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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

www.prh.noaa.gov/peac

CURRENT CONDITIONS

At the beginning of 2011, the climate of the Pacific basin was dominated by the typical local and regional anomalies associated with La Niña. These included: A strongly positive SOI, cool equatorial SST, strong easterly surface winds, elevated sea level in Micronesia, and very dry conditions at some low-latitude western Pacific atolls (e.g., Kapingamarangi and the atolls of western Kiribati). Through the first half of 2011, the La Niña waned, and many of its associated anomalies subsided or reversed. The SOI fell, the SST warmed, the easterly surface winds weakened somewhat, and the localized island droughts came to an end. With the shift of La Niña to ENSO-neutral during the first half of 2011, rainfall was abundant throughout the USAPI. Above normal 6-month rainfall values dominated, with magnitudes equal to or exceeding 100% of average at locations in every island group except American Samoa and Kosrae (see Figures 1a and 1b). Rainfall totals were equal to or less than 85% of average only at Aasufou, Kapingamarangi, and two of four stations on Kosrae. The highest observed 6-month rainfall total was the 103.03 inches (156%) recorded at the Weather Service Office (WSO) Palau, with the 100.69 inches (103%) recorded at Palikir in 2nd place. The lowest 6-month rainfall was the 26.24 inches recorded at Saipan, which ironically was 135% of the average value during this time of the dry season in the CNMI.

Very dry conditions were experienced at Kapingamarangi during the 7-month period August 2010 through February 2011, and likely caused harm to water supplies, vegetation and crops. Drought quenching rainfall returned to Kapingamarangi in March 2011 when 8.46 inches (61%) of rainfall was observed, and recently a whopping 17.91 inches (247%) was recorded there in June 2011. The warming of the SST in the equatorial western Pacific along with the penetration of westerly surface winds to near the longitude (155°E) of Kapingamarangi accompanied the dramatic increase of rainfall there.

Forecasts from computer models available to PEAC largely anticipated the widespread abundant rainfall during the first half of 2011. Abundant rainfall typically occurs in years that begin as La Niña and transition to ENSO-neutral or to El Niño sometime later in the year. Most of the PEAC outlooks reflected this.

Most of the State of Hawaii has been receiving sufficient amounts of rain during the first half of 2011. Currently, no drought conditions are reported on Lanai, Oahu, or Kauai. Drought symptoms are improving on Maui as well. On the Big Island, conditions have been slowly improving but areas of severe and moderate drought still persist. Oahu experienced a particularly wet June, resulting in a 6-month total at 316% of normal.

The following comments from the **ENSO DIAGNOSTIC DISCUSSION** were posted on the U.S. Climate Prediction Center web site on July 7, 2011:

"ENSO Alert System Status: Not Active (NA)

Synopsis: ENSO-neutral conditions are expected to continue into the Northern Hemisphere fall 2011.

During June 2011, ENSO-neutral conditions continued as reflected by the overall pattern of small sea surface temperature (SST) anomalies across the equatorial Pacific Ocean. All of the latest weekly Niño index values were near average, ranging between 0.0°C and 0.4°C. The subsurface oceanic heat content anomaly (average temperature anomalies in the upper 300m of the ocean) remained elevated, but weakened slightly throughout the month, in accordance with the declining strength of above-average temperatures at depth. While weak, the atmospheric circulation anomalies remained consistent with certain aspects of La Niña. In particular, convection continued to be enhanced over eastern Indonesia and suppressed over the central equatorial Pacific, mainly south of the equator. Also, anomalous low-level easterly and upper-level westerly winds persisted over the central Pacific. Collectively, these tropical Pacific anomalies indicate ENSO-neutral conditions, but the atmospheric circulation continues to be characteristic of La Niña.

Forecasts from a majority of the ENSO models, indicate ENSO-neutral will continue into the Northern Hemisphere fall 2011. However, over the last couple of weeks, forecasts created by the NCEP Climate Forecast System (CFS) have begun to indicate the re-emergence of La Niña during Northern Hemisphere fall 2011. Combined with the recent weakening of the positive subsurface ocean anomalies and the lingering La Niña state of the atmosphere, the possibility of a return to La Niña during the Northern Hemisphere fall 2011 has increased over the past month. However, ENSO-neutral remains most likely into the Northern Hemisphere fall 2011, with most models and all multi-model forecasts predicting ENSO-neutral to continue through early 2012."

SEA SURFACE TEMPERATURES

During June 2011, ENSO-neutral conditions continued as reflected by the overall pattern of small sea surface temperature (SST) anomalies across the equatorial Pacific Ocean. All of the latest weekly Niño index values were near average, ranging between 0.0°C and 0.4°C. The subsurface oceanic heat content anomaly (average temperature anomalies in the upper 300m of the ocean), remained elevated, but weakened throughout the month, in accordance with the declining strength of above-average temperatures at depth. While weak, the atmospheric circulation anomalies remained consistent with certain aspects of La Niña. Collectively, these tropical Pacific anomalies indicate ENSO-neutral conditions, but the atmospheric circulation continues to be characteristic of La Niña.

SOUTHERN OSCILLATION INDEX

The 3-month average of the Southern Oscillation Index for the 2nd Quarter of 2011 was 0.8, with monthly values of 1.9, 0.4, and 0.2 for the months of April, May, and June 2011, respectively. The recent shift from positive SOI values exceeding +1.0 (as present in April) to values below +1.0 indicates a shift from a La Niña event to an ENSO-neutral state.

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.

