NWS Climate Services

December PEAC Audio Conference Call Summary

13 December, 1430 HST (14 December 2018, 0030 GMT)

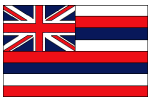
November rainfall totals reported (Joe)

% Normal: blue above normal & red below normal. Departure from normal: blue-above & red-below (same for 3 mon %)

*** Denotes missing data

	Rainfall	% Norm	Median	Departure	3 Month Total
	Inches	November	Inches	inches	SON
Koror	15.92	122	13.09	2.83	37.41
Yap	12.03	136	8.83	3.20	32.24
Chuuk	15.02	142	10.61	4.41	44.23
Pohnpei	10.97	74	14.83	-3.86	37.98
Kosrae	8.09	58	13.83	-5.74	20.98
Kwajalein	12.12	107	11.28	0.84	27.82
Majuro	9.29	69	13.44	-4.15	28.28
Guam NAS	4.51	61	7.38	-2.87	36.55
Saipan	4.64	83	5.61	-0.97	33.95
Pago Pago	11.90	117	10.14	1.76	32.33
Lihue	3.73	106	3.53	0.20	14.24
Honolulu	0.03	2	1.36	-1.33	6.43
Kahului	1.43	78	1.84	-0.41	5.22
Hilo	11.45	101	11.38	0.07	35.19

Reports from around the Region



Hawaii (Kevin)

Kauai

November rainfall totals across Kauai were near to above average at most of the gages. Below average totals were mainly from the lower elevation sites of the leeward slopes from Koloa to Mana. The U.S. Geological Survey's (USGS) gage on Mount Waialeale had the highest monthly total of 27.40 inches (73 percent of average). The highest daily total was 6.22 inches on November 9 at the USGS' Kilohana gage associated with a cold front passage.

Sufficiently wet conditions maintained above average rainfall totals at most of the Kauai gages for 2018 through the end of November. The highest year-to-date total was 484.48 inches (133 percent of average) at Mount Waialeale. This site is on pace to have its wettest year since 1994.

Oahu

Many of the gages along the slopes of the Koolau Range of Oahu had near to above average rainfall totals for the month of November. Monthly totals from sites along the Waianae Range were mostly below average. The USGS' Poamoho Rain Gage No. 1 had the highest monthly total of 19.86 inches (91 percent of average). However, the highest daily total was from the Ahuimanu gage which recorded 4.53 inches during the flash flood event on November 9. The Aloha Tower gage, located on the lower leeward portion of the Koolau Range, posted its lowest November total since 1993.

Oahu rainfall totals were near to above average at most of the gages for 2018 through the end of November. The Poamoho Rain Gage No. 1 had the highest year-to-date total of 228.29 inches (110 percent of average). The Manoa Lyon Arboretum gage was not too far behind at 203.88 inches (147 percent of average).

Maui

Gages along the windward slopes of Maui County had mostly near to above average rainfall totals for the month of November. However, most of the remaining sites had below average totals, including several at less than 10 percent of average along the leeward slopes of Haleakala. The USGS' rain gage at West Wailuaiki Stream had the highest monthly total of 22.53 inches (114 percent of average) and the highest daily total of 6.68 inches on November 10. Most of the totals from Molokai and Lanai were below 50 percent of average. The sole exception was the National Park Service's Puu Alii gage on the windward side of Molokai which recorded 14.33 inches (155 percent of average). Just 8 miles away, Kaunakakai had only 0.06 inches of rainfall (3 percent of average).

Rainfall totals for 2018 through the end of November were above average at most of the gages across Maui County. The USGS' West Wailuaiki gage had the highest year-to-date total of 319.04 inches (153 percent of average).

Big Island

Most of the Big Island gages posted near to below average rainfall totals for the month of November. The USGS' rain gage at Kawainui Stream had the highest monthly total of 18.64 inches (232 percent of average). The highest daily total was 8.03 inches on November 10 at the Laupahoehoe gage. The Kealakekua gage had its highest November total since 2007, which was mainly due to 3.71 inches recorded during the flash flood event on November 6. All of the totals from the Kau District were below 50 percent of average.

