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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

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CURRENT CONDITIONS

El Niño began in the summer of 2009, and became strong by the end of the year. During the first few months of 2010 El Niño conditions matured, and as of April 2010 most indicators are showing signs of conditions returning to neutral. During an El Niño, dry conditions are typically experienced in the western Pacific, beginning first in Australia and Indonesia during July, and working their way into Micronesia and Hawai'i in the months that follow. When El Niño conditions became moderate to strong in the fall of 2009, very dry conditions were expected across Micronesia and Hawai'i during the first few months of 2010. A team of PEAC scientists from the University of Guam coordinated with the Guam WFO to make several outreach visits within Micronesia during the fall of 2009 to discuss the anticipated effects of El Niño. The UOG team visited the Republic of the Marshall Islands (RMI), Yap, Palau, Kosrae, and Saipan, while a WFO representative visited Chuuk, Pohnpei, Rota, Saipan and Guam. At the time of the first visits in October, it was thought that the biggest threats from El Niño would be an enhanced risk of typhoon (hurricane) activity through December 2010 in Hawai'i and from the RMI westward to Guam. This increased threat of typhoon occurrence was to be followed by potentially severe dry conditions throughout this region in the first few months of 2010. Guam, the CNMI, and Yap were threatened by Super Typhoon Nida (~160 kt) in November. Hawai'i was threatened by Hurricane Neki in late October. During the second half of 2009 and January 2010, rainfall amounts were above normal in American Samoa, and near normal at most locations across Micronesia. Hawai'i, however, did experience persistent dry conditions during this time period. At the end of January 2010, it seemed that Micronesia had been spared the worst-case scenario of late-season typhoons and the onset of severe drought as discussed in outreach visits.

Unusual conditions developed in February 2010, as almost everywhere in Micronesia became extremely dry. Water resources were particularly stressed in Chuuk State and the RMI. Even in typically wet Kosrae, water managers began to worry. Monthly rainfall totals of one inch or less were common across the region. In the words of one RMI forecaster, the month was "…windy, dusty, salty, brown, and very dry!" A renewed fear of prolonged and severe dry conditions arose as tropical cyclone activity pushed eastward into French Polynesia, drying out the northern islands. In response, WSO Guam began a weekly ENSO advisory, and PEAC issued a special bulletin.

As abruptly as the rains had stopped, rainfall returned to portions of Micronesia during the second half of March. Two large and intense tropical cyclones formed in the South Pacific: Tomas and Ului. Tomas hit parts of Fiji, while Ului moved westward across the Coral Sea and made landfall on the northeast coast of Australia. These two cyclones both occurred in normal locations for this time of year, and seemed to mark the end of the El Niño-related eastward displacement of tropical cyclone activity. In association with the formation of Tomas and Ului, a northern hemisphere TC (Omais) developed south of Guam and moved between Yap Island and Ulithi. Omais brought rain to many locations, and preceded a well-established trade wind trough across the low latitudes of Micronesia. Rainfall was abundant at many locations during March, with over 20 inches falling on portions of Pohnpei Island, Kosrae, and Kapingamarangi. Despite these developments, several locations at higher latitudes (e.g., northern RMI, Guam, and the CNMI) have remained relatively dry. We are cautiously optimistic that the trade wind trough will continue to bring adequate rainfall to islands south of 7° N, and begin its seasonal northward shift, returning normal rainfall to most islands, by May or June.

During the 1st Quarter of 2010, the total rainfall at most of the U.S.-Affiliated Pacific Islands (USAPI) was below normal (see Figures 1a and 1b on page 2). February 2010 was particularly dry, with only Pago Pago on American Samoa recording higher than normal rainfall totals. Several nearby tropical cyclones and the northwest monsoon provided American Samoa with this abundant rainfall. During March, American Samoa became abruptly dry, while rainfall returned to portions of the island groups in Micronesia.

Sea-level variation in the USAPI is sensitive to the ENSO cycle, with lower (higher) sea level typically observed during El Niño (La Niña) events. The monthly mean sea level in March 2010 remained steady, and in some cases recorded a slight rise. Monthly maxima for March were higher than February at most stations, due to strong trade winds returning to the western and central tropical Pacific. Sea-level forecasts call for continuing slight rise in the coming seasons, as the current El Niño event weakens and prevailing conditions shift back to ENSO-neutral.

Comments from the latest **El Niño/Southern Oscillation (ENSO) Diagnostic Discussion** on April 8, 2010 by the **NOAA NWS Climate Prediction Center** can be found on the back page of this bulletin.

SEA SURFACE TEMPERATURES

El Niño weakened to moderate strength during March 2010, with sea surface temperature anomalies decreasing slightly, but still exceeding +1°C across much of the central and eastern equatorial Pacific Ocean at the end of the month. Subsurface heat content anomalies (average temperatures in the upper 300m of the ocean) decreased during March in response to the eastward expansion of below-average temperature anomalies at depth (100-200m) into the east-central Pacific. Anomalous tropical convection remained consistent with El Niño, with enhancement over the central and eastern Pacific and suppression over Indonesia. Collectively, these oceanic and atmospheric anomalies reflect an ongoing, but weakening El Niño.

SOUTHERN OSCILLATION INDEX

The 3-month average of the Southern Oscillation Index for the 1st Quarter of 2010 was -1.7, with monthly values of –1.5, -2.1 and –1.4 for the months of January, February, and March 2010, respectively. These recent, persistently negative Southern Oscillation Index values are historically consistent with a moderate-strength El Niño.

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.