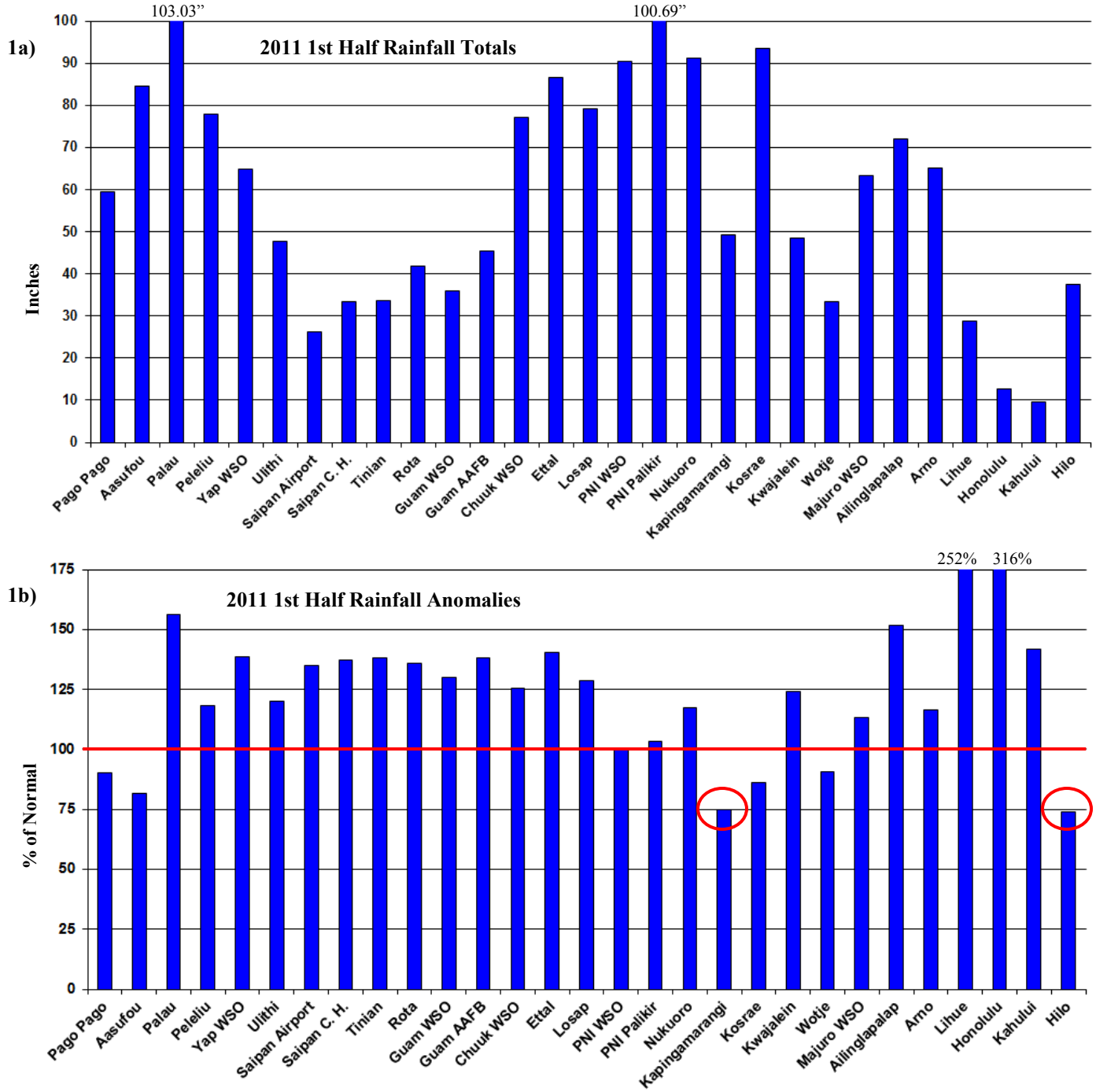

Figure 1. 2011 1st Half rainfall totals (a) in inches and (b) anomalies (expressed as % of normal). In 1b, solid line indicates normal rainfall (100%) and circles indicate rainfall less than 75% of normal.

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 pressures, 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

Tropical cyclone activity in the western North Pacific rebounded during the first half of 2011, with nine JTWC-numbered and seven JMA-named cyclones through mid-July. By contrast, there were only four JTWC-numbered and three JMA-named tropical cyclones through 01 August 2010. Normal tropical cyclone activity through mid-July is approximately eight numbered by the JTWC. Much of the activity has still been shifted to the west, but in a sign of a change from last year's weather patterns, there was one major typhoon (Ma-on, 08W) occurring during mid-July which was named east of the latitude of Guam in mid-July. The southwest monsoon swept across Palau, Yap State, the CNMI and Guam for several days (12-15 July) as this typhoon passed to the north. The periphery of Typhoon Ma-on and its associated monsoon tail produced spectacular lightning, high surf and localized very heavy rainfall (e.g. 3.37 inches of rain fell at the WSO Guam during a 24-hour period spanning 14-15 July) in Guam and the CNMI.

The Southern Hemisphere cyclone season of 2010-2011 was well below average in most categories of activity. The Southern Hemisphere's Accumulated Cyclone Energy (ACE) (see http://www.coaps.fsu.edu/~maue/tropical/) for the year ending 30 June 2011 was 140.4 versus a normal of 210, or 67% of normal. The JTWC numbered only 21 tropical cyclones for the South Indian Ocean and South Pacific ocean combined, versus a normal of 28. Tropical cyclone warning agencies in the Southern Hemisphere named only 18 of these, with the RSMC Nadi (Fiji) naming five, the three Tropical Cyclone Warning Centers (TCWCs) of Australia naming nine, TCWC Jakarta (Indonesia) naming one, and RSMC La Reunion naming only three in its area of responsibility in the South Indian Ocean.

PEAC Center Tropical Cyclone Assessment

The TSR consortium1 places the odds of lower-middle-upper tercile for western North Pacific tropical cyclone activity during 2011 at 31-44-25. This is a forecast biased quite heavily toward near-normal activity. The climate research center at the City University of Hong Kong anticipates that western North Pacific TC activity is likely to be near-normal. They are predicting 31, 27, and 16 for annual totals of TS+TY+TD, TS+TY, and TY respectively. The first two numbers are exactly normal, and the number of typhoons is one below normal. As of mid-July 2011, experimental forecasts for the annual total of western North Pacific TC activity issued by Paul Stanko (Senior forecaster, Guam WFO) indicate that the most likely category of 2011 TC activity is "normal" (among seven groupings ranging from "record high" to "record low". His complete forecast statistics are as follows: **Record High** (45 or more TC's): 1.9%, **Far Above Normal** (37 to 44 TC's): 13.5%, **Above Normal** (33 to 36 TC's): 26.9%, **Near Normal** (29 to 32 TC's): 30.8%, **Below Normal** (26 to 28 TC's): 21.2%, **Far Below Normal** (20 to 25 TC's): 5.8%, **Record Low** (19 or fewer TC's): Insignificant.

Given the available guidance[1], the PEAC anticipates that the tropical cyclone activity for the remainder of 2011 will be near normal in the western North Pacific basin and in Micronesia. Normal activity includes named tropical cyclones passing through Micronesian waters and threatening island locations. The level of threat to individual islands is included in their local variability summaries. Given the recent lack of cyclone activity, a normal distribution of tropical cyclones in the western North Pacific may seem like quite a busy year for some locations in Micronesia. Outlooks for the level of activity in the next Southern Hemisphere cyclone season will appear in next quarter's ENSO Newsletter.

The seasonal hurricane outlook for the State of Hawaii is produced by the Central Pacific Hurricane Center in collaboration with NOAA's Climate Prediction Center. For 2011, the outlook calls for a 70% chance of a below normal season, a 25% chance of a near normal season, and a 5% chance of an above normal season. 2-4 tropical cyclones are expected to affect the central Pacific this season. An average season has 4-5 tropical cyclones, which include tropical depressions, tropical storms, and hurricanes.

[1] The PEAC tropical cyclone forecasts for 2011 are based on forecasts of the status of ENSO and input from three seasonal outlooks for tropical cyclone activity in the western North Pacific basin: (1) The Guam Weather Forecast Office (WFO), (2) The City University of Hong Kong Laboratory for Atmospheric Research, under the direction of Dr. J. C-L. Chan, and (3) The Benfield Hazard Research Centre, University College London, Tropical Storm Risk (TSR) research group, UK, led by Dr Adam Lea and Professor Mark Saunders.

LOCAL SUMMARY AND FORECAST

American Samoa: American Samoa has entered the heart of its dry season. After a very wet January and a normally wet February, all the following months have been drier than normal. May was exceptionally dry, especially in the typically wet location of Aasufou, where the 3.41 inches of rain was only 19% of the May average. In fact, it was the driest May recorded there in the station's 30-year history, easily beating the previous record low amount of 6.47 inches measured there in May 1983. In stark contrast, the 44.14 inches of rainfall at Aasufou during January 2011 was the 2nd wettest January reading. Rainfall at Pago Pago typically exceeds 10 inches per month from October through April, and is less than 10 inches per month from May through September. Its driest month is July, with an average of just over 6 inches. This year, the monthly rainfall at Pago Pago fell below 10 inches in March, and has been dry since then. Thus the 3rd Quarter rainfall at Pago Pago was only 50% of normal.