For 2018 through the end of November, rainfall totals across the Big Island were near to above average at almost all the gages. The USGS' Saddle Road Quarry gage had the highest year-to-date total of 350.62 inches (274 percent of average). Through the end of November, Hilo Airport already has its sixth wettest year on record (data going back to 1949) and is on pace to have its second or third wettest year by the end of December.

American Samoa (Taylor):

American Samoa (AS) is influenced by Tropical Wet climate. The month of December received 117% of normal (% of normal and % are synonymously used throughout this call-note) rainfall. Trades are picking up as SPCZ is active over American Samoa! There is no report of any significant damage, but sea level stays elevated. There were high surfs and several flush floods on the island. But there is no report of damage due to any serious inundations. Model-based PEAC's seasonal climate outlook is now indicating above-average rainfall for DJF with moderate confidence. Currently the sea level is staying above but stable. Forecasts indicate that it will stay elevated over the next three months. A pulse of MJO may push across the tropical Pacific as we head into January. This may be associated with an enhanced risk for tropical cyclone activity.

Kwajalein (Jason):

The weather in Kwajalein is bit dry now. The month of November recorded 107% of normal rainfall. There are some high waves, but no inundations reported so far. Current model projections show most of the precipitation staying to the north or southwest. Winds during this period will be gentle and generally easterly. Cloud coverage will be moderate due to the shower activity surrounding the atoll. There are some scattered showers across the atoll. The sea level currently stays marginally above normal. However, a significant Westerly Wind Burst (WWB) between the Date Line and 120^0W is expected through to the first week of December. PEAC-model forecasts have trended to show average-below rainfall and slightly elevated sea level over the next 3 months, and there is no active TC warning now.

(Also see https://www.rts-wx.com/forecasts-kwajalein-atoll-forecast)

Reports from around the Region (CON'T)

Majuro (Nover):

While heavy rains since July has sufficiently improved Majuro's drought situation, the recent rainfall (67% and 69% in October and November) has made Majuro a bit dry. Current water reserves are about 80% capacity, which is okay as compared to the average 30 million gallons. However, this is still manageable without any major water crisis. PEAC-model forecasts have trended average rainfall and slightly elevated sea level over the next 3 months, and there is no active TC warning now.

Pohnpei (Wallace):

Pohnpei recorded 74% of normal rainfall in November. However, the streamflow is less than normal. The southern part of the island is drier than the eastern part. There have been some high surf, but no inundation reported so far. The outer islands are wet. Winter is picking-up. PEAC-model forecasts have trended average rainfall and slightly elevated sea level over the next 3 months.

Kosrae (Eden):

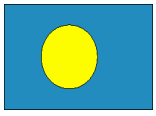
Kosrae is dry now. It only recorded 34% and 58% of normal rainfall in October and November. There were several flood statements issued during the month, but no inundations reported so far. PEAC-model forecasts have trended average rainfall and slightly elevated sea level over the next 3 months. The PEAC is now leaning toward an expectation of a higher than average risk of TC impacts for Kosrae (high waves, heavy rainfall and rough seas) in the fall months (DJF).

Chuuk (Sanchez):

Chuuk recorded 142% of normal rainfall in November. The island is enjoying normal conditions now with no report of water shortages. Trade winds have already started to pick up. PEAC forecasts indicate average-below rainfall for the island state for at least the next three months. While there is no operational tide gauge now sited at Chuuk, based on virtual satellite data, it is seen that the mean sea level throughout Chuuk State has been falling over the past few months. Now it is marginally above normal.

Yap (Chip):

Yap is in their monsoon season with the monsoon trough moving towards them. Yap received 136% of normal rainfall in November. Everything looked normal (e.g., reservoirs are full and streams are flowing well) in September, but it turned out to be bit drier in October and November. However, the outer islands are wet now. PEAC forecasts are favoring average-below rainfall and below normal sea level in the next three months.



