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Providing Information on Climate Variability for the U.S.-Affiliated Pacific Islands

www.soest.hawaii.edu/MET/Enso

CURRENT CONDITIONS

Moderate La Niña conditions are present in the Pacific Basin, and are expected to persist through the northern hemisphere's spring months. During the calendar year 2007, the climate of the tropical Pacific steadily evolved from ENSO-neutral conditions toward full-blown La Niña conditions by year's end. Oceanic cooling observed along the equator in the central and eastern Pacific increased in magnitude and extent during the course of the year. Climatic affects of La Niña were noted for much of 2007, and included well-known La Niña-related anomalies such as below normal tropical cyclone activity across most of Micronesia, a weak monsoon, and abnormally strong and widespread easterly surface winds in the low latitudes. The weather was generally tranquil at most locations, with few extremes of rainfall and damaging wind events. Rising sea levels (an effect of La Niña) coupled with high surf caused some problems with inundation, particularly on some of the atolls of Chuuk and Pohnpei states.

The 2007 annual rainfall at most of the U.S.-Affiliated Pacific Islands (USAPI) was somewhere in the range of 80% to 120% of normal at most locations (see **Figures 1a** and **1b**). Abundant rainfall in the final three months of the year pushed many islands that were dry in the first half of 2007 into the near-normal range for 2007 totals. Annual rainfall totals were less than 75% of normal at only two locations: at some of the atolls of the northern RMI, and at Woleai in the southern part of Yap State. The lowest 2007 annual rainfall totals of 47.71 inches and 49.95 inches occurred at Utirik and Wotje (northern RMI), respectively. Annual rainfall totals for 2007 in excess of 115% of normal were seen across locations in American Samoa, Yap Island, and some of the atolls of Pohnpei State. The annual total of 221.98 inches of rain at Aasufou, American Samoa was the highest recorded value in the USAPI for 2007, followed by 199.41 inches of rain at the Kosrae airport and 193.76 inches of rainfall at the WSO Kolonia, Pohnpei Island .

While no typhoons directly affected any island in the western North Pacific basin during 2007, several of the year's typhoons, evolved through their tropical disturbance and depression stages in portions of Micronesia, contributing rainfall to some locations from Pohnpei westward to Yap. Beginning in December 2007, the trough axis of the Australian northwest monsoon set up across the Indonesian sea eastward to Fiji and Tonga. Two Madden-Julian Oscillation (MJO)-related enhancements of the Australian Northwest Monsoon have occurred (one in early December and the other ongoing in mid-January). These MJO episodes result in an extension of the monsoon trough and its associated northwesterly monsoonal surface winds across the Coral Sea from Australia's Cape York Peninsula toward Fiji and Tonga. Tropical cyclone activity associated with the monsoon trough has been focused primarily in the seas north of Australia and in the Coral Sea out to Fiji. American Samoa has so far been spared any problematic tropical cyclone activity.

Sea-level variation in the USAPI is sensitive to ENSO-cycle, with low sea-level observed during El Niño and high sea-level during La Niña years. All locations across the USAPI have continued to record a rise in sea level during the 4th quarter of 2007, consistent with the continuing La Niña conditions. Several locations recorded substantial sea level deviations (**see Table 2**) in the 4th quarter, although compared to November 2007, a slight downward trend was observed in December 2007.

The following comments from the EL NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION were posted on the U.S. Climate Prediction Center web site on January 10, 2008:

Synopsis: La Niña is expected to continue into Northern Hemisphere spring 2008.

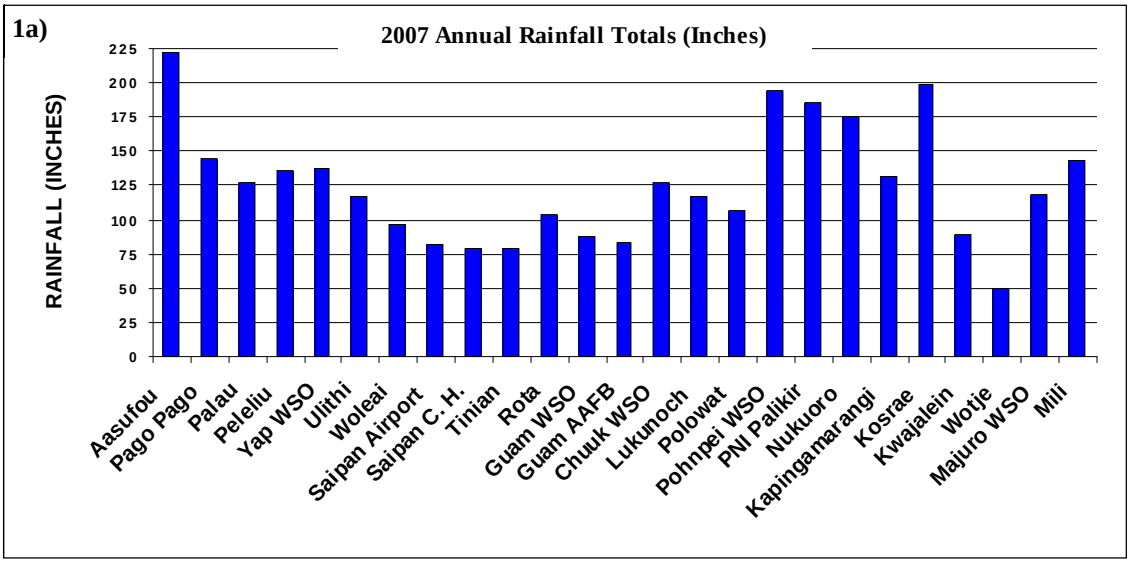
"La Niña remained at moderate strength during December 2007, with below-average sea surface temperatures (SSTs) extending from 160ºE to the South American coast... Consistent with these oceanic conditions, stronger-than-average low-level easterly winds and upper-level westerly winds continued across the central equatorial Pacific, convection remained suppressed throughout the central equatorial Pacific, and slightly enhanced convection covered the far western Pacific. Collectively, these oceanic and atmospheric conditions reflect a mature La Niña.

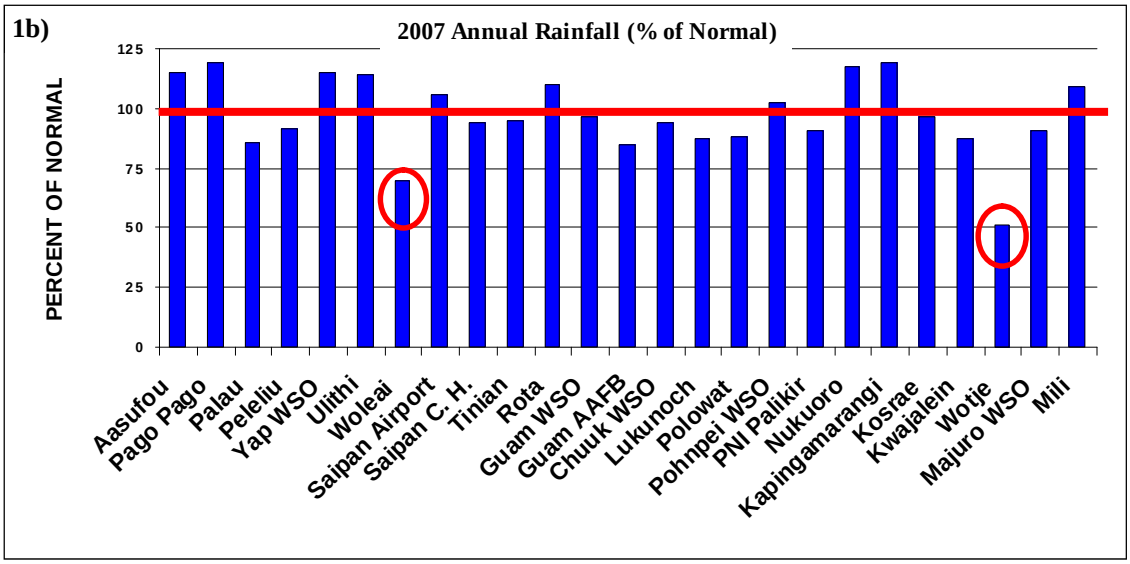
Over half of the recent SST forecasts (dynamical and statistical models) predict a moderate strength La Niña to continue through February-April, followed by weaker La Niña conditions. Current atmospheric and oceanic conditions and recent trends are consistent with a likely continuation of La Niña into the Northern Hemisphere spring 2008... Expected impacts during JFM include a continuation of below-average precipitation over the central and eastern equatorial Pacific. Recent MJO activity has contributed to short-term fluctuations in low-level winds and convection over the equatorial Pacific, which has acted to modify some of the typical La Niña impacts on a sub-seasonal timescale."