American Samoa Rainfall Summary 2nd Qtr and First Half of 2011						
Station		**Apr.**	**May**	**Jun.**	**2nd Qtr**	**1st Half**
Pago Pago WSO	**Inches**	4.01	3.69	7.01	**14.71**	**59.59**
	% Norm	33%	37%	95%	**50%**	**90%**
Aasufou	**Inches**	5.37	3.41	13.14	**21.92**	**84.46**
	% Norm	30%	19%	103%	**40%**	**81%**

Climate Outlook: American Samoa is now in the heart of its dry season. Conditions during the start of the current dry season were much drier than normal. Climate models and simple persistence of current conditions favor a continuation of below normal rainfall over the next three-month period. The next rainy season (Oct 2011- Apr 2012) is anticipated to have a normal onset with near average rainfall. ENSO-neutral conditions persisting through the latter half of 2011 should favor tropical cyclone activity in the Coral Sea from northeast Australia across to Fiji, with a near normal risk of tropical cyclone development near, or south of, American Samoa beginning in late November 2011.

Predicted rainfall for American Samoa from July 2011 through June 2012 is:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]
July - September 2011 (Heart of Dry Season)	**85% (14.84 inches - Pago Pago)**
October - December 2011 (Onset of next Rainy Season)	**95%**
January - March 2012 (Heart of next Rainy Season)	**100%**
April - June 2012 (Onset of next Dry Season)	**100%**

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

Guam/CNMI: Throughout Guam and the CNMI, the rainfall during the first half of 2011 was generally above normal, with most locations throughout the region experiencing [an unusually uniform] 130% to 140% of average rainfall. Rainfall associated with the monsoon depression precursors to some of the early season tropical cyclones contributed to the widespread above normal rainfall. It does not take much rainfall to be produce above normal values in the dry season of Guam and the CNMI. Saipan's relatively modest 6-month rainfall total of 26.24 inches was one of the lowest readings in the region, but was still 135% of normal. The 6-month total of 35.85 inches of rainfall at the Guam Weather Service Forecast Office was 130% of normal. No extraordinary short period rainfall events were experienced, with but 2 inches or more rainfall in 24 hours was experienced twice at the Guam WSO during January to June, and only once at Saipan during the same time interval. During mid-July, the southwest monsoon swept into Guam and the CNMI for a few days, and the year's top 24-hour rainfall of 3.37 inches was experienced at the Guam WSO. Heavy monsoon showers and squalls largely spared Saipan where only about 1 inch of rainfall fell on the 15th, the same day of Guam's 3-inch-plus 24-hour rainfall. Wind on that day gusted to 44 mph from the southwest at Saipan and to 38 mph a day earlier on Guam. During some most years without tropical cyclones, wind gusts over 40 mph are usually near the extreme value for the year!

Because of recent dry years, there is a public perception that this year's dry season was exceptionally wet. Lawns stayed green, wildfires were infrequent and small, and brush cutters were continually busy keeping parks and roadways clear of rapidly growing weeds and sword grass. The rainy season has now begun, and is off to a reasonably wet start, but nothing out of the ordinary has occurred yet.

Guam and CNMI Rainfall Summary 2nd Qtr and First Half of 2011						
Station		**Apr.**	**May**	**Jun.**	**2nd Qtr**	**1st Half**
Guam						
GIA (WFO)	**Inches**	5.56	5.77	5.96	**17.29**	**35.85**
	% Norm	142%	95%	92%	**105%**	**130%**
AAFB	**Inches**	7.95	6.65	5.34	**19.94**	**45.37**
	% Norm	163%	101%	84%	**112%**	**138%**
Dededo (Ypapao)	**Inches**	5.88	6.59	6.33	**18.80**	**42.26**
	% Norm	121%	100%	100%	**106%**	**129%**
Ugum Watershed	**Inches**	4.25	5.76	7.15	**17.16**	**42.86**
	% Norm	90%	87%	110%	**96%**	**138%**
Sinajaña	**Inches**	5.48	8.09	5.22	**18.79**	**37.80**
	% Norm	140%	134%	81%	**114%**	**137%**
Saipan Intl. Airport	**Inches**	4.96	4.87	5.72	**15.55**	**26.24**
	% Norm	177%	111%	123%	**131%**	**135%**
Capitol Hill	**Inches**	5.27	7.96	6.90	**20.13**	**33.34**
	% Norm	151%	145%	119%	**136%**	**137%**
Tinian Airport	**Inches**	5.48	2.86	5.91	**14.25**	**33.58**
	% Norm	156%	52%	102%	**96%**	**138%**
Rota Airport	**Inches**	7.25	5.68	4.47	**17.40**	**41.75**
	% Norm	160%	90%	72%	**102%**	**136%**

LOCAL SUMMARY AND FORECAST

Climate Outlook: The rainy season has begun on Guam and in the CNMI. An episode of the southwest monsoon in mid-July provided a good boost to July's rainfall totals, especially at the Guam WSO, where two nights of heavy thunderstorms provided nearly 6 inches to the monthly total. Guam and the CNMI depend on tropical cyclone activity and the southwest monsoon for much of their rainy season rainfall. We anticipate at least two or three additional week-long episodes of the southwest monsoon to sweep across Guam and the CNMI sometime from now through October. Also, two or three tropical storms and one typhoon are forecast to pass within 180 n mi of Guam and Saipan, with the greatest cyclone risk later in the year (October through December). This is normal. Recent years of reduced tropical cyclone activity in the western North Pacific basin have dramatically reduced the numbers of cyclones affecting Guam and the CNMI. A normal number of cyclones passing through regional waters will likely be perceived as unusually active. A degree of complacency sets-in when the weather has been so pleasant and uneventful for so long.

Predicted rainfall for the Mariana Islands from July 2011 through June 2012 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]	
	Guam/Rota	Saipan/Tinian
July - September 2011 (Heart of Rainy Season)	**120% (45.05 inches)**	**120% (38.56 inches)**
October - December 2011 (End of Rainy Season)	**125%**	**125%**
January - March 2012 (Onset of Next Dry Season)	**100%**	**100%**
April - June 2012 (2nd Half of Next Dry Season)	**100%**	**100%**

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

Federated States of Micronesia

Yap State: The months of February through April are typically the heart of the dry season for Yap Island and the atolls of Yap State, with monthly rainfall totals dropping to approximately 6 inches across Yap Island and to 5 inches or less at Ulithi. During the first half of 2011, rainfall was above normal for all six months on Yap Island, and for three of the six months at Ulithi. Woleai was drier than normal for all six months. Woleai is consistently drier than its "normal", and perhaps the rainfall climatology for that island needs to be adjusted. Many of the outer islands of Yap State, and other outer islands of the other states of the FSM have no official rainfall climatology. For these islands, the PEAC has been estimating their anomalies based on the records of nearby stations, and general precipitation patterns observed from satellite in the western Pacific. Some of the early season tropical cyclones and other tropical disturbances contributed to the wet conditions at Yap Island and some of the atolls of Yap State. One of the basins named tropical cyclones (Super Typhoon Songda - 04W) passed very close to Yap on 21-22 May while it was in its early stages of development, providing abundant rainfall and some gusty winds. No significant damage or injuries were reported for this cyclone during its passage through Yap.