Palau (Kikuko & Chip):

The following abstract is taken from Kikuko's (Staff Meteorologist NOAA NWS Office, Palau) email message.

I would like to forecast the final probability for Koror to be something like 40:35:25. We are nearly halfway through December and rainfall to date is 4.77 inches. Models have toned down the short term forecasts for precipitation and it looks like less rain in is the near future in terms of seasonal forecasts. If weak troughs or circulations, shown in current rainfall models for the last week of December, can dip a little more south over the islands that will definitely help increase the numbers. Palau is heading into the drier months of the year from January to April; various seasonal forecasts are showing a generally drier trend and looking more like an El Nino year in 2019.

PEAC forecast favors below-average rainfall and below normal sea level in the next season.

Reports from around the Region (CON'T)

Guam and CNMI (Chip & Clint):

The summer monsoon became well established in the western North Pacific Basin, and after a wet month Guam and Saipan are now a bit drier. The 61% and 83% of rainfall in November in Guam and Saipan have further dried it out. However, these two islands are still doing ok without any major water problems. PEAC forecasts are now indicating average-below rainfall for both Guam and Saipan over the next three months and slightly below normal sea level.

Saipan is still recovering from the impacts of the Super Typhoon Yutu. It was the most powerful tropical cyclone on Earth in 2018 and struck the Northern Mariana Islands. The direct strike destroyed homes, snapped trees and power lines and caused roofs to collapse on Tinian and neighboring Saipan. "Extensive damage to critical infrastructure on Saipan and Tinian has left the Commonwealth devastated with many families displaced.

Tropical Cyclones (Chip)

The PEAC will adopt the press-release forecast by the WFO Guam (Mr. Charles P. Guard and collaborators) for the 2018 typhoon season for Guam and the CNMI, wherein the odds for a severe tropical storm at each location is given as 50% (about average); the odds of a CAT 1 typhoon is set at 25% (above average); and the odds for a major typhoon (CAT 3 or higher) is set at 15% (slightly above average). Elsewhere in Micronesia, the odds for damaging TC strikes are set to slightly above average (for example, the average annual number of named tropical cyclones passing within 180 n mi of Yap or Palau is four, with a 10-15% chance of a damaging strike). Eastward of Chuuk State, the risk of a tropical storm or typhoon is much lower than at locations farther to the west, except during strong or some moderate El Niño events. During 2016 and 2017, the PEAC set very low odds (< 10%) for TC activity eastward of Chuuk State. This year, the PEAC anticipates an enhancement of TC development at locations to the east of Chuuk State, with the odds of some damaging effects from a TC (high surf; gale-force or stronger wind; and extreme rainfall > 10 inches in 24 hours) set at 25% (1-in-4) for all locations. This is an above average risk and is well above the level of activity seen throughout Micronesia in both 2016 and 2017.

A pulse of MJO may push across the tropical Pacific as we head into January. This may be associated with an enhanced risk for tropical cyclone activity in American Samoa.

Sea Level Discussion Remarks (Rashed) All values are in inches (1 inch=25.4 mm); Seasonal cycle removed.