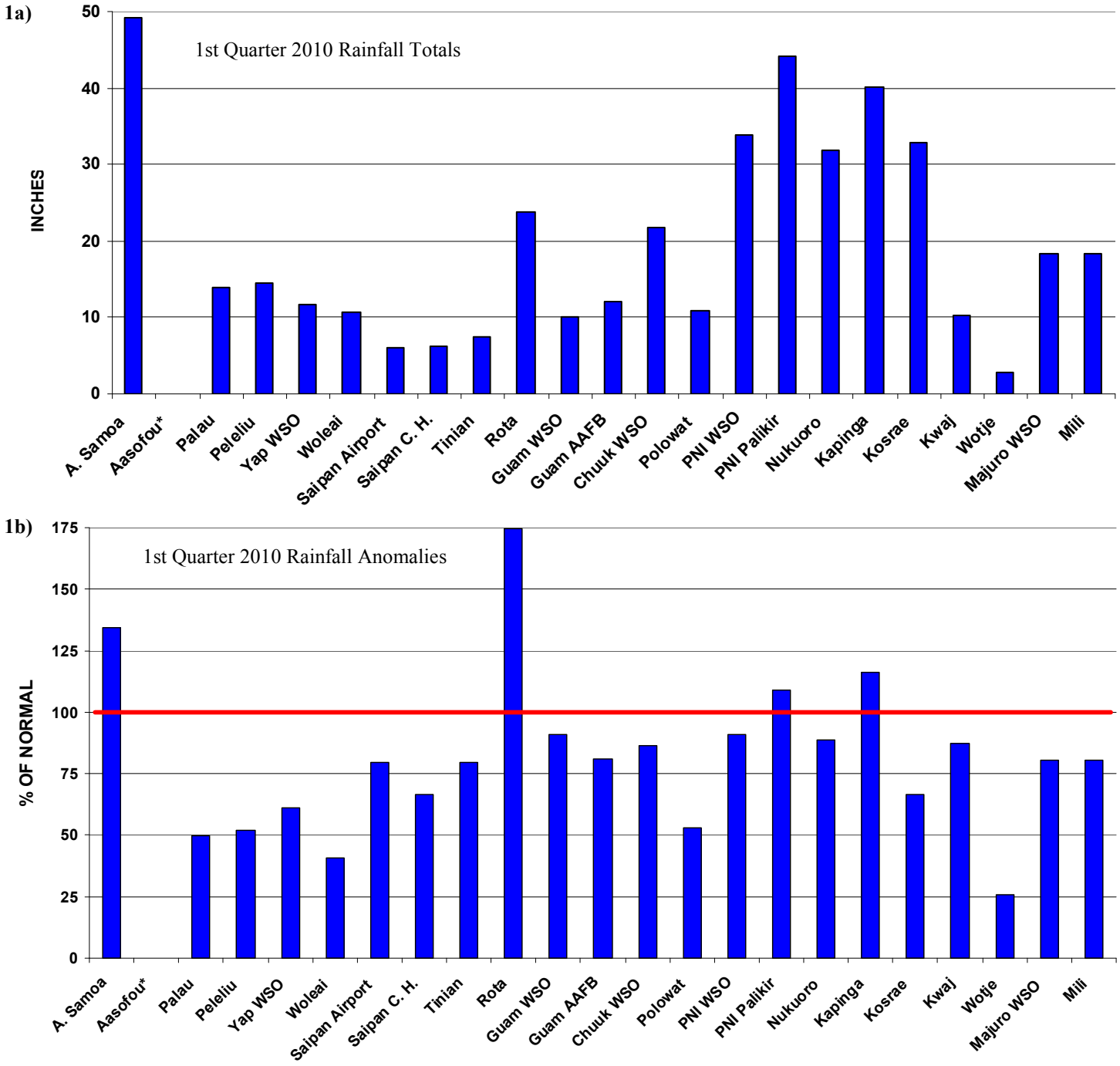


Figure 1, above. 1st Quarter 2010 rainfall totals (a) in inches and (b) anomalies (expressed as % of normal). *Aasofou data not available.

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

For the third year in a row, the tropical cyclone season in the western North Pacific basin was below normal in almost every category of activity (e.g., number of typhoons). The JTWC numbered 29 tropical cyclones in the western North Pacific basin during 2009, which was 2 below average. Of these 29 cyclones, 4 were tropical depressions, 11 were tropical storms, and 14 were typhoons. The normal values for these statistics are 3, 10, and 18, respectively. Tropical cyclone activity in the western North Pacific basin shifted eastward during 2009, which is typical during an El Niño. Because of this major shift of basin cyclone activity, Micronesia was traversed by several tropical cyclones during 2009. On the evening of September 15, 2009, the center of Typhoon Choi-Wan passed directly over Alamagan with maximum sustained winds of 145 mph. Vegetation was heavily damaged and homes were leveled. Following the aftermath of Super Typhoon Choi-Wan, the USNS Alan Shepard (T-AKE 3) and two MH-60S helicopters from Helicopter Sea Combat Squadron (HSC) 25 arrived on site in the early morning hours of Sept. 17 to provide humanitarian support to residents of Alamagan and Agrihan. One family was transported to Saipan for medical needs. A healthy baby had been born on the island days before the storm's arrival, and the child was in good condition.

The Southern Hemisphere TC season of 2009-2010 saw below average numbers of cyclones with a shift to the east of cyclone activity. Through mid-April 2010, the JTWC had numbered 23 cyclones in the Southern Hemisphere, which is below the average of 28. During February and early March, the activity shifted eastward into French Polynesia. American Samoa was affected by several cyclones, and on the 12th of February, 2010, one of these cyclones (Rene) passed close enough to the islands of American Samoa to cause flooding and some moderate wind damage. On the island group of Manu'a, strong winds damaged some homes and uprooted banana and breadfruit trees. One casualty was reported during the storm: a man fell off a roof while boarding windows for the winds.

The PEAC tropical forecast considers input from two 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 (http://aposf02.cityu.edu.hk/tc_forecast/2008_forecast_APR.htm), and, (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://tsr.mssl.ucl.ac.uk/).

PEAC Center Tropical Cyclone Outlook

The PEAC tropical cyclone outlook for the upcoming typhoon season of 2010 calls for near normal activity in the western North Pacific basin. There should be fewer cyclones (with respect to normal and with respect to 2009) traversing Micronesia as El Niño wanes and ENSO-neutral conditions return. Also, the geographical distribution of western North Pacific tropical cyclones should return to a near normal pattern, with near-normal risk of typhoon occurrence from Chuuk westward. Islands from Pohnpei eastward into the RMI experience tropical storms and typhoons primarily during El Niño, and the risk of a destructive tropical cyclone in these locations is considered low during 2010. The risk of a damaging impact by a hurricane or strong tropical storm in American Samoa is considered low through June 2010.

On December 4, 2008, the Tropical Storm Risk Research Group1 (http://www.tropicalstormrisk.com/) issued the following assessment of tropical cyclone activity for the Australian region:

The TSR (Tropical Storm Risk) early December forecast update for Australian-region tropical cyclone activity in 2008/9 anticipates activity approximately 10% above the 1975/6-2007/8 climate norm. The forecast spans the Australian season from the 1st November 2008 to the 30th April 2009 and is based on data available through the end of November 2008. Our main predictor is the observed anomaly in October-November Niño 4 sea surface temperatures (SST) which is below average at -0.50 C. … Thus we expect Australian basin cyclone activity and landfalling numbers to be above-average in 2008/9.

Our Australian-region (100 E to 170 E), while slightly non-standard, is selected to provide the best overview for tropical cyclone activity around the whole of Australia.

There is a 45% probability that Australian-region tropical storm numbers in 2008/9 will be above average (defined as more than 12 tropical storms), a 45% likelihood they will be near normal (defined as between 9 and 12 tropical storms) and only a 10% chance they will be below normal (defined as less than 9 tropical storms). …

LOCAL SUMMARY AND FORECAST

American Samoa: American Samoa has been very wet during its current rainy season. Between November 2009 and March 2010, Pago Pago received 150% of normal rainfall (93.16 inches). As anticipated, El Niño conditions caused South Pacific tropical cyclone activity to extend further east than normal. Four named tropical cyclones (Nisha, Oli, Rene, and Sarah) formed near or passed close to American Samoa. On the 12th of February, Tropical Cyclone Rene passed very close to the Manu'a island group of American Samoa. Winds approaching hurricane force damaged vegetation and homes in these islands. The three other cyclones and the monsoon surges that spawned them contributed to American Samoa's recent copious rainfall. During March, the climate pattern shifted westward to a near normal state, with tropical cyclones near Fiji and in the Coral Sea. Rainfall in American Samoa dropped to 44% of normal (4.99 inches) in March.