SEA SURFACE TEMPERATURES AND SOUTHERN OSCILLATION INDEX

SST (Sea Surface Temperatures)

La Niña remained at moderate strength through December 2007, with below-average sea surface temperatures (SSTs) extending from 160ºE to the South American coast. All of the Niño region indices remained cooler than -1.0°C, with the NIÑO 3.4 and NIÑO 3 indices persisting near - 1.5°C. The upper-ocean heat content (average temperatures in the upper 300 m of the ocean) in the central and east-central equatorial Pacific remained below average, with temperatures ranging from 2°C to 5°C below average at thermocline depth. The recent SST forecasts (dynamical and statistical models) for the NIÑO 3.4 region indicate a continuation of La Niña conditions into Northern Hemisphere spring 2008. Over half of the models predict a moderate strength La Niña to continue through February-April, followed by weaker La Niña conditions. Current atmospheric and oceanic conditions and recent trends are consistent with a likely continuation of La Niña into the Northern Hemisphere spring 2008.





SOI (Southern Oscillation Index)

The 3-month average of the Southern Oscillation Index was 1.1 for the 4th Quarter of 2007, with monthly values of +0.6, +0.9 and +1.8 for the months of October, November and December 2007, respectively. The SOI has had a positive sign since August 2007. Monthly SOI values are expected to remain positive for the next several months, as moderate La Niña conditions are expected to continue through the northern hemisphere's spring months.

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

Figure 1, left. 2007 Annual rainfall totals (a) in inches and (b) anomalies (expressed as % of normal) at indicated stations. In 1b: Solid line indicates normal rainfall, and circles indicate locations with rainfall less than 75% of normal.

TROPICAL CYCLONE

The PEAC Center 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, Hawaii. Western North Pacific tropical cyclone names are obtained from warnings issued by the Japan Meteorology 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 TROPICAL CYCLONE

Tropical Activity Summary

The 2007 North Pacific tropical cyclone season was below normal in almost every category of activity (e.g., numbers of typhoons). The JTWC numbered 26 tropical cyclones in the western North Pacific basin during 2007 (5 below average). Of these 26 cyclones: 3 were tropical depressions, 8 were tropical storms, 15 were typhoons and 4 of the typhoons were super typhoons. This corresponds to normal values of 3, 10, 18, and 4 for these statistics, respectively. The JMA named 22 of the cyclones that JTWC numbered, as well as two cyclones (Haiyan and Podul) which the JTWC did not number. In addition, the JTWC numbered one tropical storm and three tropical depressions that the JMA did not name or number. Tropical cyclone activity in the western North Pacific basin was also shifted westward and northward, which is typical during La Niña. Because of this major shift of basin cyclone activity, no area of Micronesia was severely impacted by a tropical cyclone during 2007. However, several of the basin's cyclones passed through Micronesia during the early stages of development, each providing a welcome episode of heavy showers.

The tropical cyclone activity in the eastern North Pacific (historically the world's 2nd most active basin) was well below normal. During 2007, the National Hurricane Center, Miami, named 11 cyclones there (5 below average). Of the 11 named cyclones, only 4 became hurricanes, and of the hurricanes only one of them (Hurricane Flossie) became a major hurricane (i.e., a hurricane with a Category 3, 4 or 5 intensity on the Saffir-Simpson hurricane damage potential scale). Normally there are 8 or 9 hurricanes in the eastern North Pacific, of which 4 typically reach major hurricane status. Only two of the eastern North Pacific hurricanes affected Hawaii: Hurricane Cosme and Hurricane Flossie. Cosme was dissipating as it passed well to the south of Hawaii. Flossie was a major hurricane on its approach to the Big Island of Hawaii, and it yielded a glancing blow of wind, rain and high surf to the Big Island as it passed to the south while on a weakening trend. No tropical cyclones were numbered or named by the central Pacific Hurricane Center, Honolulu.

The 2007-2008 hurricane season in the South Pacific is off to a near-normal start. There have been 4 cyclones named by the responsible agencies in this basin from July 2007 through mid-January 2008. Typical of La Niña years, the focus of tropical cyclone activity in the South Pacific has been between northeastern Australia and Fiji. In ENSO neutral years, the tropical cyclone activity of the South Pacific is more likely to extend eastward to the region of Samoa; during El Niño years, activity can extend as far east as the Cook Islands and French Polynesia. The activity occurs further eastward in a rough proportion to the strength of El Niño and further westward in a rough proportion to the strength of La Niña.

PEAC Center Tropical Cyclone Outlook

The PEAC tropical cyclone outlook[1] for the upcoming 2008 season is for more activity in the western North Pacific basin than occurred during 2007, even though the typhoon season may once again start get off to a late start because of La Niña conditions. Also, the geographical distribution of western North Pacific tropical cyclones should return to a more normal pattern, elevating the risk of a typhoon in Micronesia (from Chuuk and westward) to near normal. Islands from Pohnpei and eastward into the RMI experience tropical storms and typhoons primarily during El Niño. The risk of a damaging tropical cyclone in these locations is considered low during 2008 (but not quite so extraordinarily low as it was in 2007).

There has been some concern that above average SST in the vicinity of American Samoa would translate into an increased risk of a damaging tropical cyclone there. Through mid-January, however, the tropical cyclone activity has been focused westward and southwestward of the archipelago. At the time of this writing, an active phase of the Australian northwest monsoon was occurring in the Coral Sea, and Cyclone Funa had passed through Vanuatu with hurricane-force winds. This active phase of MJO will push out to the central South Pacific by the end of January, perhaps causing a tropical cyclone to form east of Niue and move through the Cook Islands. **The PEAC Center remains cautiously optimistic that the primary focus of the South Pacific tropical cyclone activity for the next three months will remain in the Coral Sea from northeastern Australia eastward to Fiji (a view also supported by the TSR research group – see excerpt below). Through April of 2008, it is likely that one or two tropical cyclones will pass close enough to the south of American Samoa so as to bring gusty northwesterly winds of near-gale strength to the islands and territorial waters. The risk of a damaging impact by a hurricane or strong tropical storm in American Samoa is considered to be near normal (roughly a 5 to 10% chance) through April 2008.** For comparison, the risk of a damaging impact by a typhoon on Guam is typically 10 to 20% during any given year, increasing to 25 to 30% during El Niño years.