Tide Gauge stations	Seasonal Forecasts DJF (mean[1]) (ano)	SD of SON (mean)	Monthly mean[1] anomaly — Observed rise/fall Sep/ 2018	Oct/ 2018	Nov/ 2018	Current State/ Trend SON 2018	Seasonal Fore-casts DJF (max[2]) (ano.)	SD of SON (max)	Monthly max[2] anomaly — Observed rise/fall Sep/ 2018	Oct/ 2018	Nov/ 2018
Marianas, Guam	**-1**	3.5	**+1.8**	**-1.8**	**-2**	Normal	+18	3.3	**+26**	**+15**	**+15**
Malakal, Palau	**-4**	4.4	-4	-4.2	-6	**Below**	+36	4.2	+33	+31	+30
Yap, FSM	**-2**	4.7	-2	-2.5	-3	Normal	+29	4.9	+26	+24	+24
Chuuk, FSM***	**0**	**	**+1.1**	**-1**	**-1**	Normal	+29				
Pohnpei, FSM	**+1**	4.3	+1	**+3.3**	**+2**	Normal	+33	4.5	**+27**	**+31**	**+30**
Kapingamarangi	**+4**		+9	**	**	**Above**	+30		**+32**	**+39**	**
Majuro, RMI	**+2**	3.3	+5	**+5.5**	**+3.2**	**Above**	+45	3.7	+46	+43	+43
Kwajalein, RMI	**+1**	3.5	+1.7	**+3.3**	**+1.2**	Normal	+40	3.8	**+38**	**+38**	**+37**
Pago Pago*	**+5 (+0)**	3.1	+6 [+11]	+5 [+10]	+5 [+10]	**Above**	+25 (+31)	3.2	**+31**	**+28**	**+27**
Honolulu	**+1**	1.8	+3.8	+3	+1.2	Normal	+20	2.5	**+23**	**+19**	**+20**
Hilo	**+2**	1.8	**+7**	**+5**	**+1.5**	Normal	+24	2.4	**+28**	**+25**	**+22**

+/- 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. *** (Experimental) Satellite Aviso Altimetry data, ** Data currently unavailable; *Figures in parenthesis for monthly-max anomaly indicates difference between the maximum anomaly for the given month and the long-term monthly average anomaly.*

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

**** In Pago Pago*,** There was a level shift (approximately 5 inches) in American Samoa at the time of September 2009 earthquake. So, -5 inches has been adjusted (shown in parenthesis) to the current tide-gauge values of Pago Pago.

Current Conditions: Consistent with the forthcoming **Warm Pool El Niño (WPE)**, all of the north Pacific stations stayed normal to slightly below normal in the month of November. Some of the stations **(e.g., Malakal, Yap, Majuro and Kwajalein) recorded slight fall too**. Hawaii sea levels are also staying near normal. Hilo recorded considerable fall in November and now staying close to normal. Note that the south Pacific station (i.e., Pago Pago) is elevated (+5). This station maintains 4-6 months' time-lag w.r.t north Pacific stations (i.e., Guam and the Marshalls).

The recent fall of sea level may be explained as WP El Niño, the positive sea level anomaly is located over the central Pacific. In this regard, the sea level anomaly in the tropical central Pacific may not efficiently produce a warm SST anomaly. Furthermore, anomalous easterlies over the tropical eastern Pacific induce shoaling of the thermocline and play a role of cooling, rather than warming, over the tropical eastern Pacific. In addition, there are anomalous easterlies over the eastern Pacific; as a result, the sea level anomaly is small over the eastern Pacific, indicating that the thermocline there does not support SST warming.

Impacts: While the MSL is normal or falling **(e.g. significant fall in Guam**), t*ides are sometimes high with waves. However, there is no noticeable inundation in low-lying atolls and there is no report for damage, so far.*

Forecasts for NDJ: PEAC-CCA Statistical model is predicting **normal to marginally** below-normal sea level for the north Pacific and Micronesian (FSM) stations. The RMI stations are likely to stay slightly higher than normal. In Hawaii, both Honolulu and Hilo are likely to be elevated.

