PACIFIC ENSO UPDATE

A Quarterly Bulletin of the Pacific El Niño/Southern Oscillation Applications Climate (PEAC) Center

3nd Quarter, 2014 Vol. 20, No. 3 **ISSUED: August 26, 2014**

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

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

CURRENT CONDITIONS

The most noteworthy aspects of the weather and climate of the U.S.-affiliated Pacific Islands (US-API) during the first half of 2014 includes abundant rainfall at most locations (See rain charts Fig. 5a and Fig. 5b), falling sea level across most of Micronesia (Figure 1), and formation of several of the basin's early season typhoons in the vicinity of Chuuk and moving north-westward past Guam and Saipan (Fig. 3). Rainfall at some atolls of the Republic of the Marshall Islands (RMI) during April 2014 set all-time records (see the RMI Local Variability Summary for more details). Rainfall of 30 inches on Guam during July also set all-time records (see the Guam and CNMI local summaries). The fall of sea level was substantial at some locations, particularly at Palau where, as compared to January 2014, a 6 inch drop was noted during April. Several of the basin's typhoons formed within the boundaries of Micronesia, with six of them passing near Guam and Saipan during some part of their development. During the final week of July, Super Typhoon Halong passed between Guam and Rota in its early stage as a tropical storm. The winds were moderate on Guam and Rota (~55 mph gusts), but the rains on Guam were extreme, with upwards of 15 inches in 24 hours at some locations. An extreme 24-hour rainfall event was experienced at American Samoa on 30 July 2014. The heavy rainfall caused a landslide resulting in a fatality.

During January through April 2014, the atmosphere and ocean exhibited features suggesting the impending onset of an El Niño event. A special PEAC bulletin released on April 24, 2014 provided a detailed summary and description of these indicators. In its early May monthly ENSO discussion, the U.S. Climate Prediction Center placed the Pacific Basin into an El Niño watch. During May and June, the atmosphere curiously failed to behave in a way so as to reinforce a developing El Niño. The monsoon trough was relatively weak, tropical cyclone activity slowed, and there were no episodes of strong westerly winds at low latitude. Even some of the oceanic indicators of El Niño (sub-surface warmth in the eastern equatorial Pacific and the SST in the Niño 3.4 region) eased or did not advance. Then during July, the atmosphere went wild, with a spate of tropical cyclone formation all across the North Pacific. The monsoon trough extended as far east as RMI accompanying an extensive region of westerly wind anomalies at low latitude. There was an exceptional abundance of tropical cyclones and other tropical disturbances in the eastern Pacific and central Pacific south of Hawaii. The ocean now is the entity failing to behave in a way indicative of a developing El Niño. Sub-surface water temperatures are close to normal (slightly warm near the date line and near the coast of South America, but near normal or slightly cool elsewhere). The SST in the Niño 3.4 region cooled during July, and stands near normal at the time of this writing.

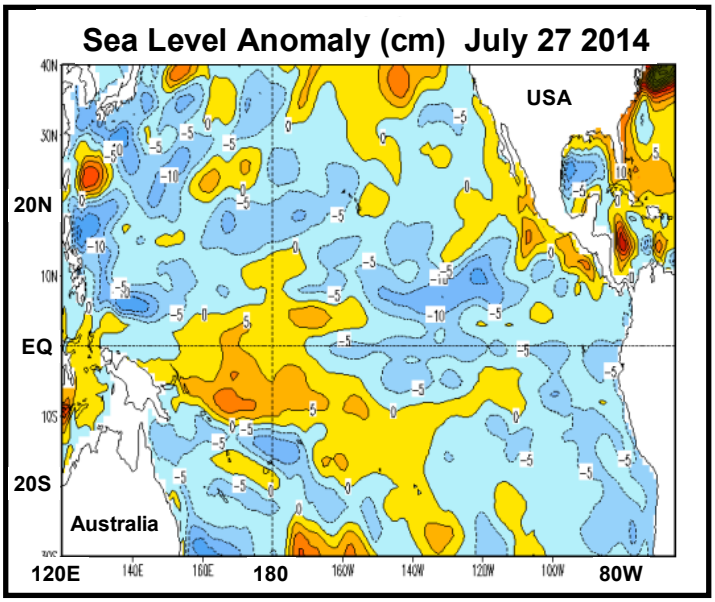


Figure 1. Anomaly of sea level for the Pacific basin as of 27 July 2014. Blue shades indicate below average sea level and yellow-orange shades are above average. The below average sea level in Micronesian waters is a huge shift from very high sea levels only a few months ago, and indeed, for most of the past decade. Curiously, sea level appears to be below average across most of the Pacific basin – not exactly a typical response to either El Niño or La Niña!

ENSO Alert System Status: El Niño Watch[1]

Synopsis: The chance of El Niño has decreased to about 65% during the Northern Hemisphere fall and early winter.

[1] Climate Prediction Center National Centers for Environmental Prediction. NOAA/National Weather Service. College Park, MD 20740

SEA SURFACE TEMPERATURES

During August the ENSO-neutral status persisted this is a result of the lack of atmospheric conditions, that are representative of an El Niño, and the return to near average SSTs in the central Pacific. After increasing for the previous two months, the month of July Niño indices decreased. Subsurface heat content anomalies decreased to slightly below normal. Meanwhile, the above-average subsurface temperatures observed in June are now constrained to a thin lens as a result of underlying below average temperatures. Low level winds remained near average in the tropical Pacific. As for the central and eastern portions of the basin westerly wind anomalies were present for the month of July.

SOUTHERN OSCILLATION INDEX

The 3-month average of the Southern Oscillation Index for the 2nd Quarter of 2014 including May, June, and July was 0.2. The respective monthly values were 0.5, 0.2, and –0.2. Consecutive periods of negative SOI values and warm ocean waters across the eastern tropical Pacific are indicative of El Niño. Current conditions are reflective of ENSO-neutral conditions.

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.

MONTH-TO-MONTH VARIATION: THE MADDEN-JULIAN OSCILLATION (MJO)

In 1971 Roland Madden and Paul Julian (1971) stumbled upon a 40-50 day oscillation when analyzing wind anomalies in the tropical Pacific. They used ten years of pressure records at Canton Island (at 2.8° S in the Pacific) and upper level winds at Singapore. The oscillation of surface and upper-level winds was remarkably clear in Singapore. Until the early 1980's little attention was paid to this oscillation, which became known as the Madden and Julian Oscillation (MJO), and some scientists questioned its global significance. Since the 1982-83 El Niño event, low-frequency variations in the tropics, both on intra-annual (less than a year) and inter-annual (more than a year) timescales, have received much more attention.

The MJO (also referred to as the 30-60 day or 40-50 day oscillation) turns out to be the main intra-annual fluctuation that explains weather variations in the tropics. It is characterized by a slow eastward progression of large regions of both enhanced and suppressed tropical rainfall. At any given location, the MJO would be perceived as roughly a month of very wet weather followed by a month-long period of relatively drier weather. The MJO affects the entire tropical troposphere but is most evident in the Indian and western Pacific Oceans. The MJO involves variations in wind, sea surface temperature (SST), cloudiness, and rainfall. Because most tropical rainfall is convective, and convective cloud tops are very cold (emitting little longwave radiation), the MJO is most obvious in the variation of outgoing longwave radiation (OLR), as measured by an infrared sensor on a satellite.

Rather than being a standing pattern like the El Niño–Southern Oscillation (ENSO), the MJO is a traveling pattern that propagates eastward at approximately 4 to 8 m/s (9 to 18 mph). Associated with the eastward propagation of large-scale tropical convective anomalies, the MJO has links to variations in the global circulation. Fairly weak correlations with the mid-latitude rainfall patterns and jet stream characteristics have been found. Effects in the Eastern Hemisphere tropics are most pronounced, with a large influences observed on the intensity and break periods of the Asian and Australian monsoons and interactions with El Niño.