On December 5, 2007, the Tropical Storm Risk Research Group (http://tsr.mssl.ucl.ac.uk/) 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 2007/8 continues to anticipate activity 10-20% above the 1975/6-2006/7 climate norm. This would make the 2007/8 season the most active for basin tropical storms since 1998/9. The forecast spans the Australian season from the 1st November 2007 to the 30th April 2008 and is based on data available through the end of November 2007. Our main predictor is the actual anomaly in October-November Niño 4 sea surface temperatures (SST) which is below average at -0.95ºC. …

There is a 72% probability that Australian-region tropical storm numbers in 2007/8 will be above average (defined as more than 12 tropical storms), a 25% likelihood they will be near normal (defined as between 9 and 12 tropical storms) and only a 3% chance they will be below normal (defined as less than 9 tropical storms). …"

[1] The PEAC tropical cyclone forecasts for 2008 are provisional. Normally the PEAC Center 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, 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. These agencies have yet to release an assessment of typhoon activity for 2008.

LOCAL SUMMARY AND FORECAST

American Samoa: Month-to-month variability of rainfall was very high during 2007. At Pago Pago, four months received less than 75% of normal rainfall and five months had rainfall at or above 150% of normal. The 2007 annual total rainfall of 145.04 inches at Pago Pago was 122% of its normal value. The highest recorded annual rainfall total in any of the USAPI was the 221.98 inches at A'asufou. Though very wet, this enormous rainfall total was only moderately above (115%) the normal annual value of 193.05 inches at this location.

American Samoa Rainfall Summary 4th Qtr 2007

Station		Oct.	Nov.	Dec.	4th Qtr	Annual
Pago Pago WSO	Rain (Inches)	16.18	14.60	9.86	40.65	**145.04**
	% of Normal	161%	131%	74%	118%	**122%**
A'asufou	Rain (Inches)	18.88	24.87	11.71	55.46	**221.98**
	% of Normal	101%	137%	60%	98%	**115%**

Climate Outlook: American Samoa is now within the heart of its rainy season, and **nearly all climate models favor a continuation of wetter than normal conditions for at least the next 3 months. Thereafter, as American Samoa enters its typical dry season, the rainfall should return to near normal.** Rainfall in American Samoa during past La Niña years of similar strength has been below normal at the end of the dry season into the start of the next rainy season (see the forecasts below).

There has been some concern that above average SST in the vicinity of American Samoa would translate into an increased risk of a damaging tropical cyclone there. Through mid-January, however, tropical cyclone activity has been focused westward and southwestward of there. The PEAC Center remains cautiously optimistic that the focus of South Pacific tropical cyclone activity will remain in the Coral Sea from northeastern Australia eastward to Fiji (see previous tropical cyclone section). **Through April 2008, it is likely that one or two tropical cyclones will pass close enough to American Samoa to bring gusty northwesterly winds to near-gale strength at exposed locations and across territorial waters. During this time period, MJO enhancements to the monsoon will bring two or three prolonged (3- to 5-day) episodes of gusty (20-25 kt) northwest wind, with or without the help of a tropical cyclone.** The risk of a damaging impact by a hurricane or strong tropical storm in American Samoa is considered to be near normal (roughly a 5 to 10% chance) through April 2008.

Predicted rainfall from February 2008 through January 2009 is:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]
Feb – Apr 2008 (Heart of Next Rainy Season)	**120% (41.34 inches - Pago Pago)**
May – July 2008 (Onset of Next Dry Season)	**100%**
Aug – Oct 2008 (Heart of Next Dry Season)	**90%**
Nov 2008 – Jan 2009 (Onset of Next Rainy Season)	**100%**

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

LOCAL SUMMARY AND FORECAST

Guam/CNMI: The 2007 annual rainfall on Guam was slightly drier than normal, with very dry conditions in the first half of 2007 balanced by abundant rainfall in the 4th Quarter. Annual totals ranged from 83.15 inches at Andersen AFB to 90.50 inches at the head of the Ugum watershed in the southern mountains. While the heaviest rains normally fall during August or September, October was the wettest month of the year for several locations. With no unusually heavy rains or strong winds, the weather on Guam during 2007 is best described as tranquil. The highest daily rainfall at the WSO was 3.92 inches in early August, compared to daily rainfall in excess of 4 inches on seven occasions in 2004, and 4 - 6 inches of rain in *one hour* during the passage of both typhoons Chataan and Pongsona in 2002! The year's highest wind gust of 54 mph occurred on July 9th, when Tropical Storm Man-Yi passed to the southwest of the island.

Guam and CNMI Rainfall Summary 4th Qtr 2007

Station		Oct.	Nov.	Dec.	4th Qtr	Annual
Guam						
GIA	Rain (Inches)	14.44	13.29	2.68	30.41	**88.02**
	% of Normal	120%	162%	50%	112%	**97%**
AAFB	Rain (Inches)	13.99	14.04	2.65	30.68	**83.15**
	% of Normal	109%	154%	44%	110%	**84%**
Dededo (Ypapao)	Rain (Inches)	17.16	11.70	2.79	31.65	**86.24**
	% of WSMO	N/A	N/A	N/A	112%	**84%**
Ugum Watershed	Rain (Inches)	17.02	13.79	3.73	34.54	**90.50**
	% of WSMO	N/A	N/A	N/A	122%	**88%**
Sinajaña	Rain (Inches)	14.95	12.91	2.84	30.70	**87.10**
	% of WSO	N/A	N/A	N/A	113%	**96%**
CNMI						
Saipan Intl. Airport	Rain (Inches)	13.26	10.92	2.96	27.14	**81.21**
	% of Normal	123%	189%	77%	133%	**105%**
Capitol Hill	Rain (Inches)	13.94	12.56	2.99	29.49	**78.66**
	% of Normal	116%	172%	62%	122%	**94%**
Tinian Airport	Rain (Inches)	13.15	14.38	1.88	29.41	**79.36**
	% of Normal	112%	197%	39%	122%	**95%**
Rota Airport	Rain (Inches)	24.89	13.60	3.18	41.67	**104.09**
	% of Normal	196%	162%	56%	154%	**110%**

* % of normal is with respect to WSMO Finigayan (now closed)

LOCAL SUMMARY AND FORECAST

The 2007 annual rainfall totals in the CNMI were generally near normal. As on Guam, most stations received their highest monthly rainfall in October. The island of Rota had a particularly wet October, with 24.89 inches recorded at the Rota Airport and 20.12 inches at the UOG rain gage cluster located at the nearby Rota Resort and Country Club. This rain gage network indicated a peak daily total of 4.26 inches on October 17th, which is not atypical for the wettest day during the annual rainy season on Guam and in the CNMI. (For comparison, the UOG rain gage network at the RRCC measured 4.26 inches of rain in *one hour* during the passage of Typhoon Chaba close to Rota in August 2004.) The weather was otherwise very tranquil throughout the CNMI during 2007, with no unusually heavy rains or strong winds.

Climate Outlook: The dry season on Guam and in the CNMI is underway. Trade winds have been quite strong, with continual high surf on north and east shores. This type of weather is expected to continue through March. **All computer models available to the PEAC Center indicate that the rainfall will be above normal in Guam and the CNMI for the next three months.** Similar years have yielded above-average rainfall for Guam and the CNMI. Above normal rains should prevail in the region for most months of the year, although extraordinary rainfall (which is usually associated with typhoons) is not anticipated. The trade winds and sub-surface ocean heating in the western North Pacific will keep sea levels above normal.

Tropical cyclone activity is anticipated to be near normal in Micronesia during 2008. **From August through December 2008, Guam and the CNMI may expect to be threatened by 2 or 3 tropical cyclones that will produces gales and hazardous seas in the island waters.** The odds of damaging winds (60 mph or higher) from a typhoon on Guam and for each island of the CNMI will be approximately 10 to 15% for all of 2008, which is the normal level of risk for a non-El Niño year.