American Samoa Rainfall Summary 1st Qtr 2010 and Annual 2009							
Station		**Jan.**	**Feb.**	**Mar.**	**1st Qtr**	**Predicted[1]**	**2009 Annual**
Pago Pago WSO	**Inches**	28.30	15.83	4.99	**49.12**	**44.77**	**139.27**
	% Norm	245%	124%	44%	**134%**	**120%**	**114%**
Aasufou	**Inches**	N/A	N/A	N/A	**N/A**	**N/A**	**N/A**
	% Norm	N/A	N/A	N/A	**N/A**	**N/A**	**N/A**

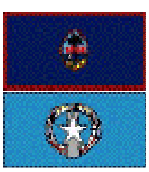
[1] Predictions for 1st Quarter 2010 made in 4th Quarter 2009 newsletter.

Climate Outlook: American Samoa is now near the end of its rainy season (November through April). Nearly all climate models favor near normal to slightly less than normal rainfall at American Samoa for at least the next three months. From May through September American Samoa enters its typical dry season, and the rainfall should be near normal. We are cautiously optimistic that no further cyclone activity will adversely impact the islands of American Samoa in the next few months, as a trade-wind regime is expected to dominate the weather pattern.

Predicted rainfall for American Samoa from April 2010 through March 2011 is:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]
April - June 2010 (Onset of Dry Season)	**100% (27.53 inches - Pago Pago)**
July - September 2010 (Heart of Dry Season)	**100%**
October - December 2010 (Onset of next Rainy Season)	**100%**
January - March 2011 (Heart of next Rainy Season)	**100%**

[2] 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 2009 was split into two regimes: relatively tranquil and dry conditions during the first half of the year, and wet conditions during the second half of the year that included several rainfall extremes (e.g., more than 5 inches in 24 hours) not seen in over three years. El Niño started late in 2009, with the atmosphere exhibiting a La Niña-type pattern of tranquil weather with few extremes during the first half of the year. During July and August, the developing El Niño was accompanied by a reasonably well-developed monsoon trough near the islands. In August 2009, tropical disturbances brought abundant rainfall to most Guam locations, exceeding 25 inches in a month for the first time since August 2005.

LOCAL SUMMARY AND FORECAST

During 2009, several tropical cyclones passed near the islands of Guam and the CNMI, with Typhoon Nida making a direct strike on Alamagan. Vegetation and homes on this island were severely damaged, but no serious injury or loss of life was reported. Hazardous surf (10-15 feet) was noted on Guam when Typhoon Nida passed to the southwest in November. Earlier, Saipan was brushed by Typhoon Melor, with hazardous surf, gusty winds, and heavy rainfall affecting the island. Only minor damage to exposed vegetation was noted on Saipan.

During the first quarter of 2010, rainfall was below normal nearly everywhere in Guam and the CNMI, with only Rota experiencing above normal rainfall. February was particularly dry, with less than one inch of rain experienced at many locations. Several shear lines, as well as the passage of Tropical Storm Omais to the south, brought a return of rainfall to near or above normal in March, which is normally the driest month of the year. Overall, dry conditions persist, causing low water levels in many streams on Guam, and wildfires in southern grasslands. One spectacular brush fire scorched the whole Lonfit Valley, and forced the evacuation of homes along the road from Nimitz Hill to Mount Alutom.

Guam and CNMI Rainfall Summary 1st Qtr 2010 and Annual 2009							
Station		**Jan.**	**Feb.**	**Mar.**	**1st Qtr**	**Predicted[1]**	**2009 Annual**
Guam							
GIA (WSO)	**Inches**	4.69	1.06	4.40	**10.15**	**8.92**	**97.13**
	% Norm	105%	28%	148%	**91%**	**80%**	**107%**
AAFB	**Inches**	6.31	1.79	4.04	**12.14**	**11.99**	**86.88**
	% Norm	111%	34%	99%	**81%**	**80%**	**88%**
Dededo (Ypapao)	**Inches**	7.36	0.98	4.31	**12.65**	**12.05**	**109.46**
	% Norm	129%	19%	105%	**84%**	**80%**	**111%**
Ugum Watershed	**Inches**	5.48	0.76	3.02	**9.26**	**11.95**	**111.69**
	% Norm	96%	15%	74%	**62%**	**80%**	**113%**
Sinajaña	**Inches**	3.97	0.80	3.90	**8.67**	**8.89**	**107.95**
	% Norm	89%	21%	131%	**78%**	**80%**	**119%**
CNMI							
Saipan Intl. Airport	**Inches**	2.51	1.12	2.41	**6.04**	**5.35**	**85.16**
	% Norm	73%	47%	120%	**79%**	**70%**	**114%**
Capitol Hill	**Inches**	2.48	0.94	2.90	**6.32**	**6.60**	**88.63**
	% Norm	62%	31%	116%	**67%**	**70%**	**98%**
Tinian Airport	**Inches**	4.77	0.73	2.04	**7.54**	**6.68**	**77.28**
	% Norm	119%	24%	82%	**79%**	**70%**	**93%**
Rota Airport	**Inches**	13.51	1.91	8.39	**23.81**	**10.88**	**93.40**
	% Norm	256%	41%	227%	**175%**	**80%**	**99%**

[1] Predictions for 1st Quarter 2010 made in 4th Quarter 2009 newsletter.
* The Weather Service Meteorological Observatory (WSMO) (now closed) was located at Finagayan, in the northwest side of Guam.

LOCAL SUMMARY AND FORECAST

Climate Outlook: The dry season on Guam and in the CNMI is underway. Although abundant rainfall returned to many low latitude islands in March, mechanisms favoring heavy rain will not reach Guam's latitude until July. Dry conditions are therefore likely to persist through June 2010. Normal April, May, and June (AMJ) 3-month rainfall ranges from 15 to 18 inches on Guam and 12 to 15 inches on Saipan. During AMJ 2010 totals of 10 to 12 inches and 8 to 10 inches (70 to 80 percent of normal) are expected on Guam and Saipan, respectively. The rainy season should begin nearly on time in early or mid-July. Western North Pacific tropical cyclone activity will likely be delayed, and pushed to the west, reducing the risk of tropical cyclones in Guam and the CNMI for at least the first half of 2010. During the second half of the year the threat of a tropical cyclone should return to near normal. The normal threat of typhoon force winds on Guam and on Saipan is expected to be 15 to 20 percent (between 1 in 7 and 1 in 5) over the course of a year, with the greatest threat in the months of October and November.

Predicted rainfall for Guam and the Mariana Islands from April 2010 through March 2011 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]	
	Guam/Rota	Saipan/Tinian
April – June 2010 (2nd Half of Dry Season)	**75% (12.32 inches)**	**75% (6.44 inches)**
July - September 2010 (Heart of Next Rainy Season)	**95%**	**90%**
October - December 2010 (End of Next Rainy Season)	**95%**	**100%**
January - March 2011 (Onset of Next Dry Season)	**100%**	**100%**

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

Federated States of Micronesia

Yap State: Annual rainfall totals for 2009 at all Yap Island locations were near normal, falling within roughly plus-or-minus 5 inches of 120 inches for the calendar year. The weather at Yap Island during 2009 was mostly unremarkable with few noteworthy events. During November, Yap Island and its outlying atoll to the northeast, Ulithi, were threatened by the large and intense Typhoon Nida. This typhoon moved almost precisely midway between Yap Island and Guam, sparing both islands of its damaging effects.