The rainfall throughout Micronesia and in American Samoa is affected by the MJO, particularly during their respective rainy seasons and then particularly during El Niño. The manifestation of the MJO signal in these regions is to produce a few weeks (roughly a month) of wet weather broken by a two weeks of very hot dry weather. The signal is not always strong, but an investigation of the first year of the WERI/Conservation Society of Pohnpei (CSP) rainfall data set (gathered during June 2003 through June 2004) suggests that the MJO was present and acting to produce periods of wet weather interspersed with dry breaks, each at intervals of approximately 40-50 days (Fig. 2).

Real-time analysis and forecasts of MJO can be found at the following page on the CPC web site: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/mjo.shtml. Expert discussions of MJO are found on this link: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/mjoupdate.pdf.

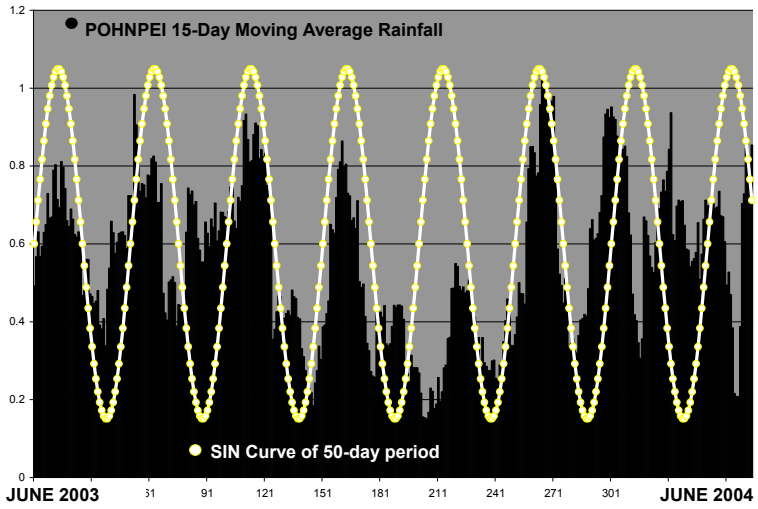


Figure 2. The rainfall at Pohnpei appears to be affected by the MJO. Dry spells and rainy spells occur at intervals of roughly 50 days. The dark columns are a 15-day moving average of the daily rainfall at the College of Micronesia, and the white line is a sine curve with a period of exactly 50 days. The 15-day moving average tends to filter the short-period fluctuations in the observed data, and exaggerates longer-period fluctuations (even if they occur by chance). The signal here, however, appears quite robust, and is likely a manifestation of the MJO that modulated the rain at Pohnpei with a period of approximately 50 days during the first year of operation of the WERI/CSP rain gage network. Day 1 = June 28, 2003; Day 331 = May 21, 2004.

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

TROPICAL CYCLONE ACTIVITY

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, Hawaii. 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.

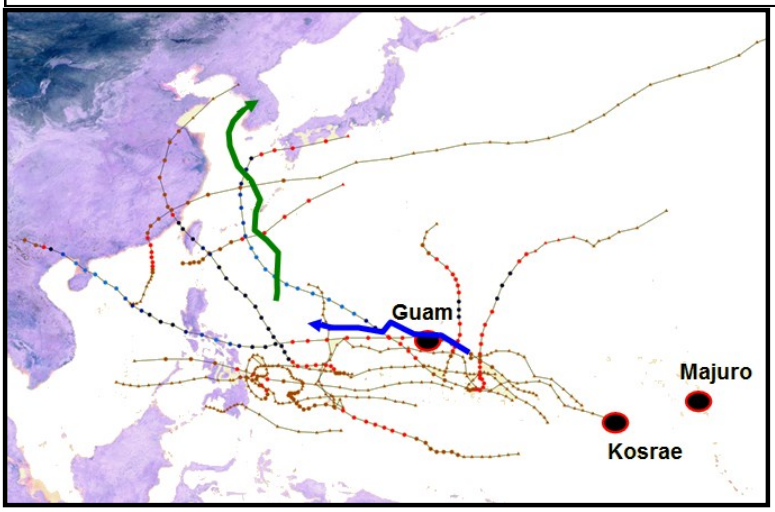


Figure 3. Western North Pacific tropical cyclone tracks through 03 August 2014. The bold green track and the bold blue track are currently active cyclones Nakri (12W) and Halong (11W), respectively. Note the nexus of typhoon tracks near Guam and the high number of tracks originating to the east of Guam's longitude. This type of typhoon track distribution is typical of El Niño.

Tropcial Cyclone Summary

Through early August of 2014, the JTWC numbered 12 significant tropical cyclones. Eleven of these six were named by the JMA. JMA named an additional tropical storm (Mitag) that JTWC declared to be sub-tropical and did not provide warnings. Six cyclones have become typhoons as per JTWC estimates. One cyclone (Tapah – 06W) was declared a typhoon by the JTWC, but only a tropical storm by the JMA, thus JMA as a tally of 5 typhoons for 2014 so far. The 2014 to-date tropical cyclones and other tropical disturbances contributed to episodes of heavy rainfall throughout Micronesia. Several of the tropical cyclones formed within Micronesia and a nexus of tracks is clustered near Chuuk, Guam and the CNMI (see Fig. 3 and the respective local variability summaries). An abundance of early season tropical cyclones is a typical response to El Niño onset in the western North Pacific. Eastward displacement of tropical cyclones during El Niño greatly elevates the risk of a typhoon throughout Micronesia during an El Niño year. Specific island risks are found in their respective local variability summaries.

At the time of this writing, the central and eastern North Pacific basins are experiencing an unusual abundance of tropical cyclones and other tropical disturbances. To-date, the NHC, Miami has named 9 cyclones (four hurricanes and five tropical storms). The Central Pacific Hurricane Center (CPHC) in Hawaii has named one system (Tropical Storm Wali). Tropical Storm Genevieve (07E) named and numbered by the NHC entered the CPHC area of responsibility on 27 July and is still active to the south of Hawaii.

The Southern Hemisphere cyclone season of 2013-2014 was relatively quiet, with the JTWC numbering 24 significant tropical cyclones in the entire region from the south Indian Ocean eastward into the South Pacific. The JTWC average annual number of Southern Hemisphere tropical cyclones is 27. It was particularly quiet in the South Pacific with only two formations (Ian and Mike) east of the 180° meridian. Cyclone Kofi moved from the Fiji Islands into the South Pacific east of the 180° meridian. No tropical cyclone adversely affected American Samoa during the 2013-2014 cyclone season (which ended June 30, 2014).

PEAC Tropical Cyclone Assessment

Western North Pacific and American Samoa

Three organizations typically produce seasonal outlooks for tropical cyclone activity in the western North Pacific that are routinely used by the PEAC Center for guidance on the upcoming typhoon season: (1) The Guam Weather Forecast Office (WFO), (2) The City University of Hong Kong Laboratory for Atmospheric Research, and (3) The Benfield Hazard Research Centre Tropical Storm Risk (TSR) research group1. The WFO Guam and the TSR group have released a forecast at the time of this writing. Both forecasts calls for cyclone activity to be above normal during 2014 for most aggregate statistics (e.g. annual number of all categories of cyclones, annual number of tropical storms and annual number of typhoons). On 03 July 2014, the TSR lowered its forecast for western North Pacific tropical cyclone activity, but it still expects the 2014 Northwest Pacific typhoon season will be the most active since 2004. The TSR predicts activity will be about 10% above the 1965 – 2013 climate norms. At the time of this writing the Hong Kong forecast for 2014 was not issued as their prediction scheme is undergoing revision, and the WFO Guam forecast is still in preparation as the office personnel have been very busy following an unusual lumber of cyclones affecting Guam!

Based on available guidance1 and the forecast behavior of ENSO, the PEAC tropical cyclone outlook for the upcoming western North Pacific typhoon season of 2014 is for above normal activity, considering: (1) the high activity of the season to-date; (2) the movement of the climate system toward El Niño; and, (3) the available guidance noted above. There may be a notable eastward shift of TC activity for all of 2014 contingent on the establishment of El Niño. An active typhoon season appears to be in store for Micronesia. Please see the local variability summaries for the anticipated typhoon risk for each island group. High cyclone activity could spill over into American Samoa during their next (2014-2015) cyclone season.

