station.



Republic of Palau: The weather and climate conditions during 2010 in the Republic of Palau were tranquil and uneventful. The rainfall during most of the months of 2010 was below normal, leading to 2010 annual totals that were below normal at most Palau locations. Despite this shortfall, there was generally enough rainfall to ensure adequate water supplies. The 2010 annual total rainfall of 106.60 inches at the WSO Koror was 72% of normal. Continuing a pattern noted since the rain gage at the Palau International Airport was activated, the 2010 total of 122.03 inches (though below the annual amounts recorded there in recent years) was again wetter than at the WSO. Peleliu has a history of being slightly drier than the WSO, but during 2010 it was slightly wetter with an annual total of 107.87 inches.

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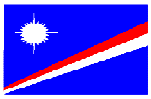
Republic of Palau Rainfall Summary 4th Qtr 2010						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
WSO Koror	**Inches**	10.49	10.94	9.29	**30.72**	**106.60**
	% Norm	76%	97%	78%	**83%**	**72%**
Nekken	**Inches**	8.86	13.37	8.82	**31.05**	**129.80**
	% Norm	64%	118%	74%	**84%**	**88%**
Intl. Airport	**Inches**	13.24	13.58	8.68	**35.50**	**122.03**
	% Norm	86%	107%	65%	**86%**	**74%**
Peleliu	**Inches**	12.60	7.97	10.79	**31.36**	**107.87**
	% Norm	91%	71%	91%	**85%**	**73%**

Climate Outlook: The distribution of rainfall on Palau during 2011 will depend upon the rate of the demise of La Niña. The faster that La Niña conditions decay in the next few months, the wetter it is likely to be in Palau, both over the next few months, and later in the year. At this time, it is anticipated that La Niña will fade to ENSO-neutral by June or July. With La Niña weakened, the southwest monsoon will extend further into the western North Pacific than it did during 2010. There will therefore be an increase of monsoon depressions and other tropical disturbances that will provide abundant rainfall to Palau throughout the year.

Predicted rainfall for Palau from January 2011 through December 2011 is as follows:

Inclusive Period	**% of long-term average / Forecast rainfall (inches) [1]**
January – March 2011	**110% (32.60 inches)**
April – June 2011	**110%**
July – September 2011	**120%**
October – December 2011	**120%**

[1] Forecast rainfall quantities represent BEST ESTIMATES given the probabilistic forecast for each particular season and station.



Republic of the Marshall Islands (RMI): The RMI is one of the regions of the tropical Pacific basin where the mean annual rainfall exhibits a statistically significant long-term decline. Hawaii is another such region, where, over its 100-year climate record, the rainfall and stream flow has been declining. During 2010, a few months of heavy rainfall pushed the 2010 annual rainfall totals at some of the atolls of the RMI to near normal values. For example, the 138.18 inches experienced at the WSO Majuro was 105% of normal. A dry start to the year at Majuro was overwhelmed by some very wet months, with the 20.86 inches of rain during June the heaviest monthly total of the year. Mili was near normal for the 4th Quarter with 30.07 inches of rain or 98%, but for the entire year, the southernmost atoll was drier than normal. In fact, at most other atolls,

LOCAL SUMMARY AND FORECAST

the annual rainfall did not go above normal. For example, at Kwajalein, the 2010 annual rainfall of 87.30 inches was 86% of normal. But even there, there were some very high monthly rainfall totals in the second half of the year. During October and November, Kwajalein had 18.56 and 16.97 inches, respectively. In spite of a few months of very heavy rainfall, the 2010 annual totals were below normal at most RMI locations! The northern islands of Utirik and Wotje were well below normal, with only 41% and 48% of normal rainfall, respectively.

RMI Rainfall Summary 4th Qtr 2010						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
RMI Central and Southern Atolls (6º N - 8º N)						
Majuro WSO	**Inches**	13.18	18.13	11.01	**43.32**	**138.18**
	% Norm	95%	142%	93%	**110%**	**105%**
Laura	**Inches**	11.86	13.77	8.54	**34.17**	**110.04**
	% WSO	86%	108%	72%	**89%**	**84%**
Mili	**Inches**	12.79	8.95	8.33	**30.07**	**107.82**
	% WSO	92%	70%	77%	**98%**	**84%**
Arno	**Inches**	15.48	22.63	6.95	**45.06**	**125.10**
	% WSO	112%	177%	59%	**117%**	**95%**
Aling-laplap	**Inches**	16.75	20.40	5.62	**42.77**	**103.06**
	% WSO	130%	174%	56%	**124%**	**88%**
Jaluit	**Inches**	5.93	7.15	5.73	**18.81**	**91.40**
	% WSO	43%	56%	48%	**49%**	**70%**
RMI Northern Atolls (North of 8º N)						
Kwajalein	**Inches**	18.56	16.97	2.96	**38.49**	**87.30**
	% Norm	156%	159%	37%	**125%**	**86%**
Wotje	**Inches**	6.56	9.75	1.75	**18.06**	**46.95**
	% Norm	58%	96%	23%	**62%**	**48%**
Utirik	**Inches**	11.00	2.93	4.06	**17.99**	**35.95**
	% Norm	109%	32%	59%	**69%**	**41%**