Rainfall amounts were drier than normal during the 1st Quarter of 2010, with the 11.73 inches at the Yap WSO coming in at 61% of the long-term average. On the morning of 23 March, Tropical Storm Omais passed close to the islands of Ulithi Atoll. This cyclone yielded some much-needed rainfall to the island, and no significant damage or injuries were reported from the storm. However, a catamaran sailboat was rammed into the pier on Mog Mog island during the height of gale force winds, stranding a family of four on the island until repairs were made.

LOCAL SUMMARY AND FORECAST

Yap State Rainfall Summary 1st Qtr 2010 and 2009 Annual							
Station		Jan.	Feb.	Mar.	1st Qtr	Predicted[1]	2009 Annual
Yap Island							
Yap WSO	Inches	5.29	2.12	4.32	**11.73**	**16.35**	**120.64**
	% Norm	72%	35%	72%	**61%**	**85%**	**100%**
Dugor	Inches	4.50	2.22	4.26	**11.78**	**16.35**	**123.39**
	% WSO				**60%**	**85%**	**103%**
Gilman	Inches	5.17	2.16	5.04	**12.37**	**16.35**	**128.63**
	% WSO				**64%**	**85%**	**107%**
Luweech	Inches	5.50	2.02	4.26	**11.78**	**16.35**	**121.48**
	% WSO				**61%**	**85%**	**101%**
Maap	Inches	7.39	1.95	4.27	**13.61**	**16.35**	**106.18**
	% WSO				**71%**	**85%**	**88%**
North Fanif	Inches	4.19	1.26	5.66	**11.11**	**16.35**	**117.55**
	% WSO				**58%**	**85%**	**98%**
Rumung	Inches	7.96	2.06	6.50	**16.52**	**16.35**	**112.28**
	% WSO				**86%**	**85%**	**94%**
Tamil	Inches	4.12	2.03	5.07	**11.22**	**16.35**	**119.28**
	% WSO				**58%**	**85%**	**99%**
Outer Islands							
Ulithi	Inches	3.52	1.66	5.71	**10.89**	**14.03**	**N/A**
	% Norm	57%	33%	113%	**66%**	**85%**	**N/A**
Woleai	Inches	5.89	1.04	3.82	**10.75**	**20.98**	**85.21**
	% Norm	55%	14%	46%	**41%**	**80%**	**61%**

[1] Predictions for 1st Quarter 2010 made in 4th Quarter 2009 newsletter.

Climate Outlook: All locations on Yap Island, Fais, and Ulithi should have slightly below-average rainfall (80-90% of normal) for the next three months. Thereafter, normal rainfall amounts should return. Rainfall at Woleai and other atolls to the south and southeast (e.g., Ngulu, Euripik and Satawal) will return to normal sooner than those locations further north. These atolls should have normal rainfall by May. Tropical cyclone activity in the western North Pacific is expected to be near normal during 2010. The odds of damaging winds from a tropical cyclone on Yap Island or any of the state's northern islands will be approximately 10 to 15 % (1-in-10 to 1-in-7) for the calendar year 2010, which represents normal risk.

Predicted rainfall for Yap State from April 2010 through March 2011 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]	
	Yap and Ulithi	Woleai
April – June 2010 (Onset of Rainy Season)	**85% (23.11 inches)**	**90% (32.63 inches)**
July – September 2010 (Heart of Rainy Season)	**95%**	**95%**
October – December 2010 (End of Rainy Season)	**100%**	**100%**
January – March 2011 (Heart of next Dry Season)	**100%**	**100%**

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

LOCAL SUMMARY AND FORECAST

Chuuk State: Annual rainfall in Chuuk State during the calendar year 2009 was near normal at most locations. The typical north-south distribution pattern was present, with the northern atolls receiving the least, and some of the atolls further south in the Mortlocks receiving the most. The annual total of 145.14 inches observed at Ta Atoll in the southern Mortlocks was the highest annual total throughout Chuuk State in 2009. The annual totals of 92.40 inches and 112.64 inches at Polowat and Namoluk, respectively, were among the lowest annual readings. The 141.63 inches recorded at the Chuuk WSO was near normal (96%).

The 1st Quarter of 2010 was relatively dry at most locations, with nearly all islands experiencing extremely dry conditions (one inch of rainfall or less) during February. Some atolls even had February totals of less than 0.50 inches. The February total of 0.31 inches at Ettal was only 5% of the normal for that month. As noted at many other low latitude locations in Micronesia, abundant rainfall returned to many atolls in March. The dry conditions of February gave quite a scare to the residents of Chuuk state. Just one month with almost no rainfall was enough to stress water resources and impact the seasonality of staple food crops (e.g., breadfruit).

Chuuk State Rainfall Summary 1st Qtr 2010 and Annual 2009

Station		Jan.	Feb.	Mar.	1st Qtr	Predicted[1]	2009 Annual
Chuuk Lagoon							
Chuuk WSO	Inches	11.91	2.46	7.35	**21.72**	**21.90**	**141.63**
	% Norm	112%	40%	88%	**86%**	**85%**	**105%**
Piis Panew	Inches	1.81	0.66	5.56	**8.03**	**21.90**	**76.94**
	% WSO				**32%**	**85%**	**57%**
Southern Mortlocks							
Lukunoch	Inches	16.41	0.29	13.90	**30.90**	**23.19**	**125.87**
	% WSO	154%	5%	167%	**121%**	**90%**	**94%**
Ettal	Inches	17.03	0.31	7.53	**24.87**	**23.19**	**142.83**
	% WSO	159%	5%	90%	**99%**	**90%**	**106%**
Ta	Inches	20.22	0.51	13.37	**34.10**	**23.19**	**145.14**
	% WSO	189%	8%	160%	**135%**	**90%**	**108%**
Northern Atolls							
Fananu	Inches	4.22	1.58	6.65	**12.45**	**20.62**	**118.86**
	% WSO	40%	26%	80%	**49%**	**80%**	**88%**
Onoun	Inches	10.82	1.50	7.86	**20.18**	**20.62**	**120.59**
	% WSO	101%	24%	94%	**80%**	**80%**	**90%**
Northern Mortlocks							
Losap	Inches	13.50	0.98	6.80	**21.28**	**21.90**	**128.47**
	% WSO	126%	16%	82%	**84%**	**85%**	**96%**
Nama	Inches	18.38	1.60	8.64	**28.62**	**21.90**	**121.42**
	% WSO	172%	26%	104%	**114%**	**85%**	**90%**
Namoluk	Inches	10.16	0.76	10.12	**20.94**	**21.90**	**112.64**
	% WSO	95%	12%	120%	**83%**	**85%**	**84%**
Western Atolls							
Polowat	Inches	2.69	1.19	7.01	**10.89**	**16.44**	**92.40**
	% Norm	34%	19%	112%	**53%**	**80%**	**77%**

[1] Predictions for 1st Quarter 2010 made in 4th Quarter 2009 newsletter.

LOCAL SUMMARY AND FORECAST

Climate Outlook: Easterly trade winds should continue to dominate the flow throughout Chuuk State for the next three months. The normal trade wind trough and its associated east-west band of persistent showers has become established at low latitudes (4-6° N), and will gradually shift northward over the next three months. For the next three months, rainfall will be distributed in a north-south pattern across Chuuk State, with atolls in the north (e.g., Fananu and Onoun) receiving less rain than atolls located further south (e.g., Ta and Ettal). Beginning in August and continuing through December, a few of the tropical cyclones occurring in the western North Pacific basin will begin their lives in Chuuk State as depressions. One or two occurrences of gale-force wind associated with a tropical cyclone may affect Chuuk Lagoon or atolls to the north, especially in the fall of 2010. This represents a normal risk.