Hawaii

On 21 May 2014, NOAA's Central Pacific Hurricane Center released the following outlook for the 2014 Central Pacific Hurricane season:

TROPICAL CYCLONE ACTIVITY

"… climate conditions point to a near-normal or above-normal season in the Central Pacific Basin this year. For 2014, the outlook calls for a 40% chance of a near-normal season, a 40% chance of an above-normal season, and a 20% chance of a below-normal season. We expect 4 to 7 tropical cyclones to affect the central Pacific this season. An average season has 4-5 tropical cyclones, which include tropical depressions, tropical storms, and hurricanes."

"This outlook is based upon the expectation of El Niño developing during the 2014 hurricane season. El Niño decreases the vertical wind shear over the tropical central Pacific, favoring the development of more and stronger tropical cyclones. Since 1995 the central Pacific has been in an era of low activity for hurricanes, but this pattern will be offset in 2014 by the impacts of El Niño."

The PEAC concurs with NOAA's assessment for an above-normal hurricane season in the Central Pacific. Higher-than normal cyclone activity in the central Pacific region has two sources: (1) hurricanes moving into the central Pacific region from the eastern North Pacific, and (2) enhanced formation in the region itself. During El Niño, there is an enhancement of central Pacific cyclones form both sources. Westward moving cyclones of the eastern North Pacific have extended survival rates, and there are more in-situ formations.

SEASONAL SEA LEVEL OUTLOOK FOR THE US-AFFILIATED PACFIC ISLANDS

The following sections describe: (i) the Canonical Correlation Analysis (CCA) forecasts for seasonal (mean and maxima) sea level anomalies (seasonal cycle removed) for the forthcoming August-September-October (ASO), September-October-November (SON) of 2014, and October-November-December (ii) JAS return values at 20 and 100-yr period, (iii) the observed monthly mean and maximum sea level anomalies for the previous season AMJ 2014. Note that, seasonal cycles have been removed for the data anomalies that are defined as 'deviations or departures from the normal' using the 1983 through 2001 mean sea level value computed at each station. Also note that CCA-forecasting technique adopted 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 (anomalies with respect to climatology) for ASO, SON, and OND of 2014

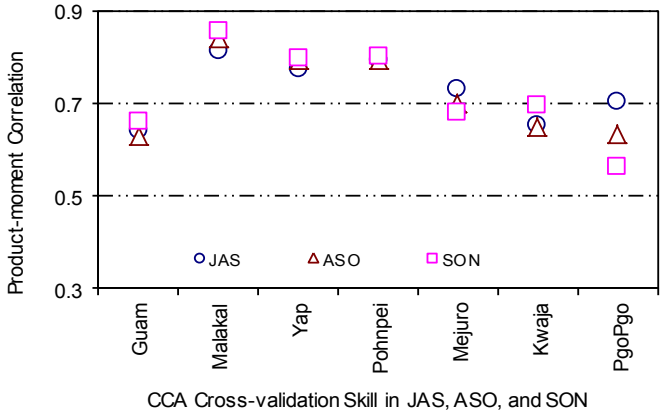
Forecasts of the sea level anomalies in the USAPI (see http://www.prn.noaa.gov/peac/map.php) are presented using CCA statistical model. Based on the independent SST and zonal wind (U) (SST-U) values in AMJ of 2014, the resulting CCA model has been used to forecast the sea level of three consecutive seasons: JAS, ASO, and SON (see Table 1: left panel shows values for seasonal mean while the right panel shows the seasonal maxima). All the tide gauge stations (at 0 to 2-months lead time) show skillful forecasts for these three consecutive seasons (Table 1). The forecasts have been found to be skillful (http://www.prh.noaa.gov/peac/peu/2014_1st/PEU_v20_n1.pdf). The forecasts values of sea level for ASO, SON and OND seasons (Table 1) indicate that most of the stations in the north and south Pacific regions are likely to be marginally (e.g., 2-4 inches) higher than normal in the forthcoming seasons. In Hawaii, both Honolulu and Hilo are likely to be closer to normal during the same time period. As compared to the previous quarter, the current trend of sea level is stable. This is more supportive to ENSO neutral condition. Consistent to the current ENSO forecasts, the forecasts values of sea level for ASO, SON, and OND seasons is likely to be close to normal (or marginally higher) in the forthcoming seasons.

Table 1: Forecasts of sea level anomalies in inches (ASO, SON, and OND)

	Seasonal Mean Deviations [1]				Seasonal Max Deviations [2]					
Tide Gauge Station	ASO	SON	OND	Forecast Quality[3]	ASO	SON	OND	Forecast Quality[3]	*JAS: Return Period*[4]	
Lead Time [5]	*0*	*1M*	*2M*		*0*	*1M*	*2M*		*20 Year*	*100 Year*
Marianas, Guam	+4	+4	+4	Good	+19	+18	+18	Good	6.3	10.9
Malakal, Palau	+2	+2	+2	V. Good	+39	+39	+38	Good	8.1	10.2
Yap, FSM	+3	+3	+3	V. Good	+30	+31	+31	Good	8.4	11.3
Chuuk, FSM**	+3	+3	+3	N/a	+30	+30	+30	N/a	n/a	n/a
Pohnpei, FSM	+4	+4	+3	V. Good	+32	+32	+31	V. Good	5.8	7.0
Majuro, RMI	+3	+2	+2	V. Good	+43	+42	+41	Fair	3.5	4.2
Kwajalein, RMI	+4	+4	+4	V. Good	+42	+42	+41	Good	5.2	6.8
Pago Pago, Am. Samoa	+5	+5	+5	Good	+30	+30	+29	V. Good	4.1	5.2
Honolulu, Hawaii	+2	+2	+2	Fair	+21	+21	+21	Poor	4.1	5.4
Hilo, Hawaii	+2	+2	+2	Fair	+24	+23	+22	Poor	3.4	5.7

Note: (-) indicate negative anomalies (fall of sea level from the mean), and (+) indicate positive anomalies (rise of sea level from the mean), n/a: data not available. Anomalies from -1 to +1 inches are considered negligible and anomalies from -2 to +2 inches are unlikely to cause any adverse climatic impact. Forecasts for Chuuk (**) are estimated subjectively based on information from WSO Chuuk and observations from neighboring stations of Pohnpei and Yap. See: http://www.prh.noaa.gov/peac/footnote.php for the explanations of footnotes 1 to 5. Also note that all information is based on the 1983-2001 epoch.

SEASONAL SEA LEVEL OUTLOOK FOR THE US-AFFILIATED PACFIC ISLANDS



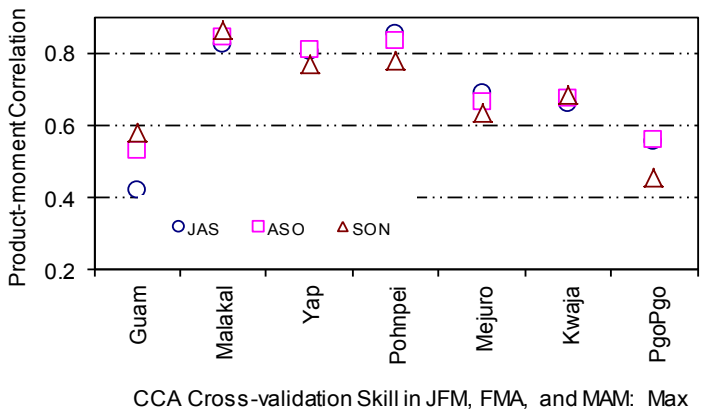


Figure 4a and 4b: CCA Cross-validation hind cast skills for seasonal mean (4a) and seasonal maximum (4b) sea level forecasts for seasons JAS, ASO, and SON

(iii) Observed monthly sea level anomalies in AMJ, 2014

The monthly time series (April to June) for sea level anomalies have been taken from the UH Sea Level Center. The full time series (in mm) for monthly mean is available at: ftp://ilikai.soest.hawaii.edu/islp/slpp.anomaliess. Locations of all these stations can be found at http://www.prn.noaa.gov/peac/map.php.