Predicted rainfall for Guam and the CNMI from February 2008 through January 2009 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]	
	Guam/Rota	Saipan/Tinian
Feb – Apr 2008 (Heart of Dry Season)	**120% (12.76 inches)**	**120% (7.58 inches)**
May – Jul 2008 (End of Dry Season)	**100%**	**100%**
Aug – Oct 2008 (Heart of Next Rainy Season)	**120%***	**120%***
Nov 2008 – Jan 2009 (End of Next Rainy Season)	**120%***	**120%***

[2] Forecast rainfall quantities represent BEST ESTIMATES given the probabilistic forecast for each particular season and station.
* Forecasts are subject to large error if a typhoon should pass directly over any island!

For more information on Guam's weather and climate go to
http://www.prh.noaa.gov/guam

LOCAL SUMMARY AND FORECAST

Federated States of Micronesia

Yap State: 2007 annual rainfall totals at all Yap Island locations were generally in the range of 130 to 140 inches, which is approximately 10 to 20 inches above the typical value for a calendar year. Throughout much of the past year, many of the disturbances that became the tropical cyclones of the western North Pacific passed north of Yap, contributing to the abundant rainfall. The weather on Yap Island was otherwise uneventful, with no reports of unusually heavy rain or high winds. To the south, Woleai was quite dry, with a 2007 annual rainfall total of 96.54 inches (69% of normal). The shift of tropical cyclone activity to the north of Yap may account for the lack of rain at Woleai during the final quarter of 2007. At Ulithi, the 2007 rainfall was above normal by the same magnitude as on Yap Island. The total of 145.26 inches at Dugor on Yap Island was the highest recorded value for all of Yap State for the calendar year of 2007.

Yap State Rainfall Summary 4th Qtr 2007

Station		Oct.	Nov.	Dec.	4th Qtr	Annual
Yap Island						
Yap WSO	**Rain (Inches)**	17.43	12.76	8.71	38.90	**137.65**
	% of Normal	146%	141%	97%	141%	**115%**
Dugor*	**Rain (Inches)**	15.51	15.73	11.80	43.04	**145.26**
Gilman*	**Rain (Inches)**	12.75	12.22	9.24	34.21	**126.03**
Luweech*	**Rain (Inches)**	9.42	14.34	9.28	33.04	**137.32**
Maap*	**Rain (Inches)**	10.28	13.46	10.87	34.61	**130.06**
North Fanif*	**Rain (Inches)**	13.46	13.07	11.49	38.02	**140.38**
Rumung*	**Rain (Inches)**	10.92	14.43	12.00	37.35	**129.70**
Tamil*	**Rain (Inches)**	13.72	15.43	13.49	42.64	**137.74**
Outer Islands						
Ulithi	**Rain (Inches)**	14.78	14.10	8.29	37.17	**116.66**
	% of Normal	145%	183%	109%	146%	**114%**
Woleai	**Rain (Inches)**	6.10	3.79	2.59	12.48	**96.54**
	% of Normal	45%	35%	23%	34%	**69%**

* Long term normal is not established for these sites

Climate Outlook: All of the islands of Yap State should have abundant rainfall for the next three months, and will probably remain wet for most months of the coming year. La Niña is at its peak now and will wane during 2008. Past years with similar ENSO conditions have brought above-average rains to Yap State. Woleai should be wet until the monsoon trough pulls well to its north in August through October, and this may result in a period of relative dryness there as was seen during 2007.

LOCAL SUMMARY AND FORECAST

Stronger than normal trade winds and sub-surface ocean heating in the western North Pacific will continue to keep sea levels above normal. Tropical cyclone activity in the western North Pacific is expected to be higher than it was during the quiet 2007. **During August through December 2008, 2 or 3 typhoons should pass to the north of Yap Island and Ulithi producing gusty westerly winds and hazardous seas in the island waters.** The odds of damaging winds from a tropical cyclone on Yap or any of its northern atolls will be approximately 10 to 15% for the calendar year 2008, which represents a slightly elevated risk.

Predicted rainfall for Yap State from February 2008 through January 2009 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]	
	Yap and Ulithi	Woleai
Feb – April 2008 (Heart of Dry Season)	**120% (20.60 inches)**	**120%**
May – July 2008 (Onset of Rainy Season)	**110%**	**110%**
August – October 2008 (Heart of Next Rainy Season)	**100%**	**90%**
Nov 2008– Jan 2009 (Onset of Next Dry Season)	**100%**	**100%**

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

Chuuk State: Amounts of rainfall during the calendar year 2007 were slightly drier than normal throughout Chuuk State, with the northern atolls of Fananu Onoun and Piis Panew being the driest. The 126.64 inches of annual rainfall at the WSO on Weno Island was 94% of normal, and was one of the higher values of rainfall in Chuuk State for the year. Only Ta and Losap, in the southern and northern Mortlock Islands, respectively, recorded more rainfall during 2007 than the WSO. While weather conditions were generally tranquil, persistent trade winds and high surf contributed to substantial sea inundation on many of the atolls and coastal areas of Chuuk Lagoon early in 2007, causing damage to taro patches and other staple food plants such as breadfruit trees. From early December 2007 through mid-January 2008, high astronomical tides and strong trade winds combined with already elevated sea levels (associated with La Niña) to produce more coastal flooding and inundation in Chuuk and Pohnpei states — damaging roads, taro patches and property.

Climate Outlook: Gusty easterly trade winds should continue to dominate the flow throughout Micronesia for the next three months. **Higher than normal sea level coupled with high surf is likely to cause more inundation events in Chuuk Lagoon and other low islands in Chuuk State.** These conditions are possible through April of 2008, after which the trade winds normally weaken. **Rainfall should be near normal throughout Chuuk State for all of 2008.** From August through December, several tropical cyclones of the western North Pacific basin will begin their lives in Chuuk State as depressions, bringing episodes of heavy showers across Chuuk State before they move northwestward. **One or two occurrences of gale-force wind associated with a tropical cyclone may affect Chuuk Lagoon or atolls to the north during 2008**, representing a normal risk. Also, there is a higher likelihood than during 2007 for a substantial rain event (10 to 15 inches in one day) that could cause slope failures and mudslides on the high islands of Chuuk Lagoon. This also represents a normal risk of such an event.

LOCAL SUMMARY AND FORECAST

Chuuk State Rainfall Summary 4th Qtr 2007

Station		Oct.	Nov.	Dec.	4th Qtr	Annual
Chuuk Lagoon						
Chuuk WSO	**Rain (Inches)**	8.68	12.76	13.84	35.28	**126.64**
	% of Normal	62%	119%	127%	99%	**95%**
Piis Panew*	**Rain (Inches)**	3.92	13.92	11.70	29.54	**76.31**
Xavier H. School*	**Rain (Inches)**	7.35	13.40	13.84**	34.59**	**115.64****
Southern Mortlocks						
Lukunoch*	**Rain (Inches)**	9.85	12.68	11.79	34.32	**117.08**
Ettal*	**Rain (Inches)**	7.62	13.00	18.45	39.10	**125.24**
Ta*	**Rain (Inches)**	6.87	18.18	23.06	48.11	**156.51**
Northern Atolls						
Fananu*	**Rain (Inches)**	9.34	13.19	9.28	31.81	**100.19**
Onoun*	**Rain (Inches)**	12.66	16.29	10.78	39.73	**112.25**
Northern Mortlocks						
Losap*	**Rain (Inches)**	10.39	17.28	11.72	39.39	**130.17**
Nama*	**Rain (Inches)**	7.05	15.48	15.78	38.31	**124.20**
Western Atolls						
Polowat	**Rain (Inches)**	3.02	12.34	4.51	19.87	**106.31**