Climate Outlook: The weather pattern for 2011 should continue to feature widespread easterly low-level winds, tropical cyclones pushed to the west of normal (at least for the first half the year), and a monsoon trough that does not push eastward beyond Chuuk at low latitudes. In this pattern, the trade wind trough dominates the weather of the RMI. During the RMI rainy season (July through December), low pressure systems in the upper atmosphere (i.e., TUTT cells) passing north of the RMI modulate the deep convection, and help to bring bouts of heavy rain showers to the atolls. This was the case during 2010, where a fortuitous set-up of the upper atmospheric wind patterns helped to bring some episodes of very heavy rainfall to many of the atolls. Not counting on the help of unusually favorable upper air flow patterns, and considering the long-term trend of declining rainfall in the RMI, the outlook for 2011 is for near normal to slightly below normal rainfall for most months of 2011 and for the annual total.

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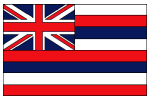
Predicted rainfall for the RMI from January 2011 through December 2011 is as follows:

Inclusive Period	**% of long-term average / Forecast rainfall (inches)** [1]		
	South of 6ºN	**6ºN to 8ºN**	**North of 8ºN**
Jan – March 2011 (Dry Season)	**95% (22.21 inches)**	**90% (21.04 in)**	**85% (10.77 in)**
April – June 2011 (Onset of Rains)	**100%**	**100%**	**95%**
July – Sept 2011 (Rainy Season)	**100%**	**100%**	**100%**
Oct – Dec 2011 (Start of Dry Season)	**100%**	**100%**	**100%**

[1] Forecast rainfall quantities represent BEST ESTIMATES given the probabilistic forecast for each particular season and station.



Hawaii: Drought conditions enveloped the state of Hawaii in 2010. The October 2009 through April 2010 Hawaiian Islands wet season, or Hooilo, ranked as the driest in the past 30 years and one of the driest in the past 55 years. Relief from drought conditions did not begin until September when persistent trade winds brought windward areas of the state small amounts of rain. This rainfall continued into October with the beginning of the wet season. This with the continued rainfall events in November and December brought the Hawaiian Islands to near-normal and above-normal rainfall totals. Drought conditions have lessened on all the islands and were eliminated on Oahu and Kauai in December. A record daily maximum rainfall total of 5.41 inches fell at the Honolulu International Airport Sunday, December 19th, breaking the old record of 5.28 inches set in 1955.

The long standing drought in 2010, however, has left its mark. Ranchers in some areas on the Big Island are still hauling water for livestock and water use restrictions are still present on Oahu, Molokai, and Maui. Unfortunately, the financial impacts of the drought conditions present this past year will be felt by farmers and ranchers for some time to come.

State of Hawaii Rainfall Summary 4th Qtr 2010						
Station		**Oct.**	**Nov.**	**Dec.**	**4th Qtr**	**Annual**
Lihue Airport	**Inches**	0.83	1.61	10.01	**12.45**	**24.62**
	% Norm	20%	34%	209%	**91%**	**62%**
Honolulu Airport	**Inches**	0.11	0.55	11.73	**12.39**	**17.43**
	% Norm	5%	24%	412%	**170%**	**95%**
Kahului Airport	**Inches**	0.40	1.25	3.61	**5.26**	**9.53**
	% Norm	38%	58%	117%	**83%**	**51%**
Hilo Airport	**Inches**	8.29	10.82	7.13	**26.24**	**63.22**
	% Norm	86%	69%	68%	**73%**	**50%**

For more information on weather and climate in Hawaii go to
http://www.prh.noaa.gov/pr/hnl/ or
www.cpc.noaa.gov/products/predictions/long_range/fxhw40.html