Consistent to the on-going El Nino state, the monthly mean sea level in most of the stations continued to fall rapidly in the last couple of months except for Guam and Kwajalein which displayed a slight rise in the month ofJune. Malakal, Yap, Pohnpei, and Majuro registered further fall and all are close to normal. Guam and Pago Pago are still higher than normal. Honolulu and Hilo also recorded rise and are slightly above normal. The monthly maximum values remained static for some stations.

Most of the islands recorded fall. This falling trend is very supportive to the on-going El Nino state. Normally sea level is lower than normal during an El Nino year and higher than normal during a La Nina year, and the fall or rise of sea level is also directly related to the strength of El Nino and La Nina events. So, further fall of sea level depends on how strong this year's El Nino is going to be. According to IRI climate briefing (July 21, 2014), El Niño is not fully developed yet, and the probability of an El Niño forming during the current July-August-September season is slightly above 50%, which is down from about 65% a month ago. So, if the ENSO state remains in the neutral phase then we may not see any abrupt variation of sea level in the months to come.

Table 2: Monthly observed mean/max sea level anomalies in inches

Tide Gauge Station	Monthly Mean Deviations[1]				Monthly Max Deviations[2]			
	April	May	June	Standard Deviations AMJ	April	May	June	Sea level Trend (falling/static/ rising)
Marianas, Guam	+5.5	+3.6	+5.5	4.1	+19	+17	+20	Static
Malakal, Palau	0	+2.0	-0.3	4.3	+34	+36	+34	Falling
Yap, FSM	+6.7	+2.7	+2.3	4.7	+34	+28	+31	Falling
Chuuk, FSM**								Falling
Pohnpei, FSM	+0.5	-0.5	*	3.2	+28	+28	*	Falling
Majuro, RMI	+0.8	+0.3	*	3.1	+36	+34	*	Falling
Kwajalein, RMI	+1.7	0	+1.4	3.2	+36	+35	+38	Falling
Pago Pago, American Samoa	+5.6	+5.0	+4.5	4.7	+27	+27	+29	Static
Honolulu, Hawaii	0	-0.7	+3.5	2.0	+16	+17	+23	Rising
Hilo, Hawaii	-0.1	-0.3	+1.2	2.4	+18	+22	+26	Rising

+/- indicate positive anomaly (rise) and negative anomaly (fall) respectively. Note that any changes between (0~ ±1) inch is considered to be negligible. Also note that changes within the range of (+/-) 2 inches are unlikely to cause any adverse climatic impact. ** Guesstimated values, * Data currently unavailable;

1: Difference between the mean sea level for the given month and the 1983 through 2001 mean sea level value at each station (seasonal cycle removed); 2: Same as 1 except for maxima; SD stands for standard deviations.

LOCAL SUMMARY AND FORECAST

NOTE: *All Predictions[1] listed in the rainfall summaries represent BEST ESTIMATES given the probabilistic forecast for each particular season and station.*

American Samoa: Rainfall at Pago Pago during the first half of 2014 and during the 2nd Quarter of 2014 was near average. January was particularly wet, with a monthly total of 19.54 inches (155%). This was balanced by a dry March when only 6.95 inches (62%) was recorded. Heavy rainfall in late December 2013 into early January 2014 prompted flash flood warnings nearly every day, with reports of land slides and rock falls. A wetter than average April and June was balanced by a drier than average May to provide near normal totals of rainfall as American Samoa now enters its typical dry season. Very heavy rainfall in American Samoa during July (18.48 inches at Pago Pago) included an extreme 24-hour event on the island of Tutuila that caused land-slides and flooding. A slow-moving cloud band delivered almost 6 inches of rain to American Samoa on the 29th of July. Floods, flash floods, landslides and overtopping of streams were reported across three villages. About 100 people were evacuated after mudslides and floods damaged their homes. A 17-year-old girl drowned when she was swept away by a stream. The government estimates that the damages to offices, equipment, bridges and roads were up to $5 million. Some of the impacts from the event were: (1) 20 homes and a community church destroyed by rainfall and mud; (2) 50 families asked to evacuate; (3) One fatality; (4) No injuries attributed to the storm; (5) No major disruptions to power or water systems. Since January 2014, the monthly mean sea level in Pago Pago remained above normal and currently is reading +4.5 inches above normal. How-ever, when compared to January's sea level of +7.9 inches, it has recorded a slight fall. The mean sea level at Pago Pago has been at historically high levels for many months, but has under-gone a modest fall since late 2013. This is expected, as the sea level fall in American Samoa displays a couple of months delay with respect to north Pacific Islands. Tropical cyclone activity in the South Pacific was well below normal for the 2013-2014 cyclone season, with only one cyclone (Ian – TC 08P) developing near American Samoa. Cyclone Ian did not seriously impact American Samoa.

American Samoa Rainfall Summary: April through June, 2nd Qtr, and 1st half 2014

Station		Apr.	May	Jun.	2nd Qtr.	1st Half
Pago Pago (WSO)	Inches	14.29	7.84	8.22	30.35	68.49
	% Avg	119%	79%	111%	103%	104%

Climate Outlook: American Samoa is now entering its dry season, with the 3-month period of July through September typically the driest months of the year. Climate models blended with a persistence of current conditions favor average to above average rainfall over the next three-month period. If the climate system transitions to El Niño over the next few months, tropical cyclone activity could be drawn eastward into the South Pacific east of the 180° meridian. This would elevate the risk of tropical cyclone development near American Samoa beginning in November 2014. American Samoa is in a region of the globe where correlations of rainfall with ENSO are near zero. During

LOCAL SUMMARY AND FORECAST

strong El Niños, however, very dry conditions can develop at American Samoa, typically in the year following the onset of El Niño (e.g., 1983 and 1998). The drop of mean sea level in response to El Niño typically reaches its low-point in March of the year following El Niño. The outlook for the next seasons (JAS, ASO, and SON) sea level indicate a higher sea level of +5 inches in Pago Pago. The rainfall outlooks below are based on the development of moderate El Niño in the latter half of 2014.

Predicted rainfall for American Samoa from July 2014 through June 2015 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]
Jul – Sep 2014 (Heart of Dry Season)	100% (19.68%)
Oct – Dec 2014 (Onset of next Rainy Season)	100%
Jan – Mar 2015 (Heart of next Rainy Season)	95% *
Apr – Jun 2015 (Onset of next Dry Season)	90% (Post El Niño)

* Could be higher if one or more tropical cyclones provide excessive rainfall.

Guam/CNMI: The rainfall during the first half of 2014 was above normal at most Guam and CNMI locations. The rainfall distribution by month was very unbalanced. January 2014 was so wet that it overcame drier than normal rainfall values during most of the other months of the first half of 2014. After the heavy rains of January, the monthly amounts of rainfall on Guam and in the CNMI fell generally to at-or-below 4 inches. Wild fires left a patchwork of burn scars in the southern mountainous areas of Guam, but the coverage of the fires was not out of the ordinary for a dry season. During the first half of 2014, two typhoons, two tropical storms, and one weak unnumbered tropical depression passed near Guam and Saipan: (1) Faxai (03W) – moved northward with a closest point of approach (CPA) to Guam about 300nm east on the 3rd of March; (2) Tapah (06W) – also moved northward with a CPA to Guam of about 150nm east on the 28th of April; (3) Neoguri (08W) – passed south of Guam on the 2nd of July; (4) Tropical Storm Ramassun – passed between Rota and Guam on the night of July 12; and, (5) a weak unnumbered tropical depression passed south of Guam on the night of July 20. During the passage of Faxai, Guam and Saipan experienced about an inch of rain with modest wind gusts in the range of 35mph. Tapah was a small typhoon, which did little except to cause the winds to shift to northerly as it passed to the east. Neoguri was a very large tropical cyclone that caused winds to gust over 60mph on Guam and produced very large surf on the western shores of Guam and in the CNMI. Ramassun passed through the Rota Chanel as a developing tropical storm and had little impact. The weak unnumbered tropical depression passing south of Guam on the 20th of July caused winds to gust to 40 mph on Guam and Rota, and provided 3-5 inches of rainfall across Guam. With regards to sea level, since January 2014, unlike other north Pacific stations, the monthly mean sea level in Guam is rather steady and staying above normal. Currently, it is +5.9 inches above normal. It registered a slight drop in March +3.5 inches and rose in April +5.6 inches. In May it again registered a fall of +3.7 inches and finally rose again in June to the mentioned +5.9 in..