Predictions for Chuuk State from April 2010 through March 2011 are as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]			
	Chuuk Lagoon, Losap, and Nama	Polowat	Northern Islands	Southern Mortlocks
Apr – Jun 2010	**80% (28.43 inches)**	**80% (28.44 in)**	**75% (26.66 in)**	**90% (31.99 in)**
Jul – Sep 2010	**90%**	**95%**	**90%**	**100%**
Oct – Dec 2010	**100%**	**95%**	**100%**	**100%**
Jan – Mar 2011	**100%**	**95%**	**100%**	**100%**

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

Pohnpei State: The majority of locations on Pohnpei Island and the atolls of Pohnpei State had near normal or slightly below normal rainfall during 2009. Nukuoro and Kapingamarangi were wetter than normal. Palikir topped the list of rainfall totals in Pohnpei State during 2009 with 194.41 inches, even though it was a bit below normal (95%) for that location. This was the wettest 2009 annual total recorded in Micronesia.

Rainfall was abundant in January and March 2010, with very dry weather during February. Pohnpei Island normally receives high rainfall (approximately 15 inches per month) year-round, with a brief let-up in February when the average falls to about 10 inches. This February, amounts were very low, with some locations on Pohnpei Island receiving less than 2 inches, and Nukuoro receiving only 0.18 inches. Stream flow on Pohnpei Island was briefly lowered during February, which caused some concern for water resources. During March, abundant rains returned to Pohnpei.

LOCAL SUMMARY AND FORECAST

Pohnpei State Rainfall Summary 1st Qtr 2010 and Annual 2009							
Station		**Jan.**	**Feb.**	**Mar.**	**1st Qtr**	**Predicted[1]**	**2009 Annual**
Pohnpei Island							
Pohnpei WSO	**Inches**	8.16	1.83	23.94	**33.93**	**31.69**	**167.72**
	% Norm	62%	17%	177%	**91%**	**85%**	**89%**
Palikir*	**Inches**	11.87	3.90	28.37	**44.14**	**34.42**	**194.41**
	% Norm	84%	33%	194%	**109%**	**85%**	**95%**
Airport**	**Inches**	6.14	1.50	19.96	**27.60**	**26.07**	**156.75**
	% Norm	57%	17%	179%	**90%**	**85%**	**101%**
Atolls of Pohnpei State							
Nukuoro	**Inches**	16.39	0.18	15.19	**31.76**	**30.68**	**171.83**
	% Norm	139%	2%	112%	**88%**	**85%**	**115%**
Pingelap	**Inches**	19.01	1.70	17.89	**38.60**	**33.14**	**132.34**
	% Norm	154%	14%	123%	**99%**	**85%**	**75%**
Mwoakilloa	**Inches**	15.36	1.91	10.68	**27.95**	**26.11**	**147.57**
	% Norm	143%	22%	96%	**91%**	**85%**	**95%**
Kapingamarangi	**Inches**	16.01	3.28	20.93	**40.22**	**34.67**	**145.82**
	% Norm	153%	32%	151%	**116%**	**100%**	**133%**

[1] Predictions for 1st Quarter 2010 made in 4th Quarter 2009 newsletter.
* Palikir normal est. as 108% of WSO normal
** Airport normal est. as 86% of WSO normal

Climate Outlook: In the weather pattern of persistent trade winds that has become established in Micronesia, the trade-wind trough sharpens and the zonal band of cloudiness associated with it causes increased rainfall on Pohnpei Island and the atolls that lie within the latitude bounds of 4º to 8º N. This is especially true for the months of April and May when Pohnpei Island experiences its highest monthly average rainfall. Near normal rainfall is anticipated on Pohnpei Island and the atolls of Pohnpei State for the next several months.

No typhoons or tropical storms are anticipated to adversely affect Pohnpei State during 2010, although several of the basin's tropical cyclones may begin as depressions near Pohnpei. These will contribute to expected rainfall.

Predicted rainfall for Pohnpei State from April 2010 through March 2011 is as follows:

Inclusive Period	**% of long-term average / Forecast rainfall (inches)** [2]	
	Pohnpei Island and atolls	**Kapingamarangi**
Apr - Jun 2010	**95% (50.74 inches)**	**100% (31.28 inches)**
Jul - Sep 2010	**100%**	**100%**
Oct - Dec 2010	**100%**	**100%**
Jan - Mar 2011	**100%**	**95%**

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

LOCAL SUMMARY AND FORECAST

Kosrae State: Kosrae is typically one of Micronesia's wettest locations. Its annual average of over 200 inches is high even by global comparison. For 2009, the 192.55 inches received at the Kosrae Airport was exceeded only by 194.41 inches at Palikir on Pohnpei Island. Though comparatively high to other locations, the Kosrae 2009 annual rainfall was actually slightly below normal.

Largely a result of a very dry February, the 2010 1st Quarter rainfall was below normal. Roughly 2 inches of rain was recorded across the island during February, which was an extremely rare event. In the Kosrae Airport climate data (going back to 1990), only four months have less rainfall than February 2010. An all-time low value of 0.25 inches occurred in February 1992, and the less than two inches was received in each of the first three months of 1998. Water resource managers began to worry during February 2010, but thankfully normal abundant rainfall returned in March.

Kosrae State Rainfall Summary 1st Qtr 2010 and Annual 2009							
Station		**Jan.**	**Feb.**	**Mar.**	**1st Qtr**	**Predicted[1]**	**2009 Annual**
Airport (SAWRS)	**Inches**	12.87	2.24	17.76	**32.87**	**39.53**	**192.55**
	% Norm	89%	14%	95%	**67%**	**80%**	**93%**
Utwa	**Inches**	17.42	1.50	18.08	**37.00**	**39.53**	**178.68**
	% Norm	121%	9%	97%	**75%**	**80%**	**87%**
Nautilus Hotel	**Inches**	12.31	1.95	20.48	**34.74**	**39.53**	**174.67**
	% Norm	86%	12%	107%	**70%**	**80%**	**85%**
Tofol	**Inches**	6.44	N/A	19.29	**N/A**	**39.53**	**N/A**
	% Norm	45%	N/A	103%	**N/A**	**80%**	**N/A**

[1] Predictions for 1st Quarter 2010 made in 4th Quarter 2009 newsletter.

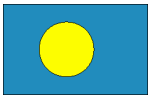
Climate Outlook: Similar to Pohnpei, the trade-wind trough produces abundant rainfall on Kosrae under persistent trade winds. The months of March through June, normally the wettest of the year, are anticipated to be near normal. Kosrae typically receives between 17 and 20 inches of rain for all months of the year, and is one of few places where 20-inch monthly rainfall totals are common. During 2010, there should be three or four months with rainfall in excess of 20 inches. For comparison, five months during 2008 and two months during 2009 met this condition. No adverse tropical cyclone activity is expected for Kosrae State during 2010.