Seasonal Sea Level Outlook for the US-Affiliated Pacific Islands

The following sections describe: (i) the *Canonical Correlation Analysis* (*CCA*)-based forecasts of sea-level deviations for forthcoming seasons JFM, FMA and MAM 2011, (ii) the observed monthly mean and maximum sea-level deviations for the season OND 2010, (iii) forecast verifications (observed/forecast values) for OND 2010, and (iv) a Synopsis of ENSO and seasonal sea-level variability. *Note that the deviations are defined as 'the difference between the mean sea level for the given month and the 1975 through 1995 mean sea-level value computed at each station'. Also note that the CCA-forecasting technique adapted here does not account for sea-level deviations created by other atmospheric or geological factors such as tropical cyclones, storm surges or tsunamis.*

(i) Seasonal Sea Level Forecast *(deviations with respect to climatology*) for JFM, FMA and MAM 2011 (Table 1).

Forecasts of the sea-level deviations in the USAPI (see http://www.prh.noaa.gov/peac/map.php for location of stations) are presented using the CCA statistical model based on the independent SST values in OND 2010. The resulting CCA model has been used to forecast the sea-level of three consecutive months: JFM**,** FMA, and MAM (see Table 1: left panel shows values for seasonal mean while the right panel shows the seasonal maxima). Consistent with the on-going moderate-to-strong La Niña event, the sea level in these islands are higher than normal.

Table 1: **Forecasts of Sea Level Deviation (in inches) for JFM, FMA, and MAM 2011.**

	Seasonal Mean Deviations				Seasonal Max Deviations					
Tide Gauge Station	**JFM**	**FMA**	**MAM**	**Forecast Quality**	**JFM**	**FMA**	**MAM**	**Forecast Quality**	***Return Period for JFM Season***	
Lead Time	*0*	*1M*	*2M*		*0*	*1M*	*2M*		*20 Year*	*100 Year*
Marianas, Guam	+8	+8	+8	V. Good	+23	+23	+23	V. Good	5.6	6.7
Malakal, Palau	+7	+6	+6	Good	+42	+42	+42	Good	9.6	14.3
Yap, FSM	+6	+5	+6	V. Good	+33	+35	+35	Good	16.7	33.0
Chuuk, FSM**	+6	+5	+6	N/A	+33	+35	+35	N/A	N/A	N/A
Pohnpei, FSM	+7	+6	+6	V. Good	+36	+35	+35	V. Good	5.8	7.1
Kapingamarangi, FSM	+6	+6	+5	Good	+33	+30	+30	Fair	7.4	9.4
Majuro, RMI	+4	+4	+3	Good	+44	+44	+43	Fair	4.1	5.1
Kwajalein, RMI	+4	+5	+5	Good	+43	+43	+43	Fair	4.5	5.9
Pago Pago, Am. Samoa	+4	+6	+6	V. Good	+28	+29	+30	V. Good	3.9	5.4
Honolulu, Hawaii	0	0	0	Poor	+16	+16	+16	Poor	4.1	5.9
Hilo, Hawaii	-1	-2	-1	Poor	+22	+23	+19	Fair	7.9	11.4

Note: (-) indicates negative deviations (fall of sea level from the mean), and (+) indicates positive deviations (rise of sea level from the mean); N/A: data not available. Deviations from -1 to +1 inch are considered negligible, and deviations from –2 to +2 inches are unlikely to cause any adverse climatic impact. Forecasts for Chuuk (**) are estimated subjectively based on information from WSO Chuuk and observations from neighboring stations of Pohnpei and Yap. See http://www.prh.noaa.gov/peac/peu/2011_1st/sea_level.php#footnote for explanations of footnotes 1 through 5.

Remarks: The forecasts values of sea level for JFM, FMA, and MAM seasons (Table 1, above) indicate that sea levels for some of the stations (i.e., Guam, Malakal, Yap, Pohnpei, and Kapingamarangi) are likely to be about 6-8 inches higher than normal in the forthcoming seasons. Other stations in the Marshalls (Majuro, Kwajalein) and American Samoa (Pago Pago) are also expected to be about 4-6 inches higher than normal. The forecast, which is about 4-8 inches higher than normal, is supportive to on-going La Niña conditions. According to CPC, La Niña is expected to continue in the Northern Hemisphere into spring 2011. A moderate-to-strong La Niña was present during December 2010 as reflected by well below-average sea surface temperatures (SSTs) across the equatorial Pacific Ocean. Convection remained enhanced over Indonesia and suppressed over the western and central equatorial Pacific. 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 on-going La Niña. During any La Niña event the sea level in the USAPI region experiences a rise.