LOCAL SUMMARY AND FORECAST

Yap State Rainfall Summary 2nd Qtr and First Half of 2011						
Station		Apr.	May	June	2nd Qtr	1st Half
Yap Island						
Yap WSO	Inches	7.20	15.10	13.56	**35.86**	**64.87**
	% Norm	125%	167%	107%	**130%**	**139%**
Dugor	Inches	9.89	16.54	16.45	**42.88**	**75.47**
	% WSO	172%	183%	130%	**156%**	**161%**
Gilman	Inches	7.05	13.78	17.54	**38.37**	**70.09**
	% WSO	122%	152%	138%	**139%**	**150%**
Luweech	Inches	6.76	9.21	15.47	**31.44**	**60.00**
	% WSO	117%	102%	122%	**114%**	**128%**
Maap	Inches	7.82	12.17	17.69	**37.68**	**65.50**
	% WSO	136%	134%	139%	**137%**	**140%**
North Fanif	Inches	13.50	20.67	19.73	**53.90**	**73.95**
	% WSO	234%	228%	155%	**196%**	**158%**
Rumung	Inches	13.73	11.97	13.46	**39.16**	**68.87**
	% WSO	238%	132%	106%	**142%**	**147%**
Tamil*	Inches	13.94	16.64	14.09	**30.58**	**62.99**
	% WSO	242%	184%	111%	**111%**	**135%**
Outer Islands						
Ulithi	Inches	8.47	12.55	8.99	**30.01**	**47.74**
	% Norm	173%	163%	83%	**128%**	**120%**
Woleai	Inches	4.59	5.35	8.60	**18.54**	**36.71**
	% Norm	42%	44%	66%	**51%**	**59%**

Climate Outlook: A continuation of near normal to above normal rainfall is anticipated for all islands of Yap State for at least the next three months and probably through the end of the year. The monsoon trough of the western North Pacific has become established in a near-normal location. Rainfall patterns and the basin's topical cyclone distribution in an ENSO-neutral climate favor wet conditions on Yap and a normal risk of a typhoon. The odds of gale-force winds or greater from a tropical cyclone on Yap Island or any of its northern atolls will be near normal (roughly 10-15%).

Predicted rainfall for Yap State from July 2011 through June 2012 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]	
	Yap and Ulithi	Woleai
July - September 2011 (Heart of Rainy Season)	**120% (52.08 inches)**	**90% (36.27 inches)**
October - December 2011 (End of Rainy Season)	**110%**	**95%**
January - March 2012 (Heart of Next Dry Season)	**100%**	**90%**
April - June 2012 (Onset of next Rainy Season)	**110%**	**90%**

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

LOCAL SUMMARY AND FORECAST

Chuuk State: Rainfall was abundant throughout Chuuk State during the first half of 2011, with some locations receiving very high amounts of rainfall. There was a slight north-south gradient reflecting the placement of the trade wind trough across the southern portions of the state in the first few months of the year. During May and June, the monsoon trough moved eastward into Chuuk State bringing abundant deep convection and intense rain showers into the region. The northern atolls received the least amount of rain, and some of the atolls further south in the Mortlocks received extraordinary amounts of rainfall. The 97.73 inches observed at Ta Atoll in the southern Mortlocks was the highest observed 2011 first-half total within Chuuk State, and was one of the highest observed 6-month rainfall totals in all of Micronesia. The 77.06 inches recorded at the Chuuk WSO during the first half of 2011 was above normal (125%), and included a big June total of 25.43 inches (217%).

Chuuk State Rainfall Summary 2nd Qtr and First Half of 2011

Station		Apr.	May	June	2nd Qtr	1st Half
Chuuk Lagoon						
Chuuk WSO	**Inches**	12.48	8.68	25.43	**46.59**	**77.06**
	% Norm	101%	71%	217%	**128%**	**125%**
Piis Panew	**Inches**	7.49	5.21	15.26	**27.96**	**46.24**
	% WSO	61%	43%	130%	**77%**	**75%**
Southern Mortlocks						
Lukunoch	**Inches**	12.40	16.20	22.27	**50.87**	**89.15**
	% WSO	100%	132%	190%	**140%**	**145%**
Ettal	**Inches**	10.41	17.22	27.08	**54.71**	**86.50**
	% WSO	84%	141%	231%	**151%**	**141%**
Ta	**Inches**	9.48	21.29	26.45	**57.22**	**97.73**
	% WSO	77%	174%	226%	**158%**	**159%**
Northern Atolls						
Fananu	**Inches**	6.18	15.06	11.04	**32.28**	**58.93**
	% WSO	50%	123%	94%	**89%**	**96%**
Onoun	**Inches**	6.53	13.64	18.03	**38.20**	**75.93**
	% WSO	53%	157%	154%	**105%**	**123%**
Northern Mortlocks						
Losap	**Inches**	10.09	12.17	23.97	**46.23**	**79.13**
	% WSO	82%	110%	205%	**127%**	**129%**
Nama	**Inches**	7.60	17.69	19.71	**45.00**	**85.45**
	% WSO	62%	145%	168%	**124%**	**139%**
Namoluk	**Inches**	12.93	15.65	21.15	**49.73**	**90.82**
	% WSO	105%	128%	180%	**137%**	**148%**
Western Atolls						
Polowat	**Inches**	2.47	5.38	12.74	**20.59**	**27.66**
	% Norm	41%	60%	102%	**75%**	**57%**

LOCAL SUMMARY AND FORECAST

Climate Outlook: With the Pacific basin climate remaining in ENSO-neutral, abundant rainfall should continue throughout Chuuk State for at least the next several months. The monsoon trough should episodically extend into Chuuk State with its embedded tropical disturbances and monsoon depression stages of developing tropical cyclones bringing periods of heavy rain showers to the region. During August and September, the monsoon trough may move northward at times placing Chuuk State in a weak ridge of high pressure that brings hot dry weather with light winds. Thus the weather for the next few months in Chuuk State will feature periods of heavy rain showers with some several-day breaks of hot dry weather. One or two occurrences of gale-force wind associated with a developing tropical cyclone may affect Chuuk Lagoon or atolls to the north, especially in the fall of 2011. This represents a near normal risk of hazardous effects from tropical cyclones.