Forecast rainfall for Kosrae State from April 2010 through March 2011 is as follows:

Inclusive Period	**% of long-term average / Forecast rainfall (inches)** [2]
April – June 2010	**100% (59.46 inches)**
July - September 2010	**100%**
October - December 2010	**100%**
January - March 2011	**100%**

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

LOCAL SUMMARY AND FORECAST



Republic of Palau: Rainfall was abundant throughout the Republic of Palau during 2009. The 170.09 inches at the WSO was 115% of normal. Continuing a pattern noted since the rain gage at the Palau International Airport was activated, the 2009 total was wetter there (187.82 inches) than at the WSO. Peleliu has a history of being slightly drier than the WSO, with 163.19 inches in 2009. During El Niño, the Republic of Palau is often one of the first locations in Micronesia to experience below normal rainfall. 2009 was an exception, and Palau remained wet through the end of the year.

Dry conditions became established in the 1st Quarter of 2010, as rainfall throughout most of Palau was below normal. The WSO and Peleliu received 50% (13.93 inches) and 52% (14.54 inches) of their normal values. Nekken 1st Quarter total, however, was close to normal (99%) due to a wet January.

Republic of Palau Rainfall Summary 1st Qtr 2010 and Annual 2009

Station		Jan.	Feb.	Mar.	1st Qtr	Predicted[1]	2009 Annual
WSO Koror	Inches	6.88	3.61	3.44	**13.93**	**25.19**	**170.89**
	% Norm	64%	40%	42%	**50%**	**85%**	**115%**
Nekken	Inches	17.20	2.48	8.11	**27.79**	**25.19**	**169.20**
	% Norm	161%	27%	98%	**99%**	**85%**	**114%**
Intl. Airport	Inches	8.91	5.17	4.79	**18.87**	**25.19**	**187.82**
	% Norm	83%	57%	58%	**67%**	**85%**	**127%**
Peleliu	Inches	9.12	1.90	3.52	**14.54**	**25.19**	**163.19**
	% Norm	85%	21%	43%	**52%**	**85%**	**110%**

[1] Predictions for 1st Quarter 2010 made in 4th Quarter 2009 newsletter.

Climate Outlook: The distribution of rainfall on Palau during the next few months will still be affected by the current waning El Niño event. It has already been quite dry throughout Palau during the first three months of the year. During May, rainfall normally increases on Palau, and the months of June and July are typically the wettest of the year. This year, the steep increase of rainfall normally experienced in May and June may be delayed somewhat. Rainfall will, however, rebound to normal by July or August. Tropical cyclone influence on Palau should be near normal during both the early part of the 2010 cyclone season (April through June), and near the end of the year (late October through December). Though the basin as a whole is anticipated to experience a slow start in 2010, Palau could experience one episode of near-gale (25 to 35 mph) westerly wind associated with a north-passing tropical storm or tropical depression during May, June, or early July. Two or three such episodes of gusty winds and heavy showers are likely to occur during October through December. Because of its southerly location, Palau is not anticipated to experience a direct strike by a strong tropical storm or a typhoon.

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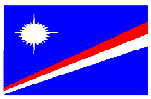
Predicted rainfall for Palau from April 2010 through March 2011 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]
April – June 2010	**90% (34.42 inches)**
July – September 2010	**100%**
October – December 2010	**100%**
January – March 2011	**100%**

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



Republic of the Marshall Islands (RMI): In 2009, all reporting locations in the RMI had below normal rainfall, especially during the first half of the year: Kwajalein and Majuro had 6-month rainfall totals of 39% and 56% of normal, respectively. Rainfall was heavier during the 2nd half of 2009. The annual total of 108.94 inches at the Majuro WSO was 83% of its long-term average. Majuro and other atolls of the RMI (especially in the north) have been experiencing drier than normal conditions for some time now. Although heavy rains occurred at the end of 2009, the RMI became very dry during the first two months of 2010. Similar to locations throughout Micronesia, February was extremely dry, with some atolls receiving less than 1 inch of rain. Water sup-

RMI Rainfall Summary 1st Qtr 2010 and Annual 2009

Station		Jan.	Feb.	Mar.	1st Qtr	Predicted[1]	2009 Annual
RMI Central and Southern Atolls							
Majuro WSO	Inches	4.89	3.74	9.73	**18.36**	**19.51**	**108.94**
	% Norm	58%	61%	118%	**80%**	**85%**	**83%**
Laura	Inches	4.16	1.73	N/A	**N/A**	**19.87**	**118.93**
	% Norm*				**N/A**	**85%**	**91%**
Mili	Inches	7.40	2.20	8.79	**18.39**	**19.54**	**N/A**
	% Norm*				**80%**	**85%**	**N/A**
Aling-laplap	Inches	3.17	0.69	3.82	**7.68**	**14.84**	**95.42**
	% Norm*				**44%**	**85%**	**82%**
Jaluit	Inches	6.17	2.36	13.03	**21.56**	**20.64**	**84.65**
	% Norm*				**94%**	**90%**	**64%**
RMI Northern Atolls							
Kwajal-ein	Inches	5.29	1.23	3.86	**10.38**	**9.54**	**72.83**
	% Norm	116%	38%	94%	**87%**	**80%**	**71%**
Wotje	Inches	0.69	1.39	0.77	**2.85**	**8.77**	**55.05**
	% Norm	16%	48%	20%	**26%**	**80%**	**57%**

[1] Predictions for 1st Quarter 2010 made in 4th Quarter 2009 newsletter.
* Normal values are estimated based on WSO Majuro, Kwajalein and satellite-derived precipitation distribution.

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plies were severely stressed, with the 33-million-gallon Majuro airport Reservoir falling to about 10% of capacity. Harsh water restrictions were mandated.

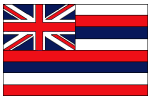
Some welcome rainfall returned to the RMI in March, but was confined to atolls from Majuro southward. The northern atolls continued to experience dry conditions.

Climate Outlook: As El Niño weakens, the sharpening trade-wind trough in Micronesia strengthens the rainfall gradient across the RMI bringing abundant rains in a band just grazing the northern end of Majuro. This keeps the southern atolls (e.g., Mili) in abundant rain, while the northern atolls remain dry. During the first half of the year, the trade wind trough works its way slowly to the north, ending the RMI dry season first in the southern atolls, and last of all in the northern atolls (e.g., Kwajalein and Wotje). It appears that Majuro and nearby atolls to the south have begun to benefit from returning rainfall. Atolls to the north may have to wait another two or three months for rainfall to return to near-normal values. Near-normal rains should return to all atolls by July and continue for the rest of the calendar year.

Predicted rainfall for the RMI from April 2010 through March 2011 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]		
	South of 6ºN	6ºN to 8ºN	North of 8ºN
April – June 2010	**100% (33.92 inches)**	**90% (30.53 in)**	**80% (20.09 in)**
July – Sept 2010	**100%**	**100%**	**95%**
Oct – Dec 2010	**100%**	**100%**	**100%**
Jan – Mar 2011	**100%**	**100%**	**100%**

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



Hawai'i: The climate in the Hawaiian islands during the 2009 calendar year was generally drier than normal, with the rain gauges at the Lihue, Honolulu, and Kahului airports receiving 67, 63, and 71 percent of normal, respectively. Only the Hilo airport received average rainfall (104 percent of normal). In Hawai'i, El Niño events tend to bring dry winters to the islands, and the 2009-2010 winter was no exception. Drought conditions are most likely during the October - March time period of an El Niño event.