LOCAL SUMMARY AND FORECAST

Guam and CNMI Rainfall Summary: April through June, 2nd Qtr, and 1st half 2014						
Station		Apr.	May	Jun.	2nd Qtr.	1st Half
GUAM and CNMI						
GIA (WFO)	Inches	2.74	3.36	6.08	12.18	37.12
	% Norm	70%	56%	94%	74%	134%
AAFB	Inches	3.97	5.03	5.15	14.15	42.06
	% Norm	82%	76%	81%	79%	128%
Ugum Watershed	Inches	5.94	2.14	4.49	12.57	32.10
	% Norm	122%	32%	71%	71%	98%
Saipan Intl. Airport	Inches	4.41	4.87	4.12	13.40	32.35
	% Norm	158%	111%	89%	113%	166%
Tinian Airport	Inches	5.36	3.78	3.81	12.95	29.25
	% Norm	153%	69%	66%	88%	120%
Rota Airport	Inches	3.43	5.34	3.62	12.39	31.86
	% Norm	76%	84%	58%	73%	104%

Climate Outlook: The onset of El Niño tends to significantly enhance rainfall in the late spring and summer on Guam and in the CNMI through enhanced tropical cyclone activity and other forms of deep convection. Based on an expected onset of El Niño conditions during the autumn months and on computer rainfall forecasts, we anticipate above normal rainfall over the next three to four months on Guam and in the CNMI. During El Niño, the monsoon trough is very active across Micronesia with an abundance of tropical disturbances and an elevated risk of tropical cyclone formation. With El Niño, the Mariana Islands could see several typhoon threats and several monsoon surges. There is a good chance that Guam/ Rota and Tinian/Saipan could each experience at least one typhoon event from October to January. The Northern Islands of the CNMI could also experience a typhoon in August or September. The other long term risk posed by El Niño is drought. El Niño-related drought typically occurs during the dry season that follows a strong El Niño year. However, with a moderate El Niño, rainfall can be well-below or near normal.

Predicted rainfall for the Mariana Islands from July 2014 through June 2015 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]	
	Guam/Rota	Saipan/Tinian
Jul – Sep 2014 (Heart of Rainy Season)	120% (45.29in)	120% (43.07in)
Oct – Dec 2014 (End of Rainy Season)	95%*	95%*
Jan – Mar 2015 (1st half of Next Dry Season)	80%*	80%*
Apr – Jun 2015 (2nd half of Next Dry Season)	75%**	75%**

* A typhoon occurrence could push these rainfall totals much higher
** The severity of dryness depends on the strength of El Niño

LOCAL SUMMARY AND FORECAST

Federated States of Micronesia

Yap State: The rainfall distribution during the 1st half of 2014 at Yap Island and at the other atolls in Yap State featured well above average amounts during the 1st Quarter and below average amounts during the 2nd Quarter. For the whole 1st half, the heavy rainfall of the 1st Quarter outweighed the deficits of the 2nd Quarter to make the 1st half rainfall totals above average for most Yap Island locations and at Ulithi. May was particularly dry, with less than 4 inches at most Yap Island locations. Rainfall amounts rebounded during June, but still fell short of average. Woleai in the south-east of Yap State had below average rainfall for 5 of the 6 months within the 1st half of 2014. Its 1st Quarter, 2nd Quarter and 1st half totals were all well below normal, but were still adequate for most agricultural, drinking and cooking needs. During January through April, Yap State received some heavy rain showers from the peripheral rain bands of tropical cyclones Kajiki (02W), TD 04W, and Peipah (05W) in addition to episodes of heavy showers form several other tropical disturbances passing westward through the state. In May and June there was a break in cyclone activity in the western Pacific basin contributing to dryness during those two months. During July, the western Pacific basin became very active again, and three typhoons – Neoguri (08W), Rammasun (09W), and Matmo (10W)- affected Yap State with heavy rainfall and some gusty westerly winds. At the time of this writing, another large monsoon depression is affecting Yap State with heavy rainfall and gusty southwesterly winds, especially at Ulithi and Fais. There were no reports of any problems with water supply or coastal inundations from the series of storms. The monthly mean sea level in Yap displayed a considerable fall in the last couple of months, although in January there was an anomaly of +8.9 inches above normal. Current conditions are +2.4 inches above normal.

Yap Rainfall Summary: April through June, 2nd Qtr, and 1st half 2014						
Station		Apr.	May	Jun.	2nd Qtr.	1st Half
Yap State						
Yap WSO	Inches	12.72	3.07	9.95	25.74	59.19
	% Norm	221%	34%	78%	94%	127%
Ulithi	Inches	5.14	3.18	4.99	15.32	40.82
	% Norm	105%	41%	65%	65%	103%
Woleai	Inches	6.03	5.67	5.80	19.70	38.42
	% Norm	55%	46%	62%	54%	61%

Climate Outlook: Above average rainfall is anticipated for all islands of Yap State, at least through September and probably through October. If El Niño conditions become established in the next few months, dry weather could become established across Yap State at the end of 2014 and become much drier than normal in the first half of 2015. The severity of the dry conditions depends on the strength of El Niño, with a strong El Niño causing the greatest reduction of monthly rainfall amounts and the most prolonged period of dry conditions. During El Niño, the risk of a typhoon within Yap State,

LOCAL SUMMARY AND FORECAST

particularly at Yap Island and the atolls to the northeast is increased. The elevated risk is present from October through December. In the months of July through September, tropical cyclone tracks tend to be well north of Yap State, but passing cyclones can still contribute to heavy rainfall, an increase in southwesterly monsoonal winds, and high surf. The chances for tropical storm-force winds near Yap Island or any of its northern atolls will be above normal for the remainder of the year. With El Niño, they can expect two or three tropical cyclones to pass through Yap State, with a chance of one of them being a typhoon. Forecasts for the next seasons (JAS, ASO, and SON) sea level indicate marginally higher sea levels around +3 inches.

Predicted rainfall for Yap State from July 2014 through May 2015 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]	
	Woleai	Yap & Ulithi
Jul y– September 2014 (Heart of Rainy Season)	95% (38.29in)	120% (51.90in)
October – December 2014 (End of Rainy Season)	90%	100%
January – March 2015 (Heart of next Dry Season)	70%	75%
April – June 2015 (End of next Dry Season)	90%	80%

Chuuk State: Rainfall was well above average throughout most of Chuuk State during the first half of 2014. The total rainfall during the first half of 2014 would have been near normal were it not for very heavy rainfall during February, which caused an extreme monthly value of 35.70 inches recorded at the Chuuk Weather Service Office in February. This was nearly as much as the entire second quarter rainfall. During late April into May 2014, a widespread reduction in clouds and rainfall spread across Micronesia, probably as a result of a strong negative phase of the Madden-Julian Oscillation (MJO) entering the region. Rainfall amounts decreased across Chuuk State and a period of inadequate rainfall was reported from the southern Mortlocks. Water supplies, however, were not impacted. In June 2014, rainfall increased, with some of the southern atolls receiving very high amounts. Excessive water was reported in taro patches. During July 2014, the monsoon trough became established across the north of Chuuk State bringing heavy rains from developing tropical cyclones and other monsoonal rain systems. An episode of high surf occurred on the 4th of June. A tsunami threat on the 2nd of April passed without incident.