Predictions for Chuuk State from July 2011 through June 2012 are as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]			
	Chuuk Lagoon, Losap, and Nama	Atolls		
		Polowat	Northern Islands	Mortlocks
Jul - Sep 2011	**120% (43.86 inches)**	**90% (32.57 in)**	**120% (43.43 in)**	**120% (43.43 in)**
Oct - Dec 2011	**120%**	**95%**	**120%**	**120%**
Jan - Mar 2012	**100%**	**90%**	**100%**	**100%**
Apr - Jun 2012	**110%**	**95%**	**100%**	**110%**

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

Pohnpei State: During the first half of 2011, rainfall was near normal to above normal at most locations throughout Pohnpei State, with the exception of the occurrence of very dry conditions at Kapingamarangi during the latter half of 2010 and the first two months of 2011. The total rainfall during the seven-month period of August 2010 through February 2011 was only 10.28 inches or 19% of normal. Three of the months during this time period had less than one inch of rainfall. This dry weather likely caused harm to water supplies, vegetation and crops. Drought quenching rainfall returned to Kapingamarangi in March 2011 when 8.46 inches (61%) of rainfall was observed, and recently a whopping 17.91 inches (247%) was recorded there in June 2011. For some perspective on the extraordinary dryness at Kapingamarangi, the following rainfall totals during notable severe drought conditions on other islands are given: 1. 1983 drought Pohnpei Island, January to May rainfall = 9.37 inches (13%), 2. 1998 drought Pohnpei Island, January to April rainfall = 10.53 inches (20%), 3. 1983 drought Guam, January to June rainfall = 7.66 inches (28%), 4. 1998 drought Guam, January to June rainfall = 11.26 inches (41%), 5. 1983 drought Majuro, January to May rainfall = 5.93 inches (17%), and 6. 1998 drought Majuro, January to April rainfall = 2.77 inches (11%).

LOCAL SUMMARY AND FORECAST

The recent dry condition at Kapingamarangi, and to a lesser extent at Nukuoro, were the direct result of the La Niña distribution of cold equatorial SST and its effects on weather patterns. With La Niña fading to ENSO-neutral during the first half of 2011, abundant rainfall returned to Kapingamarangi and to Nukuoro where the 2nd Quarter rainfall totals were 38.26 inches (123%) and 63.25 inches (151%), respectively. Not only did the dry conditions abate during the 2nd Quarter, but it was extremely wet at these two islands during June 2011. The 32.72 inches reported at Nukuoro for June 2011 was the highest monthly value seen in Micronesia for the entire quarter.

Pohnpei State Rainfall Summary 2nd Qtr and First Half of 2011

Station		Apr.	May	June	2nd Qtr	1st Half
Pohnpei Island						
Pohnpei WSO	Inches	8.04	18.35	18.90	**45.29**	**90.38**
	% Norm	49%	96%	110%	**86%**	**100%**
Palikir	Inches	12.43	16.25	19.43	**48.11**	**100.69**
	% Norm	70%	79%	105%	**84%**	**103%**
Kolonia Airport	Inches	10.32	19.28	19.68	**49.28**	**89.99**
	% Norm	76%	123%	140%	**114%**	**122%**
Atolls of Pohnpei State						
Nukuoro	Inches	13.38	17.15	32.72	**63.25**	**91.27**
	% Norm	89%	116%	268%	**151%**	**117%**
Pingelap	Inches	6.36	24.23	17.19	**47.78**	**88.02**
	% Norm	37%	142%	106%	**95%**	**98%**
Mwoakilloa	Inches	6.26	23.72	20.68	**50.66**	**95.90**
	% Norm	46%	151%	147%	**117%**	**130%**
Kapingamarangi	Inches	9.99	10.36	17.91	**38.26**	**49.19**
	% Norm	74%	100%	247%	**123%**	**75%**

Climate Outlook: Near normal to above normal rainfall is anticipated on Pohnpei Island and the atolls of Pohnpei State for the next several months. Kapingamarangi is entering its dry season now, but ironically, it is likely to be wetter during the next few months of its dry season than it was at the beginning of its past rainy season. Unless it is El Niño, tropical storms and typhoons do not typically affect Pohnpei State. With ENSO-neutral conditions prevailing for the remainder of 2011, it is likely that a few tropical disturbances and perhaps a monsoon depression or two will pass through the State contributing to abundant rainfall.

Predicted rainfall for Pohnpei State from July 2011 through June 2012 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]	
	Pohnpei Island and atolls	Kapingamarangi
Jul - Sep 2011	**110% (46.46 inches)**	**120% (27.24 inches)**
Oct - Dec 2011	**100%**	**100%**
Jan - Mar 2012	**100%**	**100%**
Apr - Jun 2012	**120%**	**100%**

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

LOCAL SUMMARY AND FORECAST

Kosrae State: Kosrae was relatively dry during the first three months of 2011, receiving approximately 70% of the normal rainfall for this time period. A very wet May helped push the 2nd Quarter total to near 100%, and the first half total to approximately 85%. Despite being below normal, the 2011 first half rainfall total of 93.58 inches (86%) at the Kosrae Airport was among the highest rainfall totals across Micronesia. The dryness in early 2011 was likely due to a greatly expanded La Niña-related equatorial dry wedge extending from the 180° meridian westward into Micronesian waters along the equator. Low latitude atolls of Pohnpei State (e.g., Kapingamarangi and Nukuoro) and of Kiribati were exceptionally dry in proportion to their closeness the equator. Kosrae and some of the southern islands of the RMI were affected by this dry wedge. With ENSO-neutral now here, the rainfall has increased at most of these low latitude islands.

Kosrae State Rainfall Summary 2nd Qtr and First Half of 2011

Station		Apr.	May	June	2nd Qtr	1st Half
Airport (SAWRS)	Inches	16.11	28.41	16.69	**61.21**	**93.58**
	% Norm	74%	151%	88%	**103%**	**86%**
Utwa	Inches	16.41	21.85	18.45	**56.71**	**92.65**
	% WSO	76%	116%	97%	**95%**	**85%**
Tofol	Inches	18.86	21.12	15.71	**55.69**	**92.20**
	% WSO	87%	112%	83%	**94%**	**85%**
Nautilus Hotel	Inches	15.00	20.65	18.60	**54.25**	**94.94**
	% WSO	69%	110%	98%	**91%**	**87%**

Climate Outlook: For the next several months, weak easterly winds should dominate in Kosrae. Westerly winds that are part of the monsoon trough system of the western North Pacific should episodically reach almost to Kosrae. Monsoon depressions and other disturbances of the tropical atmosphere tend to develop near the eastern reaches of the monsoon trough. Periodic regions of disturbed weather should bring abundant rainfall to Kosrae for the remainder of the year, with monthly rainfall totals running near normal to above normal. No adverse tropical cyclone activity is expected for Kosrae State during the remaining months of 2010, although from August through October there may be some short periods of westerly surface winds.

Predicted rainfall for Kosrae State from July 2011 through June 2012 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]
July - September 2011	**110% (47.69 inches)**
October - December 2011	**110%**
January - March 2012	**100%**
April - June 2011	**120%**

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

LOCAL SUMMARY AND FORECAST

Republic of Palau: All recording locations throughout the Republic of Palau were very wet during the first half of 2011. Four of the first 6 months of the year had rainfall totals in excess of 15 inches at the Koror Weather Service Office, with two months (May and June) topping 20 inches. This heavy rainfall pushed the Koror WSO 6-month total to 103.03 inches, which was the highest recorded 2011 first half total within Micronesia. Most of the year's early season tropical cyclones affected the Republic of Palau with heavy rainfall, and some produced gusty southwest winds. Named cyclones passing close enough to Palau to affect the local weather include: TC 02W (Tropical Depression), TC 03W (Tropical Storm Aere), TC 04W (Super Typhoon Songda), TC 05W (Tropical Storm Sarika), TC 06W (Tropical Storm Haima), TC 07W (Tropical Storm Meari), and the monsoon surge that swept across Palau into the two-storm combination of TCs 08W (Typhoon Ma-on) and 09W (Tropical Storm Tokage).