In October 2009, a tropical storm passed south of the main islands, then veered to the North and traveled through the Papahanaumokuakea Marine National monument as Hurricane Neki. Rescue efforts were coordinated by NOAA Ship Oscar Elton Sette and the U.S. Coast Guard to retrieve Fish and Wildlife and NOAA personnel off these low-lying atolls prior to the storm.

The 1st quarter of 2010 saw persistent dry condition throughout the Hawaiian Islands. During January, the western and southern regions of Maui and the Big Island faced extreme drought conditions (D3), and at that time Hawai'i was the only state in the U.S. with areas in this drought category. Hawai'i made national news on February 27th when a tsunami warning was issued in response to an 8.8 magnitude earthquake off the coast of central Chile. This quake was similar in location and magnitude to the 1960 earthquake, which generated a tsunami that destroyed much of downtown Hilo. Luckily, by the time the 2010 tsunami reached the islands, wave energy had dissipated substantially and no serious damage or loss of life was reported.

The months of March and April saw the return of persistent trade winds to the state of Hawai'i, bringing increased rainfall to windward slopes and easing dry conditions in those areas. This corresponded with the weakening of both the atmospheric and oceanic components of the current El Niño event. Unfortunately, only limited amounts of rainfall occurred on leeward sides of the larger islands in March , and significant drought conditions continue on portions of the Big Island and Molokai.

State of Hawai'i Rainfall Summary 1st Qtr 2010 and Annual 2009

Station		Jan.	Feb.	Mar.	1st Qtr	2009 Annual
Lihue Airport	Inches	1.10	0.90	1.76	**3.76**	**26.59**
	% Norm	24%	28%	49%	**33%**	**67%**
Honolulu Airport	Inches	0.71	0.67	0.59	**1.97**	**11.56**
	% Norm	26%	29%	31%	**28%**	**63%**
Kahului Airport	Inches	0.99	0.62	1.40	**3.01**	**13.40**
	% Norm	26%	26%	60%	**36%**	**71%**
Hilo Airport	Inches	0.94	1.38	8.65	**10.97**	**131.81**
	% Norm	10%	16%	60%	**33%**	**104%**

Climate Outlook: The following comments are from the U.S. Climate Prediction Center's Seasonal Outlook Discussion:

Drier than normal conditions are expected over Hawai'i and some U.S.-Affiliated islands during the next season based on current conditions in the tropical pacific and on results from historical studies on the effects of warm episodes. NCEP models predict a tendency for below normal temperatures for Hawai'i for May, June, and July (MJJ) 2010. ***Below median precipitation for Hawai'i is expected for MJJ 2010 based on the El Niño composite and NCEP forecast tools.***

For more information on weather and climate in Hawai'i 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)* forecasts for seasonal (mean and maxima) sea-level deviations for the forthcoming seasons AMJ, MJJ, and JJA of 2010; (ii) the observed monthly mean and maximum sea-level deviations for the season JFM 2010; (iii) forecast verifications for JFM2010 (observed/forecast values). *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 AMJ, MJJ and JJA 2010 (Table 1). See Figure 2 for locations of tide stations.

Table 1: **Forecasts of sea-level deviation (in inches) for April-May-June, May-June-July, and June-July-August 2010.**

	Seasonal Mean Deviations [1]				Seasonal Max Deviations [2]					
Tide Gauge Station	**AMJ**	**MJJ**	**JJA**	**Forecast Quality [3]**	**AMJ**	**MJJ**	**JJA**	**Forecast Quality [3]**	***Return Period [4] for AMJ Season***	
Lead Time [5]	*0*	*1M*	*2M*		*0*	*1M*	*2M*		*20 Year*	*100 Year*
Marianas, Guam	+2	+3	+4	V. Good	+14	+17	+17	V. Good	*5.6*	*6.7*
Malakal, Palau	0	0	+1	Good	+32	+35	+35	Good	*9.6*	*14.3*
Yap, FSM	0	+1	+1	V. Good	+24	+28	+28	Good	*16.7*	*33.0*
Chuuk, FSM**	0	+1	+1	N/A	+24	+28	+28	N/A	*N/A*	*N/A*
Pohnpei, FSM	+3	+2	+2	V. Good	+31	+32	+32	Good	*5.8*	*7.1*
Kapingamarangi, FSM	0	-1	-1	Good	+29	+27	+26	Fair	*7.4*	*9.4*
Majuro, RMI	+2	+1	1	Good	+44	+44	+43	Fair	*4.1*	*5.1*
Kwajalein, RMI	+3	+3	+3	Good	+39	+40	+41	Fair	*4.5*	*5.9*
Pago Pago, AS	-1	0	+1	V. Good	+25	+25	+23	V. Good	*3.9*	*5.4*
Honolulu, Hawai'i	0	0	0	Fair	+20	+18	+18	Fair	*4.1*	*5.9*
Hilo, Hawai'i	+2	+1	+1	Good	+26	+23	+22	Good	*7.9*	*11.4*

Remarks: The forecast values for the AMJ, MJJ, and JJA seasons indicate that sea levels for most stations in the north Pacific are likely to record slight rise in the forthcoming seasons. The maximums will remain slightly higher than normal due to returning trade winds in the western and central tropical Pacific. Sea levels at the Hawaiian stations are also likely to be slightly elevated during this time period.

The forecast values are supportive to the condition of a transition from a moderately strong El Niño to a weaker El Niño. However, if the on-going transition to ENSO-neutral conditions continues then more rise is possible in the vicinity of the northwest Pacific islands. At PEAC, we are constantly monitoring the on-going El Niño event. Significant results will be reported in a special bulletin format, if required.

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 in Pohnpei and Yap.

Seasonal Mean Deviation (1) is defined as the difference between the mean sea level for the given month and the 1975-1995 mean sea-level value at each station. Likewise, **Seasonal Maximum Deviation (2)** is defined as the difference between the maximum sea level (calculated from hourly data) for the given month and the 1975-1995 mean sea-level value at each station.

Forecast Quality (3) is a measure of the expected CCA cross-validation correlation skill. Higher skills correspond to greater expected accuracy of the forecasts. In general terms, these kinds of forecasts are thought to be of useful (but poor) skill if the CCA cross-validation value lies between 0.3~0.4. Skill levels greater than 0.4/0.6 are thought to be fair/good skills. Skill levels greater than 0.7 are thought to be very good. Refer to **www.soest.Hawai'i.edu/MET/Enso/peu/2010_2nd/sea_level.shtml** for cross-validation skills.

Return period (RP) (4) of extreme values are calculated from hourly sea-level data. For example, the predicted rise of 5.6 inches at 20-year RP at Marianas, Guam indicates that this station may experience an extreme tide event once every 20 years that could result in sea-level rise of up to 5.6 inches **above the median of seasonal maxima** during the AMJ season. Likewise, about once every 100 years we can expect the highest AMJ tide at Marianas, Guam to be as high as 6.7 inches above the median of seasonal maxima. During some seasons some stations display alarmingly high values at the 20 and 100 year RP. *These high values are due to large and significant increases in the tidal range caused by the passage of past storm events during that season.*

Lead time (5) is the time interval between the end of the initial period and the beginning of the forecast period. For example, lead-0, lead-1M, and lead-2M means 'sea level' of target season 0 (AMJ), 1 (MJJ), and 2 (JJA) month leads based on SSTs of JFM 2010.