* Long term normal is not established for these sites
** Estimated

Forecast rainfall for Chuuk State from February 2008 through January 2009 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]			
	Chuuk Lagoon, Losap and Nama	Polowat	Atolls and Northern Islands	Southern Mortlocks
Feb – Apr 2008	**110% (29.13 inches)**	**100%**	**100%**	**120%**
May – Jul 2008	**120%**	**110%**	**100%**	**120%**
Aug – Oct 08	**110%**	**95%**	**120%**	**100%**
Nov 08 – Jan 09	**100%**	**100%**	**100%**	**100%**

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

LOCAL SUMMARY AND FORECAST

Pohnpei State: Most locations within Pohnpei State were slightly wetter than normal during 2007, particularly in the final quarter of the year. The 193.76 inches recorded at the WSO in Kolonia (103% of its normal annual value of 188.76 inches) was the highest amount observed in Pohnpei State during 2007, although the amounts were most certainly higher in the interior of Pohnpei Island where UOG rain gages have measured over 300 inches of rain in each of the years 2004 - 2006. Most of the atolls of Pohnpei State were wet during 2007 including Mwoakilloa, Nukuoro, and Kapingamarangi. The 155.49 inches of rain recorded at Pingelap during 2007 was somewhat drier (87%) than its estimated mean annual rainfall.

High sea levels and strong trade winds associated with La Niña allowed some ocean inundation to occur on Pohnpei Island. The PEAC Center has received reports that wind-whipped choppy waves were splashing water onto the causeway to the airport and eroding the rock and gravel fill on its east side. Brisk trades and high sea levels are typical during La Niña events.

Pohnpei State Rainfall Summary 4th Qtr 2007

Station		Oct.	Nov.	Dec.	4th Qtr	Annual
Pohnpei Island						
Pohnpei WSO	**Rain (Inches)**	15.72	26.13	20.90	**62.75**	**193.76**
	% of Normal	96%	177%	132%	**134%**	**107%**
Palikir	**Rain (Inches)**	21.83	15.10	20.09	**57.02**	**185.27**
Atolls of Pohnpei State						
Nukuoro	**Rain (Inches)**	10.58	16.59	22.03	**49.20**	**176.01**
	% of Normal	98%	138%	184%	**117%**	**118%**
Pingelap	**Rain (Inches)**	12.06	22.06	17.68	**51.80**	**155.49**
	% of Normal	81%	155%	132%	**122%**	**87%**
Mwoakilloa	**Rain (Inches)**	17.37	22.88	13.01	**53.26**	**169.01**
Kapingamarangi	**Rain (Inches)**	3.09	9.51	5.97	**18.57**	**131.22**
	% of Normal	64%	116%	68%	**85%**	**119%**

Climate Outlook: In a climate of enhanced trade winds, the trade-wind trough, and the zonal band of cloudiness associated with it, sharpens. The result is an increase in rainfall on Pohnpei Island and the atolls that lie within the latitude bounded by 4º to 8º N. This is especially true during April and May when Pohnpei Island usually experiences its highest monthly average rainfall. Conversely, atolls near the equator such as Kapingamarangi typically have reduced rainfall during La Niña. Kapingamarangi is one of only a few places in Micronesia where reduction in rainfall over the next 3 to 6 months may cause problems with water supplies (e.g., rain catchments). **The PEAC Center strongly recommends that residents of Kapingamarangi continue voluntary water conservation and other technical measures to ensure an adequate supply of potable water for the next 3-6 months.**

LOCAL SUMMARY AND FORECAST

Easterly trade winds should continue to dominate the flow in eastern Micronesia for the next several months. **These gusty winds coupled with elevated sea level could lead to a few episodes of minor coastal inundation and coastal erosion**, especially at times of the month when the astronomical tidal range is greatest. No typhoons or tropical storms are anticipated to adversely affect Pohnpei State during 2008, although several of the basin's tropical cyclones may begin as depressions near Pohnpei. These storms will only contribute to the expected abundant rainfall.

Forecast rainfall for Pohnpei State from February 2008 through January 2009 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]	
	Pohnpei Island and atolls	Kapingamarangi
February – March 2008	**100% (40.68 inches)**	**80%**
April – June 2008	**125%**	**90%**
July - October 2008	**100%**	**90%**
Nov 2008 - Jan 2009	**100%**	**95%**

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

Kosrae State: Although the 2007 annual rainfall at Kosrae was slightly below normal, the 199.41 inches at the Kosrae Airport was the highest value seen throughout the region (only the 221.98 inches recorded at A'asufou in American Samoa was higher). The airport's 2007 total was just short (97%) of its normal annual rainfall of 206.17 inches. As at Pohnpei, the 4th Quarter of 2007 was particularly wet, and helped to make up for a deficit over the other months of the year.

Kosrae State Rainfall Summary 4th Qtr 2007

Station		Oct.	Nov.	Dec.	4th Qtr	Annual
Airport (SAWRS)	**Rain (Inches)**	13.97	20.82	32.38	**67.17**	**199.41**
	% of Normal	86%	131%	223%	**144%**	**97%**
Utwa*	**Rain (Inches)**	18.00	21.00**	18.96	**57.96****	**178.23****
	% of WSO	N/A	N/A	N/A	**124%**	**86%**
Nautilus*	**Rain (Inches)**	12.19	22.34	24.30	**58.83**	**185.30**
	% of WSO	N/A	N/A	N/A	**126%**	**90%**

* Long term normal is not established for these sites
** Estimated

Climate Outlook: During La Niña, the trade-wind trough, and its zonal band of cloudiness, sharpens in such a way to increase the rainfall on Kosrae. March - June (normally the wettest months of the year) are anticipated to be especially wet this year. Normal monthly rainfall values at Kosrae are typically between 17 - 20 inches for all months of the year. In 2008 perhaps five or six of the months will see monthly rains in excess of 20 inches. East-

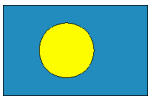
LOCAL SUMMARY AND FORECAST

erly trade winds should continue to dominate the flow in eastern Micronesia (Pohnpei and eastward) for at least the first half of 2008. **This could cause rough seas and elevated sea level on the eastern reefs and the eastern shoreline.** No adverse tropical cyclone activity is expected for Kosrae State during 2008.

Forecast rainfall for Kosrae State from February 2008 through January 2009 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]
February – March 2008 (Onset of Next Rainy Season)	**100% (35.02 inches)**
April – June 2008 (Heart of Next Rainy Season)	**125%**
July – October 2008 (Onset of Next Dry Season)	**100%**
November 2008 – January 2009 (Heart of Next Dry Season)	**110%**

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



Republic of Palau: The 2007 annual rainfall was slightly lower than average throughout the Republic of Palau. The 126.53 inches at the WSO was 86% of normal. Rainfall at other Palau locations was higher than at the WSO with the highest reading of 144.11 inches noted at the International Airport. Even this total was still a bit short of the normal annual rainfall of 147.97 inches. It is interesting to note than the 2007 annual rainfall was approximately the same at Yap Island as at Palau. Normally, the annual rainfall at Yap is about 25 inches less than at Palau. In retrospect, it appears that the shift of the western North Pacific tropical cyclone tracks to the north and west of normal placed Yap Island in the path of more rain than at Palau, and at Yap State's own southernmost island, Woleai.