Republic of Palau Rainfall Summary 2nd Qtr and First Half of 2011

Station		Apr.	May	June	2nd Qtr	1st Half
WSO Koror	Inches	12.30	20.24	22.62	**55.16**	**103.03**
	% Norm	142%	169%	131%	**145%**	**156%**
Nekken	Inches	13.24	17.03	25.63	**55.90**	**96.62**
	% Norm	139%	131%	135%	**135%**	**133%**
Intl. Airport	Inches	7.18	19.37	18.65	**45.20**	**77.90**
	% Norm	80%	161%	110%	**119%**	**118%**
Peleliu	Inches	15.99	17.30	24.13	**57.42**	**89.85**
	% Norm	184%	144%	140%	**151%**	**136%**

Climate Outlook: It has been very wet throughout Palau in the first half of the year. A lot of this abundant rainfall was associated with passing tropical cyclones, usually in their intitial developmental stages. In the anticipated continuation of the ENSO-neutral state of the climate, many of the western North Pacific basin's tropical cyclones will form and/or move close enough to Palau to keep rainfall abundant there. Typically during late August through September, the monsoon trough and the tracks and regions of tropical cyclone formation move well to the north of Palau, providing a "mini" dry season in the middle of the rainy season. During such time, tropical cyclones pass well to the north of Palau, and a gusty southwest wind sweeps across with hazy skies and choppy seas in coastal waters and in the open waters of the Rock Islands. One or two episodes of very gusty (25 to 35 kt) southwest winds are anticipated in the coming months, with the greatest risk of these events during late August through November. No direct strike of Palau by a tropical cyclone is expected, although if it were to occur, it would likely be late in the year (late November through December).

Predicted rainfall for Palau from July 2011 through June 2012 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]
July – September 2011	**125% (54.75 inches)**
October – December 2011	**120%**
January – March 2012	**100%**
April - June 2012	**110%**

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

Republic of the Marshall Islands (RMI): The 2nd half of 2010 was very wet at some locations in the RMI. Wet conditions continued during the first three months of 2011, and then drier conditions prevailed in the 2nd quarter of 2011. Overall, the wet conditions of the first quarter of 2011 outweighed the dry conditions of the 2nd quarter. The 6-month 2011 first half rainfall totals were thus above normal at most recording locations. The long-term climate records at Kwajalein and at Majuro (which begin in the early 1950s) show a long slow decline of mean annual rainfall that is statistically significant. At the WSO Majuro, the downward trend of annual rainfall is such that there is a loss of nearly 20 inches of annual rainfall during the 2000s versus the 1950s. At Kwajalein, the loss of annual rainfall over the same 6-decade time period is approximately 14 inches. The recent wet conditions over the past year have done little to affect the long-term trend, and appear as a small upward fluctuation in an otherwise downward trending time series (Figure 2 below).

2)

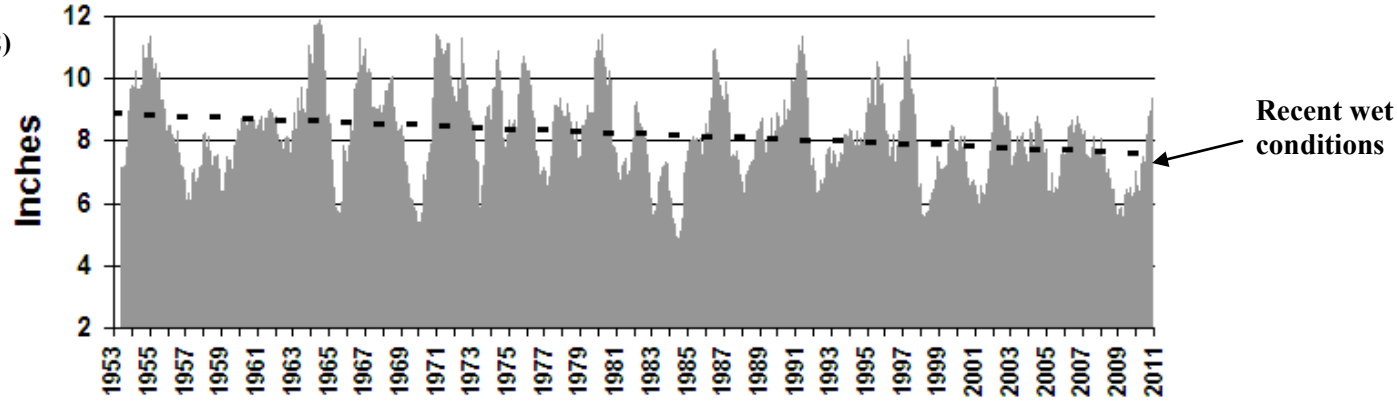

Figure 2. Rainfall time series at Kwajalein from 1953 to present. Values plotted are a 12-month running average of the monthly rainfall. Note the steady long-term decline, and the pronounced fluctuations that are to a large extent related to ENSO. The recent wet conditions are a relatively small upward spike in the time series. The Majuro time series (not shown) is similar.

LOCAL SUMMARY AND FORECAST

The recent "RMI Big Wet" was accompanied by some unusual weather events noted on the web site of the Kwajalein Reagan Test Site weather station, now operated by Atmospheric Technology Services Company (ATSC)/Reagan Test Site (RTS) (http://rts-wx.com/). An article entitled, "The Hunt for Wet October" provides details on the very extreme monthly rainfall experience during October 2010. Another article entitled, "Recent Thunderstorm Rattles Island", describes an intense thunderstorm that affected Kwajalein on the 30th of January 2011. Frequent cloud to ground lightning (as noted in the latter article) is rare in the maritime tropical regions, primarily the result of land-ocean differences in suspended aerosols and atmospheric stability, both of which act to increase the lightning frequency in continental versus maritime thunderstorms. The cold dry upper atmospheric conditions in TUTT cells are known to enhance the lightning production of thunderstorms that form in association with them. The 30 January 2011 Kwajalein lightning event, however, was not associated with a TUTT cell, and looked rather unremarkable in satellite imagery. The ATSC article takes a good stab at explaining this unusual lightning event in terms of favorable upper level winds allowing long-lived convection. It also provides other useful lightning facts.