Seasonal Sea Level Outlook for the US-Affiliated Pacific Islands

(ii) Observed Monthly Sea Level Deviation in OND 2010. The monthly time series (OND) for sea level deviations have been taken from the UH Sea Level Center. The full time series for monthly mean is available at ftp://ilikai.soest.hawaii.edu/islp/slpp.deviations. Locations of these stations can be found at: http://www.prh.noaa.gov/peac/map.php.

Table 2 : Monthly Observed Max/Mean Sea Level Deviations in Inches (1 inch = 25.4mm)

Tide Gauge Station	Monthly Mean Deviations[1]				Monthly Max Deviations[2]			
	Oct.	Nov.	Dec.	Standard Deviations	Oct.	Nov.	Dec.	Standard Deviations
Marianas, Guam	+7.1	+5.0	*	4.0	+24.3	+21.0	*	3.5
Malakal, Palau	+8.1	+8.0	+8.2	4.0	+43.1	+42.2	+40.0	4.1
Yap, FSM	+7.2	+7.8	+6.6	4.1	+35.7	+37.0	+32.0	4.1
Chuuk, FSM	*	*	*	*	*	*	*	*
Pohnpei, FSM	+10.1	+7.5	*	4.7	+38.0	+39.0	*	4.9
Kapingamarangi, FSM	*	*	*	3.1	*	*	*	3.8
Majuro, RMI	+4.6	+7.2	*	3.7	+44.0	+47.0	*	3.8
Kwajalein, RMI	+4.4	+3.9	+1.9	3.1	+42.7	+41.0	+38.0	3.2
Pago Pago, American Samoa	+6.9	+5.8	+8.0	2.5	+31.5	+29.2	+29.9	2.2
Honolulu, Hawaii	+3.1	+1.0	+2.4	1.8	+21.8	+22.8	+24.0	2.6
Hilo, Hawaii	+4.8	+4.4	+3.5	1.8	+24.5	+27.1	+27.0	2.2

* Data currently unavailable; [1] Difference between the mean sea level for the given month and the 1975 through 1995 mean sea level value at each station; [2] Same as [1] except for maxima; SD stands for standard deviations.

Remarks: As compared to November 2010, the monthly mean sea-level in December 2010 did not change much in the north Pacific. Since there is data missing for several stations, it was difficult to develop a comprehensive picture of variations. However, based on November data, it may be mentioned that only Majuro recorded high sea level. As mentioned, other stations did not change considerably. In the South Pacific, Pago Pago also recorded rise. The monthly maxima also displayed similar rising trends. The current trend of sea-level, which is about 2-8 inches higher than normal, is supportive of an on-going La Niña condition.

(iii) Forecast Verification (Seasonal Mean) for OND 2010

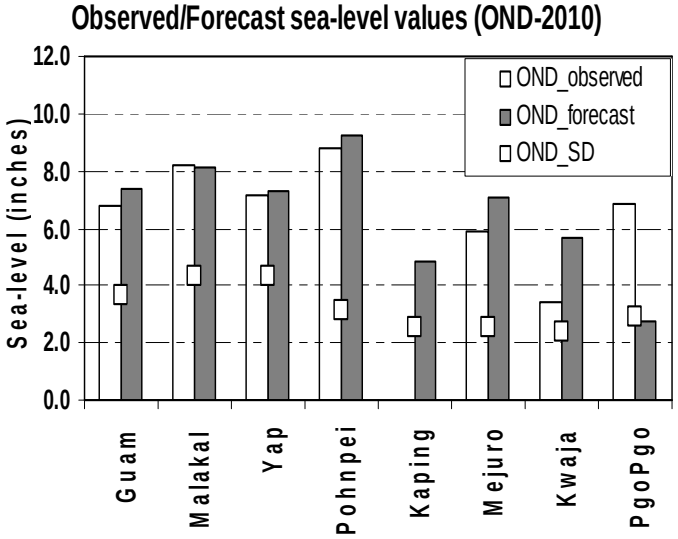


Figure 2: The observed and forecast values for the 2010 season OND is presented above. Forecasts were in general skillful. Only Kwajalein and Pago Pago were under forecasted.