Republic of Palau Rainfall Summary 4th Qtr 2007

Station		Oct.	Nov.	Dec.	4th Qtr	Annual
Koror WSO	Rain (Inches)	10.08	13.36	10.40	**33.84**	**126.53**
	% of Normal	73%	118%	87%	**91%**	**86%**
Nekken	Rain (Inches)	10.07	11.81	14.33	**36.21**	**140.24**
	% of Normal	N/A	N/A	N/A	**97%**	**95%**
Intl. Airport	Rain (Inches)	7.42	13.50	15.41	**36.33**	**144.11**
	% of Normal	N/A	N/A	N/A	**98%**	**97%**
Peleliu	Rain (Inches)	9.30	11.52	14.70	**35.52**	**135.54**
	% of Normal	N/A	N/A	N/A	**96%**	**92%**

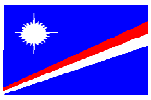
Climate Outlook: Palau has a complex pattern of monthly rainfall with the highest average rainfall in the months of June and July; the lowest average rainfall in the months of February, March and April; and a secondary minimum in September when the monsoon trough and typhoon tracks pull well to the north. During 2008, the normal dry months of February through May should see above average rainfall. Then, the normally wetter months of June and July should see rainfall amounts near normal. Tropical cyclone influence on Palau should be slightly enhanced in both the early part of the cyclone season (April through June), and again at the end of the year (late October through December). **This means that Palau could experience one or two episodes of near-gale (25 to 35 mph) westerly winds associated with tropical cyclones passing to the north during April - June, and three or four such episodes of gusty winds and heavy showers during October - December.** Because of its southerly location, it is not anticipated that Palau will experience a direct strike by a strong tropical storm or a typhoon, even though the risk of such an occurrence is considered to be slightly higher than average this year.

LOCAL SUMMARY AND FORECAST

Forecast rainfall for Palau from February 2008 through January 2009 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]
Feb – May 2008 (Palau's Dry Season)	**120% (47.00 inches)**
June – August 2008 (Palau's wettest months)	**100%**
September – October 2008	**100%**
November 2008 – January 2009	**100%**

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



Republic of the Marshall Islands (RMI): The 2007 annual rainfall totals at some of the atolls in the northern RMI were among the lowest values at any of the USAPI. While most atolls of the RMI were below normal for the year, the less than 50 inches of annual rainfall at

RMI Rainfall Summary 4th Qtr 2007

Station		Oct.	Nov.	Dec.	4th Qtr	Annual
RMI Central Atolls (6º N - 8º N)						
Majuro WSO	Rain (Inches)	20.74	20.31	10.89	**51.94**	**118.66**
	% of Normal	150%	159%	92%	**135%**	**90%**
Laura*	Rain (Inches)	17.42	N/A	N/A	**N/A**	**N/A**
Arno*	Rain (Inches)	15.00	20.10	10.89	**45.99**	**115.44**
Aling-laplap*	Rain (Inches)	7.57	3.77	3.64	**40.91**	**143.51**
RMI Southern Atolls (South of 6º N)						
Mili*	Rain (Inches)	14.32	22.95	3.64	**40.91**	**143.51**

* Normal values are estimated based on WSO Majuro, Kwajalein and satellite-derived precipitation distribution

LOCAL SUMMARY AND FORECAST

RMI Rainfall Summary 4th Qtr 2007

Station		Oct.	Nov.	Dec.	4th Qtr	Annual
RMI Northern Atolls (North of 8º N)						
Kwajalein	**Rain (Inches)**	11.59	12.43	5.76	**29.78**	**89.32**
	% of Normal	97%	117%	71%	**97%**	**87%**
Wotje*	**Rain (Inches)**	12.85	4.06	2.25	**19.16**	**49.95**
Utirik*	**Rain (Inches)**	10.16	3.96	1.33	**15.45**	**47.71**

* Normal values are estimated based on WSO Majuro, Kwajalein and satellite-derived precipitation distribution

Utirik and at Wotje represented only a little over half of the normal annual rainfall expected at those locations. The 118.66 inches at the WSO, Majuro, was 90% of normal. A strong 4th Quarter helped to boost the annual totals at Majuro, Arno and at Mili. Only at Mili with its 143.51 inches was the 2007 annual total above normal (109%).

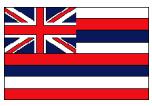
Early in 2007, dry conditions prevailed in the northern RMI. Emergency measures had to be taken in order to insure adequate drinking water for some islands. Rainfall in the northern RMI will once again have to be monitored, as 2 or 3 months of rainfall below 5 inches per month could once again impact the supplies of potable water.

Climate Outlook: Although near normal rainfall is anticipated for most of the atolls of the RMI for the next several months, it is now the dry season there, and even normal rainfall is less than 5 inches per month at Utirik and Wotje through March. **Because of dry conditions during 2007, low rainfall in the next two or three months might impact potable water supplies on some atolls in the northern RMI. Residents of the northern RMI are thus urged to participate in voluntary water conservation measures. Normal summer rains should be experienced on all islands.**

Forecast rainfall for the RMI from February 2008 through January 2009 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [2]		
	South of 6ºN	6ºN to 8ºN	North of 8ºN
Feb – Apr 2008	**95% (25.26 inches)**	**95% (25.26 in)**	**85% (12.89 in)**
May – July 2008	**100%**	**100%**	**95%**
August – Oct 2008	**100%**	**100%**	**100%**
Nov 2008 – Jan 2009	**100%**	**100%**	**100%**

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



Hawaii: While the State of Hawai'i entered the 4th quarter of 2007 with lackluster rainfall in October, the months of November and December helped make up for the deficit. After an atypically quiet October, a strong kona storm at the beginning of November brought thunderstorms, heavy rains and flash flooding to Kaua'i, Oahu and Moloka'i, with some areas of windward Oahu receiving 8-10 inches of rain in the two day period. A strong upper-level trough moved across the state on the 26th and 27th, generating thunderstorms and heavy showers across Kaua'i before moving southeast — causing significant flash flooding, damage to homes and highway closures along the Kona slopes of the Big Island. December, the wettest month since March 2006, continued this stormy trend. A strong cold front pushed across the state on the 4th bringing damaging winds, torrential rains and widespread flooding. The associated low pressure system kept very moist kona winds over the islands, producing brief but frequent episodes of moderate to heavy showers through the 8th. Flooding forced road closures on Kauai, and violent winds brought down a string of 16 utility poles along Farrington Highway near Wai'anae, Oahu. Maui and Hawaii islands saw the heaviest rains, with several sites recording event totals between 10- to 15-inches. In Maui County, two people were rescued from the roof of their home after it was swept downhill over 100 yards. While damage estimates will likely run into the millions of dollars, only one significant injury was reported.

The wet conditions for the second consecutive month helped ease drought problems which established itself in May 2007. Mandatory water use restrictions in Upcountry Maui and Waimanalo, Oahu have been removed due to improved reservoir supplies.