RMI Rainfall Summary 2nd Qtr and First Half of 2011

Station		Apr.	May	June	2nd Qtr	1st Half
RMI Central Atolls (6º N - 8º N)						
Majuro WSO	**Inches**	3.15	12.60	10.63	**26.38**	**63.35**
	% Norm	31%	113%	92%	**80%**	**113%**
Arno	**Inches**	3.92	11.44	8.48	**23.84**	**65.06**
	% Norm	38%	102%	73%	**72%**	**111%**
Laura	**Inches**	1.30	16.21	12.04	**29.55**	**60.18**
	% Norm	13%	145%	104%	**89%**	**108%**
Aling-laplap	**Inches**	2.60	13.46	10.99	**27.05**	**72.02**
	% Norm	29%	127%	104%	**90%**	**152%**
Jaluit	**Inches**	8.39	11.34	10.74	**30.47**	**61.81**
	% Norm	82%	101%	93%	**92%**	**111%**
RMI Central Atolls (6º N - 8º N)						
Kwajalein	**Inches**	3.76	7.83	8.38	**19.97**	**48.48**
	% Norm	50%	78%	87%	**74%**	**124%**
Wotje	**Inches**	3.92	6.72	5.54	**16.18**	**32.33**
	% Norm	55%	71%	61%	**63%**	**88%**

Climate Outlook: A normally active monsoon trough in the western North Pacific, and the typical distribution of deep convection in the trade wind trough across the RMI should couple to provide near normal to above normal rainfall for at least the next few months at most locations. In the current ENSO-neutral climate state, there are no strong signals for either very wet or very dry conditions.

Predicted rainfall for the RMI from July 2011 through June 2012 is as follows:

LOCAL SUMMARY AND FORECAST

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]		
	South of 6ºN	6ºN to 8ºN	North of 8ºN
July – Sept 2011	**100% (36.32 inches)**	**110% (39.95 in)**	**100% (32.48 in)**
Oct – Dec 2011	**100%**	**110%**	**110%**
Jan – Mar 2012	**100%**	**100%**	**100%**
Apr - June 2012	**110%**	**100%**	**100%**

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

Hawai'i: The first half of 2011 has brought abundant rainfall to many areas of the Hawaiian islands. The Lihue, Honolulu, and Kahului airports received 252%, 316%, and 142% of normal, respectively, over the 6-month period. Early June heavy rain events and numerous trade wind showers produced well above normal monthly totals at most of the rain gages on Oahu. Honolulu Airport's 1.36 inches registered as the wettest June since 1980 and the fifth wettest in over 60 years of record. The Manoa Lyon Arboretum, Nuuanu Upper, Oahu Forest NWR, and upper Moanalua Valley (USGS) gauges posted measurable rainfall (at least 0.01 inches) on 29 out of 30 days. Drought conditions are no longer being reported on Lanai, Oahu, or Kauai.

State of Hawaii Rainfall Summary 2nd Qtr and First Half of 2011

Station		Apr.	May	Jun.	2nd Qtr	1st Half
Lihue Airport	**Inches**	2.11	9.08	1.97	**13.16**	**28.65**
	% Norm	109%	609%	154%	**279%**	**252%**
Honolulu Airport	**Inches**	2.58	3.09	1.36	**7.03**	**12.73**
	% Norm	496%	773%	756%	**639%**	**316%**
Kahului Airport	**Inches**	0.06	1.32	0.28	**1.66**	**9.53**
	% Norm	7%	269%	311%	**113%**	**142%**
Hilo Airport	**Inches**	4.45	8.48	6.38	**19.31**	**37.46**
	% Norm	50%	115%	101%	**85%**	**74%**

Climate Outlook: The following comments are from the U.S. Climate Prediction Center's Hawaiian Seasonal Outlook Discussion: "Below median precipitation amounts for Hawaii are forecast from ASO to SON 2011 based on the NCEP CFS and IRI multi-model ensemble prediction. With ENSO-neutral conditions expected for later in the year and into early 2012, equal chances for below, near, and above median precipitation amounts are forecast for OND 2011 and beyond."

The effects of spring rainfall continue to produce improvements in drought conditions over leeward portions of the Big Island and Maui County. This improvement trend is expected to end as drier and warmer conditions take hold during the heart of the 2011 dry season.

For more information on weather & climate in Hawaii go to:
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 JAS, ASO, and SON of 2011, (ii) the observed monthly mean and maximum sea-level deviations for the season AMJ 2011, and (iii) a synopsis of sea level rise and enhanced trade wind with suggestions for further reading on the subject. *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 JAS, ASO, and SON 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 CCA statistical model Based on the independent SST values in AMJ 2011, the resulting CCA model has been used to forecast the sea-level of three consecutive months: JAS, ASO, and SON (see Table 1: left panel shows values for seasonal mean while the right panel shows the seasonal maxima). The forecast values of sea-level for JAS, ASO, and SON displays a positive deviation in the vicinity of north and south Pacific Islands, except one station in Majuro (for JAS). All the tide gauge stations (at 0 to 2-months lead time) show skillful forecasts for these three consecutive seasons (Table 1: bottom panel). The 2010 /11 La Nina condition has ended and ENSO-neutral condition now prevail. The atmospheric component of the previous La Nina was so strong and long-lasting that we still have some impact of La Nina. Consistent with this La Nina impact (i.e., enhanced trade wind), the sea level in these islands is still higher than normal.

Table 1: **Forecasts of sea-level deviation (in inches) for July-Aug-Sep, Aug-Sep-Oct, and Sep-Oct-Nov 2011.**

	Seasonal Mean Deviations [1]				Seasonal Max Deviations [2]					
Tide Gauge Station	**JAS**	**ASO**	**SON**	**Forecast Quality [3]**	**JAS**	**ASO**	**SON**	**Forecast Quality [3]**	***Return Period [4] for JAS Season***	
Lead Time [5]	*0*	*1M*	*2M*		*0*	*1M*	*2M*		*20 Year*	*100 Year*
Marianas, Guam	+6	+4	+2	Good	+22	+20	+19	Good	*6.3*	*10.9*
Malakal, Palau	+3	+3	+2	V. Good	+40	+39	+38	V. Good	*8.1*	*10.2*
Yap, FSM	+3	+2	+2	V. Good	+30	+30	+29	V. Good	*8.4*	*11.3*
Chuuk, FSM**	+3	+2	+2	N/A	+30	+30	+30	N/A	*N/A*	*N/A*
Pohnpei, FSM	+1	+1	+1	V. Good	+29	+29	+30	V. Good	*5.8*	*7.0*
Kapingamarangi, FSM	+2	+2	+2	Good	+27	+27	+28	Fair	*3.5*	*4.2*
Majuro, RMI	0	+1	+2	Fair	+38	+40	+41	Fair	*5.2*	*6.8*
Kwajalein, RMI	+1	+1	+1	Fair	+38	+38	+38	Fair	*4.1*	*5.2*
Pago Pago, AS	+4	+4	+4	V. Good	+28	+28	+27	Good	*4.1*	*5.4*
Honolulu, Hawai'i	+2	+2	+3	Fair	+21	+20	+21	Fair	*3.4*	*5.7*
Hilo, Hawai'i	+2	+3	+2	Fair	+25	+24	+24	Fair	*6.4*	*7.4*

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_3rd/sea_level.php#footnote for explanations of footnotes 1 through 5.

Remarks: As compared to the previous seasons, the forecasts values of sea level for JAS, ASO, and SON seasons (Table 1, above) indicate a negative trend (fall) in the months to come. However, currently, most of these stations show about 2-4 inches higher than normal sea level.

Despite an elevated sea level for about 2-4 inches higher than normal in the forthcoming seasons, the forecasts clearly indicate a fall in the same time horizon. This falling trend is supportive to on-going ENSO-neutral condition. According to CPC, a transition to ENSO-neutral conditions is expected to develop during May-June 2011 and continue through the Northern Hemisphere summer 2011.