(iv) ENSO and Seasonal Sea Level Variability: A Synopsis

Table 3: Sea-Level Deviation in Current and Major ENSO Years

	Seasonal Mean Deviations: Observed rise/fall (inches)			
Seasons	OND10 (La Nina)	OND09 (El Nino)	OND97 (El Nino)	OND98 (La Nina)
Marianas, Guam	+8	+2	-7	+8
Malakal, Palau	+7	-2	-7	+9
Yap, FSM	+5	-4	-9	+7
Pohnpei, FSM	+4	+1	-10	+8
Majuro, RMI	+4	+1	-9	+6
Kwajalein, RMI	+2	0	-7	+3
Pago Pago	+2	+3	+2	+7

Remarks: As the sea level in the USAPI is very sensitive to the phase of the ENSO climate cycle, a perspective of sea level anomalies during the recent ENSO event (2009-10) and the ENSO event of 1997-98 is presented in the above Table. Data for the season OND is presented here; a more comprehensive analysis on this issue is available in http://www.soest.hawaii.edu/MET/Hsco/Paper/Weather-65-10263-68.pdf.

Pacific ENSO Update

Excerpts from El NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION
Issued by NOAA NWS Climate Prediction Center - 6 January 2011

http://www.cpc.noaa.gov/products/analysis_monitoring/enso_advisory/index.shtml

ENSO Alert System Status: La Niña Advisory

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 (Fig. 1). All of the Niño indices were –1.5°C at the end of December, except for the easternmost Niño-1+2 region (Fig. 2). The subsurface oceanic heat content (average temperatures in the upper 300m of the ocean, Fig. 3) continued to reflect a large reservoir of below-average temperatures at depth in the central and eastern equatorial Pacific (Fig. 4). Convection remained enhanced over Indonesia and suppressed over the western and central equatorial Pacific (Fig. 5). 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.

The current ENSO model forecasts have not changed significantly compared to last month (Fig. 6). La Niña is currently near its peak and is expected to persist into the Northern Hemisphere spring 2011 at a lesser intensity. Thereafter, there remains considerable uncertainty as to whether La Niña will last into the Northern Hemisphere summer (as suggested by the NCEP CFS and a few other models), or whether there will be a transition to ENSO-neutral conditions (as suggested by the CPC CON and a majority of the other models).

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. (see 3-month seasonal outlook released on December 16th, 2010). 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).

The Pacific ENSO Update is a bulletin of the Pacific El Niño-Southern Oscillation (ENSO) Applications Climate (PEAC) Center. PEAC conducts research & produces information products on climate variability related to the ENSO climate cycle in the U.S.-Affiliated Pacific Islands (USAPI). This bulletin is intended to supply information for the benefit of those involved in such climate-sensitive sectors as civil defense, resource management, and developmental planning in the various jurisdictions of the USAPI.

The Pacific ENSO Update is produced quarterly both online and in hard copy, with additional special reports on important changes in ENSO conditions as needed. For more information about this issue please contact the editor, LTJG Sarah Duncan, at peac@noaa.gov or at the address listed below.

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Pacific ENSO Applications Climate (PEAC) Center:
HIG #340, 2525 Correa Road, Honolulu, Hawai'i 96822
LTJG Charlene Felkley, PEAC Outreach Officer, at 808-956-2324 for information on PEAC, the Pacific ENSO Update and ENSO-related climate data for the Pacific Islands.
Dr. Rashed Chowdhury, Principal Research Scientist, at 808-956-2324 for information on ENSO and sea-level variability in the USAPI.
Duncan Gifford, Graduate Research Assistant, at 808-956-2324 for information related to the PEAC website.

University of Hawai'i - Joint Institute of Marine and Atmospheric Research (JIMAR), School of Ocean and Earth Science and Technology (SOEST), Department of Meteorology:
HIG #350, 2525 Correa Road, Honolulu, Hawai'i 96822
Dr. Tom Schroeder, PEAC Principal Investigator at 808-956-7476 for more information on hurricanes and climate in Hawai'i.

NOAA National Weather Service
Weather Forecast Office (WFO) Honolulu:
HIG #250, 2525 Correa Rd., Honolulu, HI, 96822
James Weyman, PEAC Director, at 808-973-5270

NOAA National Weather Service
Weather Forecast Office (WFO) Guam:
3232 Hueneme Road, Barrigada, Guam, 96913
Chip Guard, Warning Coordination Meteorologist, at 671-472-0900 for information on tropical cyclones and climate in the USAPI.

University of Guam - Water and Environmental Research Institute (WERI):
UOG Station, Mangilao, Guam 96913
Dr. Mark Lander, PEAC Meteorologist, at 671-735-2685 for information on tropical cyclones and climate in the USAPI.