State of Hawaii Rainfall Summary 4th Qtr 2007

Station		Oct.	Nov.	Dec.	4th Qtr
Lihue Airport	**Rain (Inches)**	0.39	3.35	5.36	**9.10**
	% of Normal	9%	71%	112%	**66%**
Honolulu Airport	**Rain (Inches)**	0.15	5.46	3.08	**8.69**
	% of Normal	7%	241%	108%	**119%**
Kahului Airport	**Rain (Inches)**	0.48	1.59	6.88	**8.95**
	% of Normal	46%	73%	223%	**142%**
Hilo Airport	**Rain (Inches)**	8.24	10.38	17.56	**36.18**
	% of Normal	85%	67%	167%	**101%**

Climate Outlook: The following is in excerpt from the NOAA Climate Prediction Center's official Seasonal Outlook Discussion for Hawaii*:*

"Moderate La Niña conditions are present across the tropical Pacific, and recent SST forecasts for the NIÑO 3.4 region indicate a continuation of La Niña into the northern hemisphere spring 2008. Based on current conditions in the tropical Pacific and results from historical studies on the effects of cold episodes, ***wetter than normal conditions are expected over Hawaii and some U.S.-Affiliated Islands during the winter. Models indicate a tendency for above normal temperatures and precipitation for Hawaii through March-April-May 2008…"***

Seasonal Sea Level Outlook for the US-Affiliated Pacific Islands

The following sections describe: (i) the *Canonical Correlation Analysis* (*CCA*)-based forecasts for sea level deviations for the forthcoming seasons JFM, FMA and MAM 2008; (ii) tide predictions for January 1 - March 31, 2008; (iii) the observed/forecast monthly sea-level deviations for the previous season OND 2007; and (iv) the *Generalized Extreme Value* (*GEV*)-based seasonal extreme values of sea level at 20 and 100-year return periods for the JFM season. All units are in inches. *Note that 'deviation' is defined here as 'the observed or forecast difference between the monthly mean [or maximum] and the climatological monthly mean values (from the period 1975- 1995) computed at each station'. Also, note that the forecasting technique adapted here does not account for sea level deviations created by other atmospheric or geological conditions such as tropical cyclones, storm surges or tsunamis.*

(i) Seasonal Sea Level Forecast *(deviations with respect to climatology*) **for JFM, FMA, and MAM 2008.**

Forecasts of the sea level anomalies in the USAPI are presented using CCA statistical model. Based on the independent SST values in OND 2007, the resulting CCA model was used to forecast the sea level of three consecutive seasons: JFM, FMA and MAM (**Table 1**).

Table 1: **Forecasts of sea level deviation (in inches) for JFM, FMA and MAM 2008.**

Tide Gauge	JFM	FMA	MAM	Forecast Quality[1]
Lead time[2]	*0*	*1M*	*2M*	
Guam	+5	+6	+6	Good
Palau	+3	+3	+3	Good
Yap	+2	+3	+3	V. Good
Pohnpei	+5	+5	+4	V. Good
Kapinga-marangi	+5	+5	+4	Good
Majuro	+4	+3	+2	Good
Kwajalein	+3	+4	+4	Good
Pago Pago	+4	+5	+5	Good

1. Forecast quality is a measure of the expected CCA cross-validation correlation skill. 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 (see Fig. below). Higher skills correspond to greater expected accuracy of the forecasts. Skill levels greater than 0.4 and 0.6 are thought to be fair and good skills. Skill level greater than 0.7 are thought to be very good. For CCA cross-validation skill in OND, NDJ and DJF, please refer to: **www.soest.hawaii.edu/MET/Enso/peu/2008_1st/Sea_Level.htm.**

2. Lead time 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 (JFM), 1 (FMA), and 2 (MAM) month leads based on SSTs of OND 2007.

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 of +/-1 in. are considered negligible and denoted by **. Deviations +/- 2 in. are unlikely to cause any adverse climatic impact.

With a mean skill greater than 0.72 to 0.56 (at 0 to 2-months lead time) in all three consecutive seasons, all tide gauge stations are very well predicted. *The sea level in the USAPI began to rise from January 2007 and levels currently remain above average. This rising trend is consistent with on-going La Niña conditions, which is expected to continue for another three months. Likewise, we expect the sea level in the vicinity of USAPI may remain elevated (i.e. 2 to 5 inches) for another two to three months.* ***Based on current atmospheric and oceanic interactions, no further sea level rise is expected now (other than any marginal variations).*** The sea level in the vicinity of the USAPIs are sensitive to the ENSO cycle, with falling sea level observed during El Niño years and rising sea level during La Niña years.

(ii) Tide Predictions (January 1 to March 31, 2008)

Figure 2, right: Predicted water level plots from Jan 1 - Mar 31 for 3 major stations (a) Marianas, Guam (b) Kwajalein, RMI and (c) Pago Pago, American Samoa. X-axis: date/time (GMT); Y-axis: height in feet relative to mean lower low water level (MLLW); MR = Mean difference between high and low tides; SR = Difference between high and low tide during full moon (spring tide); and ML = Arithmetic means of high and low tides.

NOAA's website for tide and currents has been used to generate this water level plot for the next three months. Other tide-related monthly extreme data can be found in the web edition of this newsletter. *Observations reveal that the MR, SR, and ML for all these above stations are likely to remain within the range of average highest seasonal values during the next three months.*

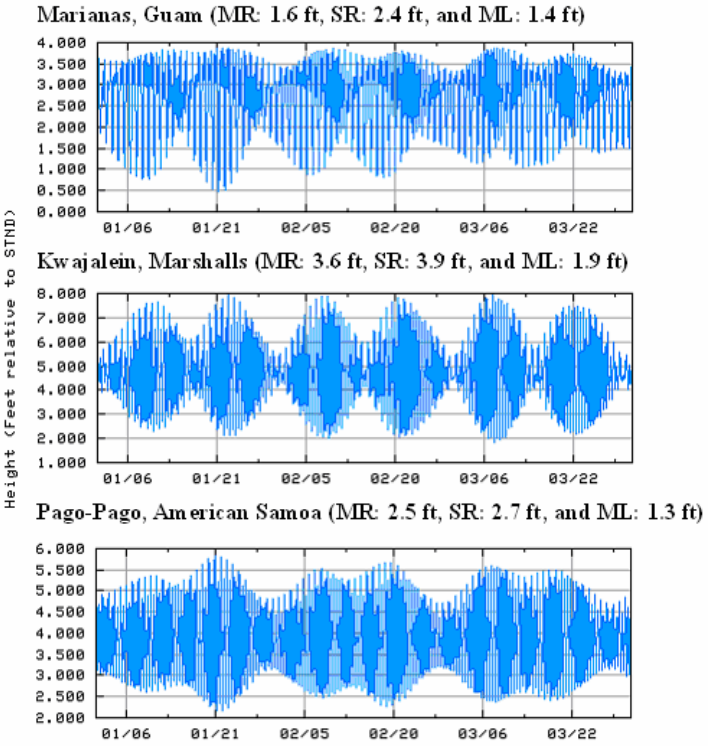


Figure 2: Predicted water level for JFM 2008 at (a) Marianas, Guam (b) Kwajalein, RMI and (c) Pago Pago, American Samoa.

Seasonal Sea Level Outlook for the US-Affiliated Pacific Islands

(iii) Observed monthly sea level deviation in Oct-Nov-Dec (OND), 2007

The monthly time series (October - December) 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 3** (below) for location of these stations.