Chuuk Rainfall Summary: April through June, 2nd Qtr, and 1st half 2014						
Station		Apr.	May	Jun.	2nd Qtr.	1st Half
Chuuk Lagoon						
Chuuk WSO	Inches	13.80	13.06	8.91	35.77	84.88
	% Avg	112%	107%	76%	99%	138%
Southern Mortlocks						
Ta	Inches	11.23	8.10	19.57	38.90	90.02
	% Avg	85%	61%	160%	89%	127%

LOCAL SUMMARY AND FORECAST

Chuuk Rainfall Summary: April through June, 2nd Qtr, and 1st half 2014						
Station		Apr.	May	Jun.	2nd Qtr.	1st Half
Northern Mortlocks						
Nama	Inches	12.47	6.87	11.71	31.05	73.12
	% Avg	101%	56%	100%	86%	119%
Northern Atolls						
Fananu	Inches	11.60	4.15	8.96	24.71	58.20
	% Avg	94%	34%	76%	68%	95%
Western Atolls						
Polowat	Inches	8.88	4.22	8.77	21.87	41.92
	% Avg	148%	47%	70%	80%	87%

Climate Outlook: With the Pacific basin climate moving toward El Niño, there should be abundant rainfall across Chuuk State, at least through October. During El Niño years, the monsoon trough extends farther to the east than at other times, and this shifts the development region of tropical cyclones eastward into Chuuk State or beyond, even as far as the Marshall Islands. The presence of the monsoon trough and an abundance of tropical disturbances helps to augment episodes of heavy rainfall. Since the monsoon trough is inherently episodic, and sensitive to MJO activity, the month-to-month variability of rainfall can be high. In the latter months of the year (SOND), there is an elevated risk of a tropical storm or typhoon to pass through Chuuk State. The level of risk for at least one named storm moving through the region is high. The longer term climate risk is the drought conditions that typically follow El Niño. This dryness could become a serious problem in early 2015. The depletion of rainfall and its duration is dependent on the strength of El Niño, with a strong El Niño causing a greater reduction of rainfall for a more prolonged time period (through May for a strong El Niño and only through March or April for a weaker El Niño). The rains usually return to the Mortlocks about a month sooner than they return to Chuuk Lagoon.

Predictions for Chuuk State from July 2014 through June 2015 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]			
	Chuuk Lagoon, Losap, and Nama	Polowat	Northern Atolls and Islands	Southern Mortlocks
Jul – Sep 2014	120% (45.84in)	100% (36.20in)	120% (45.84in)	110% (42.02in)
Oct – Dec 2014	100%	95%	100%	100%
Jan – Mar 2015	75%	75%	75%	80%
Apr – Jun 2015	80%	75%	75%	90%

Pohnpei State: During the first half of 2014, rainfall varied considerably across Pohnpei State, with some locations below average (e.g., Pingelap) and other locations above average

LOCAL SUMMARY AND FORECAST

(e.g., Nukuoro). A strong negative phase of the Madden-Julian Osillation (MJO) was observed throughout Micronesia from late April through May. In the negative phase of MJO, there is a widespread reduction of cloudiness and rainfall. During July, the positive phase of the MJO moved into the western Pacific, and was associated with a very active monsoon trough that extended all the way to the RMI. Southwesterly winds were reported across Pohnpei State, along with abundant rainfall from tropical disturbances and other forms of deep convection. It has been continually very wet at Nukuoro since a major drought there broke in June 2011. Kapingamarangi also has been continually wet for many months, but dryness during March and April caused the total rainfall for the first half of 2014 to be below average. Rainfall amounts across Pohnpei Island were average to above average. The 2014 1st half total of 97.75 inches at the Pohnpei WSO was 108% of average. No problems with water supplies were reported at locations reporting below average rainfall. There were no reports of sea inundation. A fisherman was struck and killed by lightning while fishing from a small boat in the waters off of the reef around Pohnpei Island. Mean sea level recorded at Pohnpei Island has recently exhibited a considerable fall; while the sea level anomaly in January was +8.2 inches above, the anomaly in May was half an inch below normal. This is consistent with the possible ongoing shift of the climate system to El Niño.

Chuuk Rainfall Summary: April through June, 2nd Qtr, and 1st half 2014

Station		Apr.	May	Jun.	2nd Qtr.	1st Half
Pohnpei Island						
Pohnpei WSO	Inches	15.96	17.33	17.95	51.24	97.75
	% Norm	97%	91%	105%	97%	108%
Atolls of Pohnpei State						
Nukuoro	Inches	13.77	14.47	22.80	51.04	97.86
	% Norm	92%	98%	187%	122%	126%
Pingelap	Inches	10.51	7.16	14.19	31.86	46.35
	% Norm	61%	42%	87%	63%	52%
Mwoakil-loa	Inches	7.34	12.36	8.53	28.23	61.32
	% Norm	54%	79%	61%	65%	83%
Kapinga-marangi	Inches	5.83	9.97	7.77	23.57	58.57
	% Norm	43%	96%	107%	76%	89%

Climate Outlook: The positive phase of the Madden-Julian Osillation (MJO) as of the last week of July) is moving out of the western Pacific and into the central Pacific, associated with enhanced rainfall and even tropical cyclone activity south of Hawaii. The Climate Prediction Center indicates that the negative (or dry) phase of the MJO will move into the western Pacific, causing a break in the rainfall across Pohnpei State. Thus, for early August, winds will be light, temperatures high, and rainfall lower than during recent weeks. By mid to late August, the monsoon trough should build back into Pohnpei

LOCAL SUMMARY AND FORECAST

State, with abundant rainfall returning. The monsoon trough is inherently episodic and sensitive to the MJO, so high month-to-month variability is expected for the next several months, with computer guidance indicating average to above average rainfall across Pohnpei State over the next three months. During El Niño, the monsoon extends farther eastward into Micronesia bringing episodes of heavy rains into Pohnpei State. Depending upon the ultimate strength of the developing El Niño, a tropical storm is at least 50% likely to form within or east of Pohnpei State, and then pass north of Pohnpei Island, bringing sometimes damaging southwest winds into the State. The timing of highest risk would be from late September through December. In the longer term, there is a risk of drought across most of Pohnpei State in early 2015, if the developing El Niño is moderate or strong. If it is weak or moderate, the island can also experience near normal to slightly wet conditions. So, note that a moderate El Niño can have a follow-on drought or no impact at all. Forecasts for the next seasons (JAS, ASO, and SON) seal level indicate marginally higher sea level of +3 to +4 inches above.

Predicted rainfall for Pohnpei State from July 2014 through June 2015 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]	
	Pohnpei Island and Atolls	Kapingamarangi
Jul - Sep 2014	115% (58.62in)	95% (21.36in)
Oct - Dec 2014	100%	100%
Jan - Mar 2015	85%	90%
Apr - Jun 2015	95%	80%*

* Note: if La Niña returns in 2015, then while rainfall recovers across most of Pohnpei State, the rainfall at Kapingamarangi gets less.

Kosrae State: The total rainfall for the first half of 2014 was just slightly below average at all Kosrae reporting sites. Kosrae is one of the wettest sites in the US-API, and even average rainfall is quite a large sum, over 100 inches for the first six months of the year. April 2014 was the wettest month of the first six months, and some mudslides were reported. The monsoon trough extended through the Kosrae region in April, and again during July, helping to bring abundant rainfall from the trough's associated tropical disturbances. Unusual westerly winds were observed in April and then again during July. Westerly winds are typically seen at Kosrae only during El Niño years.