***Pacific ENSO Update* is Now Available Online:**
Visit http://www.prh.noaa.gov/peac/update.php
to receive notification when the newsletter is available online.

Seasonal Sea-Level Outlook for the US-Affiliated Pacific Islands

(ii) Observed Monthly Sea Level Deviation in the April-May-June (AMJ), 2011 Season

The monthly time series (April to June 2011) for sea level deviations have been taken from the UH Sea Level Center. The full time series (in mm) 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 (year to year standard deviation in parentheses)

Tide Gauge Station	Monthly Mean Deviations[1]				Monthly Max Deviations[2]			
	Apr	May	June	Standard Deviations	Apr	May	June	Standard Deviations
Marianas, Guam	*	*	*	3.7	*	*	*	3.9
Malakal, Palau	+5.4	+2.0	*	4.0	+40	+37	+32	3.8
Yap, FSM	+2.2	+1.3	+2.4	3.4	+31	+29	+26	4.0
Chuuk, FSM*	*	*	*	*	*	*	*	*
Pohnpei, FSM	+6.5	+5.1	*	2.2	+38	+34	*	2.7
Kapingamarangi, FSM	*	*	*	2.8	*	*	*	3.1
Majuro, RMI	+4.3	+4.5	*	1.8	+45	+42	*	2.9
Kwajalein, RMI	+3.2	+3.8	+3.9	2.3	+43	+38	+37	2.7
Pago Pago, American Samoa	+10.3	*	*	3.7	+37	*	*	4.2
Honolulu, Hawai'i	0.0	-1.0	0.0	1.8	+20	+20	+20	1.9
Hilo, Hawai'i	+1.0	+0.5	+1.5	2.0	+21	+24	+24	2.4

* 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 May 2011, the monthly mean sea-level in June 2011 didn't change much, except for Yap where it recorded slight rise. Currently, all stations are slightly higher than normal. The fall in Palau is quite considerable. There are several missing data; based on sea-level data on April, Pohnpei recorded fall of sea-level while Majuro recorded a marginal rise of sea-level. The monthly maxima also displayed a falling trend everywhere. Currently, the sea-level in the north Pacific is about 2-4 inches higher than normal. Most of the stations displayed about 2-4 inches fall of sea level during the last two months. This trend is supportive to ongoing weakening stage of La Niña. At this stage our data seem to be very supportive of an ENSO-neutral condition.

(iii) Sea Level Rise and Enhanced Trade Wind: A Synopsis

While the sea level variations in the USAPI region are highly sensitive to the ENSO-cycle (i.e., low sea level during El Niño and high sea level during La Niña), the sea level rise during the La Niña year of 2007-08 was considerably higher (2 to 6 inches) than previous La Niña years at several locations. Despite somewhat smaller Oceanic Nino Index (ONI) values (indicating a weaker La Niña), as compared to ONI values during the 1998-99 and 1988-89 events (relatively stronger La Niña events), most of the islands recorded higher sea levels during the 2007-08 event (Chowdhury et al., 2010b). Based on this loosely proportional relationship between El Niño-Southern Oscillation (ENSO) strength and sea level anomaly, reasoning suggests that, in addition to the La Niña of 2007-08, there must have been other factors responsible for this rise.

One possible explanation is that the recent trend of enhanced trade winds west of the dateline is partly responsible for this rise (Timmermann et al., 2010; Merrifield, 2011 and references within). Whether these enhanced trade winds are abnormal or a longer-term trend remains to be seen. However, this finding is contradictory to the IPCC-Fourth Assessment Report (IPCC-AR4), which tended to show a weakening tropical circulation in response to an imposed warming signal. A major difference between these two types of results is one of time scales. The trend is sensitive to the start and end points of the time series analyzed. While the models used in IPCC-AR4 are on longer time scales, the others are on shorter time scales. In shorter times scales it is clear that enhanced trade winds west of the dateline are causing sea levels to rise up. In longer time scales, it is unclear to what extent the rise is a reflection of natural variability or a longer-term trend.

References and for Further Reading:

Chowdhury M. R., Barnston A. G., Guard C., Duncan S., Schroeder T, and Chu P-S 2010b. Sea level variability and change in the U.S-Affiliated Pacific Islands - Understanding the high sea levels during 2006–08, Weather 65(10), 263-268.

Merrifield, M. A., 2011. A shift in western tropical sea-level during the 1990s, J. Clim. (forthcoming).

Timmermann, A., McGregor S., and Jin F-F. 2010. Wind effects on past and future regional sea level trends in the South Indo-Pacific, J Climate 23, 4429-4437.

Pacific ENSO Update

Excerpts from El NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION
Issued by NOAA NWS Climate Prediction Center - 7 July 2011
http://www.cpc.noaa.gov/products/analysis_monitoring/enso_advisory/index.shtml

ENSO Alert System Status: Not Active (NA)

Synopsis: ENSO-neutral conditions are expected to continue into the Northern Hemisphere fall 2011.

During June 2011, ENSO-neutral conditions continued as reflected by the overall pattern of small sea surface temperature (SST) anomalies across the equatorial Pacific Ocean. All of the latest weekly Niño index values were near average, ranging between 0.0°C (Niño-4) and 0.4°C (Niño-1+2). The subsurface oceanic heat content anomaly (average temperature anomalies in the upper 300m of the ocean) remained elevated, but weakened slightly throughout the month, in accordance with the declining strength of above-average temperatures at depth. While weak, the atmospheric circulation anomalies remained consistent with certain aspects of La Niña. In particular, convection continued to be enhanced over eastern Indonesia and suppressed over the central equatorial Pacific, mainly south of the equator. Also, anomalous low-level easterly and upper-level westerly winds persisted over the central Pacific. Collectively, these tropical Pacific anomalies indicate ENSO-neutral conditions, but the atmospheric circulation continues to be characteristic of La Niña.

Forecasts from a majority of the ENSO models, indicate ENSO-neutral will continue into the Northern Hemisphere fall 2011 (three-month average in the Nino-3.4 index between –0.5°C and +0.5°C). However, over the last couple of weeks, forecasts created by the NCEP Climate Forecast System (CFS) have begun to indicate the re-emergence of La Niña during Northern Hemisphere fall 2011. Combined with the recent weakening of the positive subsurface ocean anomalies and the lingering La Niña state of the atmosphere, the possibility of a return to La Niña during the Northern Hemisphere fall 2011 has increased over the past month. However, ENSO-neutral remains most likely into the Northern Hemisphere fall 2011, with most models and all multi-model forecasts (shown by the thick lines) predicting ENSO-neutral to continue through early 2012.

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. 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.

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 Charlene Felkley, at peac@noaa.gov or at the address listed below.

PEAC is part of the Weather Forecast Office (WFO) Honolulu's mission and roles/responsibilities. All oversight and direction for PEAC is provided by the Weather Forecast Office Honolulu in collaboration with the Joint Institute for Marine and Atmospheric Research (JIMAR) at the University of Hawaii. Publication of the Pacific ENSO Update is supported by the National Oceanic and Atmospheric Administration (NOAA), National Weather Service-Pacific Region Climate Services. The views expressed herein are those of the authors and do not necessarily reflect the views of NOAA, any of its sub-agencies, or cooperating organizations.

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