Table 2 : Monthly observed max/mean sea level deviations in inches (year to year standard deviation in parentheses)

Tide Gauge Station		Oct.	Nov.	Dec.	Standard Deviations
Marianas, Guam	**Max:**	**+23.0**	**+21.0**	**n/a**	—
	Mean:	+4.9	+7.0	+5.5	(+4.0)
Malakal, Palau	**Max:**	**+42.0**	**+42.0**	**+39.0**	—
	Mean:	+7.4	+6.6	+4.0	(+4.0)
Yap, FSM	**Max:**	**+38.0**	**+36.0**	**+35.0**	—
	Mean:	+8.9	+7.5	+5.5	(+4.1)
Chuuk, FSM**	**Max:**	**n/a**	**n/a**	**n/a**	—
	Mean:	n/a	+8.0	+8.0	(n/a)
Pohnpei, FSM	**Max:**	**+42.0**	**+40.0**	**n/a**	—
	Mean:	+4.8	+9.8	n/a	+4.7
Kapingamarangi, FSM	**Max:**	**+29.0**	**+39.0**	**+31.0**	—
	Mean:	+2.0	+6.1	+4.1	+3.1
Majuro, RMI	**Max:**	**+45.0**	**+45.0**	**+45.0**	—
	Mean:	+4.3	+4.0	n/a	+3.7
Kwajalein, RMI	**Max:**	**+44.0**	**+42.0**	**+38.0**	—
	Mean:	+5.9	+4.3	+3.5	+3.3
Pago Pago, AS	Max:	**+29.0**	**+30.0**	**+26.0**	—
	Mean:	+4.5	+4.8	+2.0	+2.2

Note: - indicate negative deviations (fall from the mean), and + indicate positive deviations (rise from the mean), n/a: data not available, and figures in parenthesis are year-to-year SD (standard deviations) for the month.

Note that ''max' is defined here as 'the observed difference between the monthly maximum and the climatological monthly mean values (from the period 1975-1995) computed at each station'. Likewise, 'mean' is defined as 'the observed difference between the monthly mean and the climatological monthly mean values (from the period 1975- 1995) computed at each station'.

Table 2 (left) provides the monthly observed sea level deviations (in inches). Consistent with the on-going La Niña conditions, a positive deviation has been observed in all the stations since January 2007. Compared to November 2007, a slight fall has been observed in December 2007. Observed maximum values are considerably high for some of the stations.

*** Sea level data for Chuuk is based on estimates from neighboring tide stations (Yap and Pohnpei) and observations from WSO Chuuk.*

OND sea level data for Saipan is unavailable.

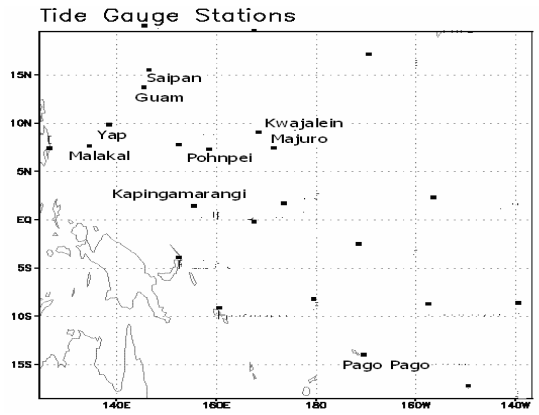


Figure 3: Locations of USAPI tide gauge stations.

(iv) Seasonal Extremes for JFM at 20 and 100-year return periods

Table 3: GEV	Sea Level Rise (inches)	
Station	**20 year RP**	**100 year RP**
Marianas, Guam	4.6 ~ 6.3*	5.4 ~ 7.9*
Saipan, CNMI	3.8 ~ 7.4	4.9 ~ 11.3
Malakal, Palau	6.7 ~ 11.8	9.6 ~ 18.9
Yap, FSM	8.3 ~ 24.6	11.8 ~ 54.9
Pohnpei, FSM	4.2 ~ 7.0	4.9 ~ 9.6
Kapingamarangi, FSM	4.4 ~ 9.6	5.3 ~ 13.8
Majuro, RMI	2.8 ~ 4.8	3.5 ~ 6.4
Kwajalein, RMI	3.8 ~ 5.1	4.8 ~ 6.9
Pago Pago, AS	2.7 ~ 5.2	3.5 ~ 7.7

The *Generalized Extreme Value (GEV)* products define the thresholds beyond the seasonal tidal range that have low but finite probabilities of being exceeded on a seasonal scale. Results of the GEV analysis for the JFM season is presented in **Table 3** (left). The extreme values are calculated from the hourly sea-level data. The upper limit (at 90% confidence interval) of rise has been shown in the right side of the column, the left side is the estimated rise based on observations. For example, the predicted rise of 4.6 ~ 6.3 inches at Marianas (*) indicates that this station may experience sea level rise of up to 6.3 inches during any JFM season within a 20 year period (20 year RP). Likewise, about once every 100 years we can expect the highest JFM tide at Marianas to be as high as 5.4 ~ 7.9 inches above normal (100 year RP).

Note that Yap displays the highest GEV deviations in JFM; *These high values are due to large and significant increases in the tidal range during the passage of past storm events in the JFM season.*

Note: Upper boundaries of rise are calculated at the 90% confidence interval. RP stands for Return Period. Bootstrap methods with 5000 iterations were used to estimate these upper limit values. *For GEV plots from 1-year to 100-year RP for all stations, please visit* **www.soest.hawaii.edu/MET/Enso/peu/2008_1st/Sea_Level.htm**.

Pacific ENSO Update

MONTHLY PACIFIC ENSO DISCUSSION FOR MICRONESIA AND AMERICAN SAMOA
Excerpts from January Discussion — Issued by NOAA-NWS-Guam WFO

Moderate La Niña conditions are consistent with the observed atmospheric patterns in the western North Pacific. For example, tropical cyclone and monsoon activity over the past 6 months has been below normal and displaced to the west. The trade wind trough across the western North Pacific is stronger than normal and set up earlier than normal.

In December, the South Pacific Convergence Zone remained generally west of the Samoan Islands, reducing rainfall over American Samoa. Nevertheless, rainfall over the Samoa region should be slightly above average for the next few months. Trade winds should continue to dominate the flow in Micronesia, and a strengthening trade wind trough should keep most of Micronesia wetter than normal. The northern Marshall Islands will likely see some extended periods of dry weather, and the westward spread of cooler equatorial SSTs will reduce equatorial rainfall east of 145ºE. Residents of Kapingamarangi and the northern RMI should closely monitor rainfall and implement water conservation measures. Monsoon and tropical storm activity for the first half of 2008 should be limited to western Micronesia, and the 2008 season could see a late start. The strong easterly trade winds will keep sea levels well above normal for the next few months in the western Pacific and in the Samoa region. High tides during new and full moon phases and La Niña effects could combine to cause coastal flooding in the Federated States of Micronesia through February.

Excerpts from El NIÑO/SOUTHERN OSCILLATION (ENSO) DIAGNOSTIC DISCUSSION
Issued by NOAA NWS Climate Prediction Center - 10 January 2008

Synopsis: La Niña is expected to continue into Northern Hemisphere spring 2008.

La Niña remained at moderate strength during December 2007, with below-average sea surface temperatures (SSTs) extending from 160ºE to the South American coast. All of the Niño region indices remained cooler than -1.0°C, with the Niño-3.4 and Niño-3 indices persisting near -1.5°C. The upper-ocean heat content (average temperatures in the upper 300 m of the ocean) in the central and east-central equatorial Pacific remained below average, with temperatures ranging from 2°C to 5°C below average at thermocline depth. Consistent with these oceanic conditions, stronger-than-average low-level easterly winds and upper-level westerly winds continued across the central equatorial Pacific, convection remained suppressed throughout the central equatorial Pacific, and slightly enhanced convection covered the far western Pacific. Collectively, these oceanic and atmospheric conditions reflect a mature La Niña.

The recent SST forecasts (dynamical and statistical models) for the Niño 3.4 region indicate a continuation of La Niña conditions into Northern Hemisphere spring 2008. Over half of the models predict a moderate strength La Niña to continue through February-April, followed by weaker La Niña conditions. Current atmospheric and oceanic conditions and recent trends are consistent with a likely continuation of La Niña into the Northern Hemisphere spring 2008. Expected La Niña impacts during January-March include a continuation of above-average precipitation over Indonesia and below-average precipitation over the central and eastern equatorial Pacific...

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

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

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