Kosrae Rainfall Summary: April through June, 2nd Qtr, and 1st half 2014

Station		Apr.	May	Jun.	2nd Qtr.	1st Half
Airport (SAWRS)	Inches	26.29	16.59	17.08	59.96	100.94
	% Avg	121%	88%	90%	101%	93%
Nautilus Hotel	Inches	24.20	14.54	19.13	57.87	99.04
	% Avg	112%	77%	101%	97%	91%

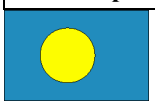
Climate Outlook: At this point, it looks as if Kosrae will be affected by a weak or possibly a moderate El Niño. As such, some episodes of unusual westerly winds will likely be experienced on Kosrae for the next several months. Overall,

LOCAL SUMMARY AND FORECAST

rainfall totals through October should be near or slightly above average, but with high month-to-month variability due to the episodic nature of the monsoon. Extended periods of heavy showers broken by two-week long periods of hot days, light winds, and diminished shower activity can be expected. During the next few months (August through December) tropical cyclones should pass north/northeast of Kosrae helping to augment the episodes of westerly winds and enhanced rains. An enhanced monsoon can also produce high surf on the southwest side of the island and can litter the reefs around the runway with boulders. In the long term, there is a risk of unusually dry conditions during early 2015, if the developing El Niño is moderate or strong. However, rains usually return to Kosrae by the end of April.

Predicted rainfall for Kosrae State from July 2014 through June 2015 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]
July – September 2014	110% (55.11in)
October – December 2014	105%
January – March 2015	80%
April – June 2015	90%



Republic of Palau: All recording locations throughout the Republic of Palau had average to below average rainfall totals for the first six months of 2014, with a distribution of very wet conditions during January and April. Relatively dry conditions during February and March, and again, May and June. This pattern was common to many of the islands throughout Micronesia, and may be partly explained by the phenomenon of the MJO in which rainfall amounts are modulated at 40-50 day time periods. During July, abundant rainfall returned to Palau. High rainfall during the wet months is partly attributed to tropical disturbances and numbered tropical cyclones passing nearby to the north. Over half of the western North Pacific basin's output of tropical cyclones affected Palau with heavy showers and enhanced southwesterlies. These include Tropical Storm Kajiki (02W), Tropical Storm Peipah (05W), Typhoon Neoguri (08W), Typhoon Ramassun (09W), Typhoon Matmo (10W), Typhoon Halong, and Tropical Storm Nakri (12W). There has been a very rapid fall of mean sea level in Palau recorded at the tide gauge located in Malakal. While the sea level anomaly in January was +7.6 inches above normal, Palau touched the normal value in April (+0.3 inches above). It again registered a marginal rise in May (+2.2) and recorded another fall in June. Currently, it is -0.3 inches below normal. A large fall of sea level in Palau at this time of year is consistent with the onset of El Niño.

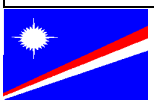
Republic of Palau Rainfall Summary: April through June, 2nd Qtr, and 1st half 2014						
Station		Apr.	May	Jun.	2nd Qtr.	1st Half
Koror (WSO)	Inches	16.38	7.45	9.91	33.74	63.88
	% Norm	189%	62%	57%	89%	97%
Intl. Airport	Inches	19.47	8.93	13.39	40.86	79.17
	% Norm	225%	67%	78%	108%	120%

LOCAL SUMMARY AND FORECAST

Climate Outlook: Near average to slightly above average rainfall is anticipated across the Republic of Palau over the next few months. If El Niño becomes established, the monsoon trough would push farther eastward into the eastern Federated States of Micronesia, and many of the season's tropical cyclones will tend to form farther east. During August and September, southwesterly wind flow will be persistent, with episodes of showery weather interspersed with periods of very warm dry days as typhoons lift far to the north. If the EL Niño event is weak or moderate, and forms in November or December, there is a good chance (25%) that a tropical cyclone would move in a westward direction, and affect Palau. A longer term risk is the possible onset of El Niño-related very dry conditions beginning in late 2014 and extending into the first few months of 2015.

Predicted rainfall for Palau from July 2014 through June 2015 is as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]
July – September 2014	110% (49.34in)
October – December 2014	95%
January - March 2015	85%
April - June 2015	90%



Republic of the Marshall Islands: The first half of 2014 it was very wet at many atolls of the RMI. February and April were particularly wet at most RMI locations. April, however, was in a class by itself:

(1) Majuro set a monthly rainfall record (23.20 inches);

(2) Kwajalein fell just short of its April extreme (although a lesser total in February 2014 set the record for that month);

(3) Kwajalein set a 24-hour rainfall record with a total of 12 inches; and

(4) Mili had over 30 inches during the month!

After the very wet April, rainfall returned to near normal to below normal during May and June, perhaps due, in part, to a long-lasting negative phase of the MJO. Two of the northern-most atolls (Wotje and Utirik) were particularly dry during May, and combined with dryness in January and February, the 2014 1st half rainfall totals at these two atolls was low. Fearing another round of drought with impacts on water quality and quantity, the WFO Guam issued a Drought Information Statement for the northern atolls of the RMI. In February 2014, a major change in weather patterns began. Very heavy rainfall fell at Kwajalein ending concerns with water supply on that atoll. Only at atolls north of 10° N (e.g., Wotje and Utirik) did relatively dry conditions continue at times during the first half of 2014, but problems with adequate fresh water supplies were not reported. During July, the monsoon trough became active once again. Unusual westerly winds occurred in the RMI as far north as Kwajalein, and were accompanied by an increase in heavy showers. At the time of this writing, tropical storm Genevieve (07E) is nearing the dateline and should become a typhoon as it passes to the northeast of Kwajalein. The very high rainfall in the RMI during this year's dry season, unusual occurrences of

LOCAL SUMMARY AND FORECAST

westerly wind, and the approach toward the RMI of tropical cyclones from the Central Pacific are canonical signs of El Niño. Another typical sign of El Niño is a Micronesia-wide fall of sea level, and as seen elsewhere across Micronesia during the past few months, the sea level has also dropped considerably in the RMI. The monthly mean sea level in Majuro continued to fall rapidly in the last couple of months. While the sea level anomaly in January was +7.6 inches above normal, the anomaly in May was +0.2 inches above normal (which can be treated as normal). Since January 2014, the monthly mean sea level in Kwajalein continued to fall rapidly. In May it registered a normal 0.0 inches and at the time of this writing recorded a slight rise to a current value of +1.5 inches above normal. NOAA's El Niño index (based on the SST in an equatorial region just east of the Date Line) is still in ENSO-neutral territory, but we still have high confidence that El Niño will become established some time in the 2nd half of 2014.

RMI Rainfall Summary: April through June, 2nd Qtr, and 1st half 2014

Station		Apr.	May	Jun.	2nd Qtr.	1st Half
RMI Central and Southern Atolls						
Majuro WSO	Inches	23.20	7.58	9.86	40.64	68.45
	% Avg	226%	68%	85%	123%	122%
Mili	Inches	33.36	10.16	12.13	55.65	89.97
	% Avg*	325%	91%	105%	168%	161%
Aling-laplap	Inches	10.67	7.47	8.76	26.90	49.17
	% Avg*	120%	71%	83%	89%	104%
Arno	Inches	21.74	5.08	10.68	37.50	69.18
	% Avg*	211%	45%	92%	113%	124%
RMI Northern Atolls						
Kwajalein	Inches	19.24	5.36	7.22	31.82	60.62
	% Avg	255%	54%	75%	117%	155%
Wotje	Inches	9.45	2.36	4.77	16.58	23.11
	% Avg	132%	25%	52%	64%	63%
Utirik	Inches	1.99	3.12	8.42	13.53	21.39
	% Avg	31%	37%	103%	59%	64%

* Station percents based on Majuro WSO averages

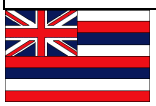
Climate Outlook: The wet conditions throughout most of the RMI so far during 2014 are consistent with a developing El Niño. The atolls of the RMI are typically very wet during an El Niño year. The normal progression of El Niño-related rainfall is for wet conditions to persist through October (2014), with high month-to-month variability, then toward the end of the year, dry conditions arrive and persist into the early part of the following year (2015). The magnitude and duration of dry conditions depend on the strength of El Niño. The risk of a tropical cyclone in the RMI is almost wholly dependent upon El Niño. Nearly all typhoons affecting the RMI occur during El Niño. The greatest threat is during November through January, but El Niño-related typhoons have occurred during other months (e.g., the unnamed typhoon of June 1905). During the summer months, tropical cyclones tend to pass well to the north of the RMI, and affect Wake Island and sometimes even Midway Island. Historical El Niño-related tropical cyclones in the RMI include: The November 1918 Typhoon, Typhoon Zelda (December 1991),

LOCAL SUMMARY AND FORECAST

Typhoon Axel (January 1992), and Typhoon Paka (December 1997). Typhoon Gay severely affected some of the atolls of the RMI in November 1992, which was a year not universally accepted as a continuation of the 1991 El Niño, but it certainly occurred during a decade dominated by El Niño. Forecasts for the next seasons (JAS, ASO, and SON) sea level indicate normal or marginally higher sea level for Majuro. Whereas, sea level forecasts for Kwajalein next seasons indicates a higher sea level of +4 inches.