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

(ii) Observed Monthly Sea-Level Deviation in the January-February-March (JFM) 2010 Season

The monthly time series (January - March 2010) for sea-level deviations have been taken from the UH Sea Level Center. The full time series (in mm) is available at ftp://ilikai.soest.Hawaii.edu/islp/slpp.deviations. See **Figure 2** (below) for the locations of these stations.

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]			
	Jan.	Feb.	Mar.	Standard Deviations	Jan.	Feb.	Mar.	Standard Deviations
Marianas, Guam	+1.1	+2.2	+3.6	(+4.2)	+18.3	+20.1	+19.9	(+3.8)
Malakal, Palau	-5.9	-6.4	-3.8	(+4.8)	+32.4	+31.1	+35.8	(+4.8)
Yap, FSM	-6.3	-4.9	-1.4	(+4.0)	+22.6	+22.6	+30.5	(+4.4)
Chuuk, FSM	*	*	*	(*)	*	*	*	(*)
Pohnpei, FSM	+0.7	-0.2	*	(+2.6)	+36.1	+32.0	*	(+3.2)
Kapingamarangi, FSM	*	*	*	(+2.4)	*	*	*	(+4.1)
Majuro, RMI	+0.5	+1.9	*	(+3.3)	+45.1	+46.4	*	(+2.5)
Kwajalein, RMI	*	*	*	(+3.7)	*	*	*	(+2.8)
Pago Pago, American Samoa	+4.2	+1.4	+0.5	(+2.8)	+29.5	+27.6	+26.4	(+3.0)
Honolulu, Hawai'i	-1.3	-5.3	-2.6	(+1.7)	+19.5	+14.5	+13.3	(+2.6)
Hilo, Hawai'i	+0.9	+0.5	*	(+2.1)	+27.9	+24.3	*	(+3.0)

Note: (-) indicates negative deviation (fall from the mean) and (+) indicates positive deviation (rise from the mean); *: data not available; Standard deviations describe how widely spread the values are in the dataset. **See Table 1 for other notes.**

Remarks: As compared to February 2010, the monthly mean sea level in March 2010 remained steady; in some cases it recorded a slight rise. The monthly maxima recorded higher than February's sea-level maxima in most stations. This is due to strong trade winds in the western and central tropical Pacific, which have again become active in recent weeks.

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

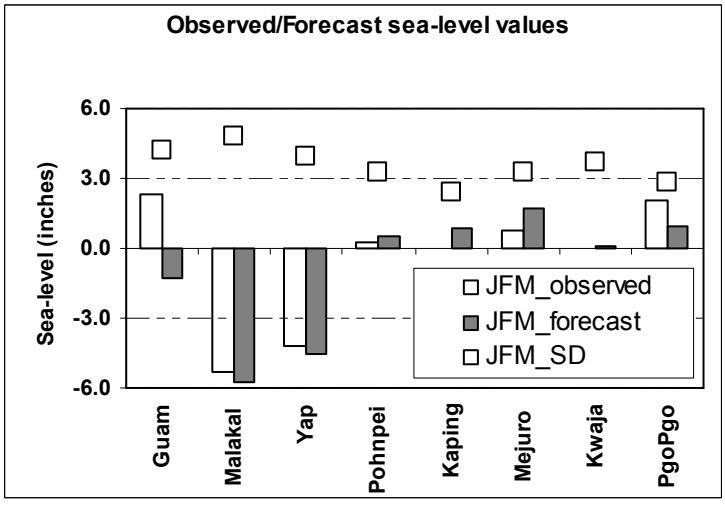


Figure 3: The observed and forecast values for the previous season JFM is presented above. Forecasts were in general skillful; only Guam displayed a different picture, where a positive

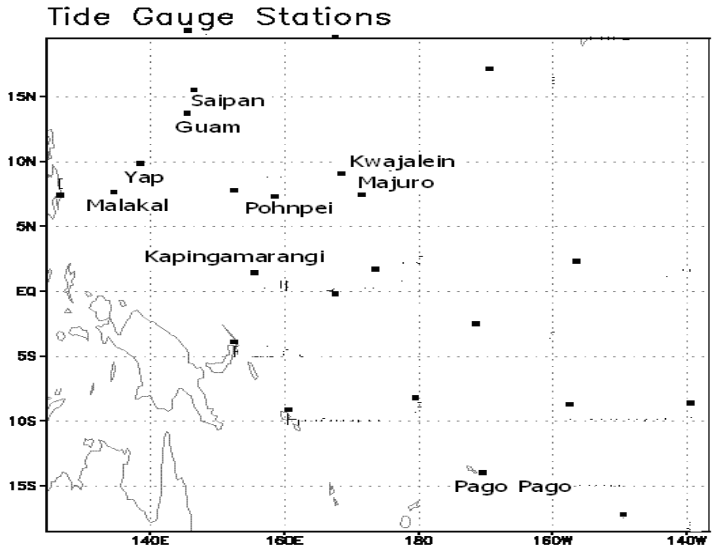


Figure 2 (above): Locations of the US-Affiliated Pacific Islands tide gauge stations.

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Pacific ENSO Update

Excerpts from El NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION
Issued by NOAA NWS Climate Prediction Center - 8 April 2010
http://www.cpc.noaa.gov/products/analysis_monitoring/enso_advisory/index.shtml

ENSO Alert System Status: El Niño Advisory

***Synopsis:* El Niño is expected to continue through the Northern Hemisphere spring 2010 and transition to ENSO-neutral conditions by Northern Hemisphere summer 2010.**

El Niño weakened to moderate strength during March 2010, with sea surface temperature (SST) anomalies decreasing slightly, but still exceeding +1°C across much of the central and eastern equatorial Pacific Ocean at the end of the month. Subsurface heat content anomalies (average temperatures in the upper 300m of the ocean) decreased during March in response to the eastward expansion of below-average temperature anomalies at depth (100-200m) into the east-central Pacific. Anomalous tropical convection remained consistent with El Niño, with enhanced convection over the central and eastern Pacific and suppressed convection over Indonesia. The equatorial low-level easterly trade winds strengthened near the Date Line, while upper-level easterly wind anomalies became confined to the eastern Pacific. Collectively, these oceanic and atmospheric anomalies reflect an ongoing, but weakening El Niño.

Nearly all models predict decreasing SST anomalies in the Niño-3.4 region through 2010, with the model spread increasing at longer lead times (Fig. 6). The majority of models predict the 3-month Niño-3.4 SST anomaly will drop below +0.5°C by May-June-July 2010, indicating a transition to ENSO-neutral conditions that will likely persist through Northern Hemisphere summer. Over the last couple months, an increasing number of models, including the latest runs from the NCEP Climate Forecast System (CFS), are predicting below-average temperatures in the Niño-3.4 region by Northern Hemisphere fall, with some forecasts meeting thresholds for La Niña. However, it should be noted that model skill is at a minimum during this time of year, and also that the majority of models continue to indicate the persistence of ENSO-neutral conditions through 2010.

Expected El Niño impacts during April-June 2010 include drier-than-average conditions over Indonesia and enhanced convection over the central and eastern equatorial Pacific Ocean. For the contiguous United States, potential El Niño impacts include above-average precipitation for the southeastern states, while above-average temperatures are most likely for the Pacific Northwest.

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 at peac@noaa.gov or at the address listed below.

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