Predicted rainfall for the RMI from July 2014 through June 2015 are as follows:

Inclusive Period	% of long-term average / Forecast rainfall (inches) [1]		
	South of 6ºN	6ºN to 8ºN	North of 8ºN
Jul – Sep 2014	110% (40.63in)	120% (44.33in)	120% (43.53in)
Oct – Dec 2014	100%	100%	100%
Jan – Mar 2015	80%	75%	70%
Apr – Jun 2015	95%	90%	85%



Hawaii: Rainfall for the Hawaiian Islands has been above normal for the first two quarters of 2014 for all stations with the exception of Hilo, where rainfall totals are near normal. Tropical cyclone (TC) activity near the Hawaiian Islands has been enhanced during recent months likely due to the development of El Niño conditions over the Pacific. Most notably, the landfall of TC Iselle is likely the only direct hit on the Big Island in the recent 100 years. Since January 2014, the monthly mean sea level in Honolulu and Hilo remained close to normal. Honolulu and Hilo went marginally below normal in April and May. However, in June, they both recorded a rise of (+3.4in) and (+1.10in) respectively.

Hawaii Rainfall Summary: April through June, 2nd Qtr, and 1st half 2014

Station		Apr.	May	Jun.	2nd Qtr.	1st Half
Lihue Airport	Inches	0.65	2.81	3.13	6.59	18.92
	%Norm	34	189	245	140	170
Honolulu Airport	Inches	0.33	3.35	0.58	4.26	10.55
	%Norm	63	838	322	387	262
Kahului Airport	Inches	2.53	1.03	0.29	3.85	14.25
	%Norm	284	210	322	262	212
Hilo Airport	Inches	13.37	7.41	6.57	27.35	54.31
	%Norm	149	101	104	121	107

Climate Outlook: Forecasts for the next seasons indicate marginally higher sea level of +2in for both Honolulu and Hilo. The U.S. Climate Prediction Center's Hawaiian Seasonal Outlook Discussion, posted August 21st, 2014 and can be found on at the following website: www.cpc.ncep.noaa.gov/products/predictions/90day/fxhw40.html.

SEASONAL RAINFALL OUTLOOK FOR THE US-AFFILIATED PACFIC ISLANDS

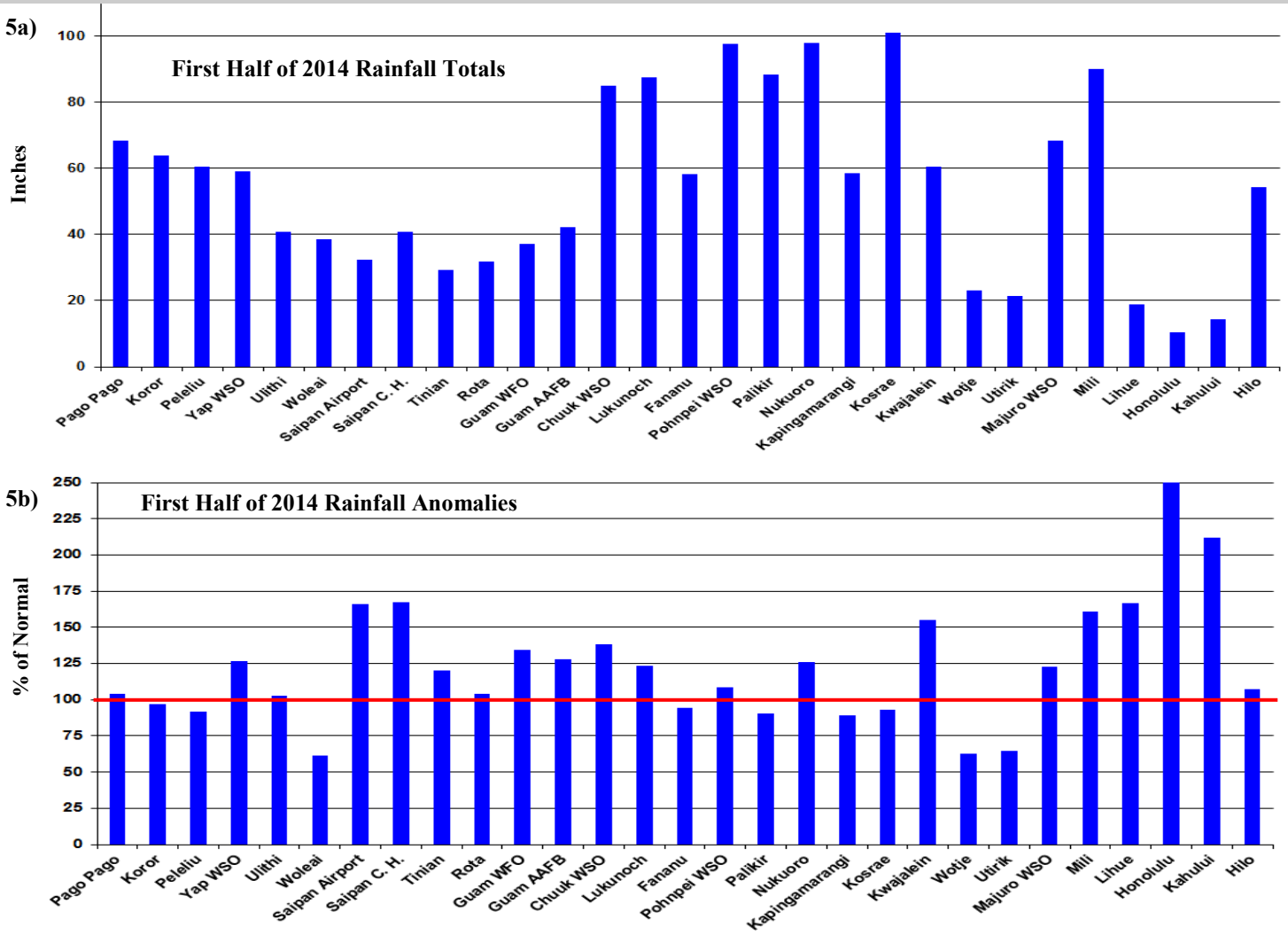


Figure 5a and 5b, 2014 January, February, March, April (JFMA) totals (a) in inches and (b) anomalies (expressed as % of average). In 5b, solid line indicates normal rainfall (100%).

ACKNOWLEDGEMENTS AND FURTHER INFORMATION

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

University of Hawai'i - Joint Institute of Marine and Atmospheric Research (JIMAR), School of Ocean and Earth Science and Technology (SOEST), Department of Oceanography:
MSB #317, 1000 Pope Road, Honolulu, Hawai'i 96822
Dr. Mark Merrifield, PEAC Principal Investigator at 808-956-6161: for more information on sea level and climate in Hawai'i.

NOAA National Weather Service
Weather Forecast Office (WFO) Honolulu:
HIG #250, 2525 Correa Rd., Honolulu, HI, 96822
Tom Evans, PEAC Director, at 808-973-5270: for information related to NWS.

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

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

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 G. Carl Noblitt IV, at peac@noaa.gov or at the address listed below.

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