5. Current State of ENSO and predictions: (Rashed) **ENSO Alert System Status: El Niño Watch**

(13 December2018)

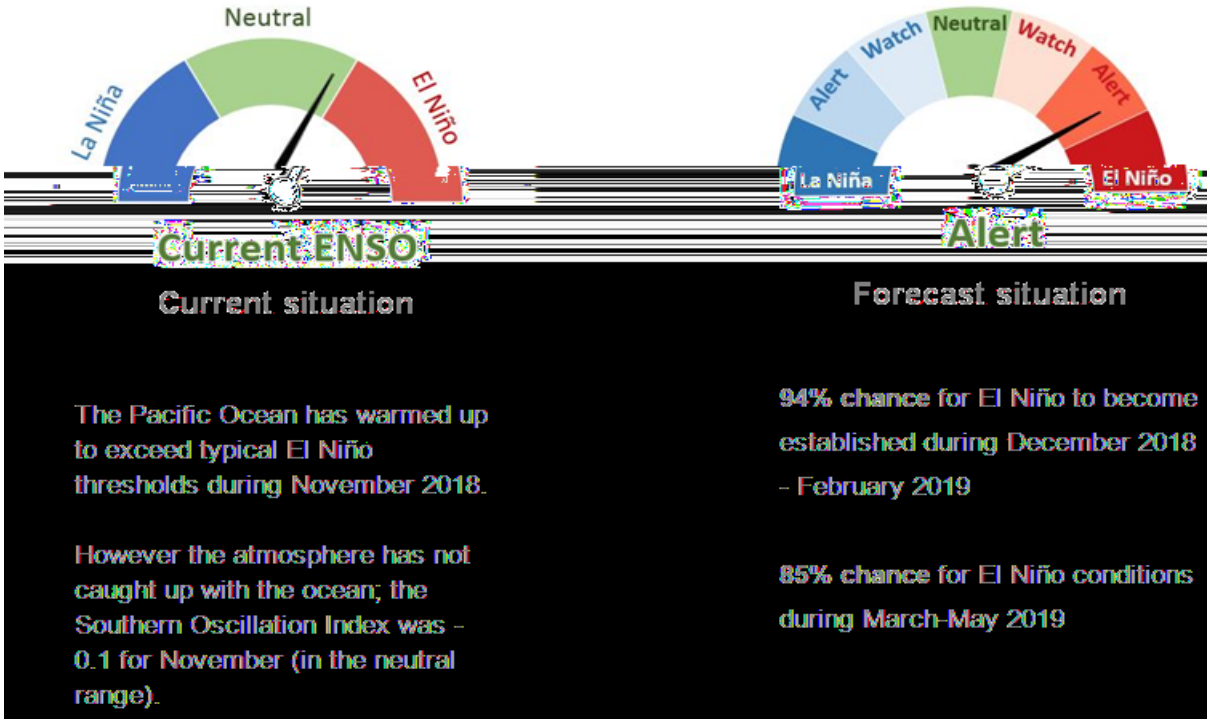
Synopsis: El Niño is favored to form in the next couple of months and continue through the Northern Hemisphere winter 2018 -19 (70-75% chance).

ENSO-neutral continued during November, despite the continuation of above-average sea surface temperatures (SSTs) across the equatorial Pacific Ocean. The latest weekly SST indices for all four Niño regions were near +1.0□C. Positive subsurface temperature anomalies (averaged across 180°-100°W) weakened slightly, but above-average temperatures persist at depth across the central and eastern equatorial Pacific Ocean. However, the atmospheric anomalies largely reflected intra-seasonal variability related to the Madden-Julian Oscillation, and have not yet shown a clear coupling to the above-average ocean temperatures. For the month as a whole, atmospheric convection remained close to average near the Date Line and suppressed over Indonesia. Also, the low-level and upper level winds were mostly near average across the equatorial Pacific. The equatorial Southern Oscillation index (SOI) was negative, while the traditional SOI was near zero. Despite the above-average ocean temperatures, the overall coupled ocean-atmosphere system remained ENSO-neutral.

The majority of models in the IRI/CPC plume predict a Niño3.4 index of +0.5□C or greater to continue through the winter and spring. The official forecast favors the formation of a weak El Niño, with the expectation that the atmospheric circulation will eventually couple to the anomalous equatorial Pacific warmth. In summary, El Niño is expected to form and continue through the Northern Hemisphere winter 2018-19 (~90% chance) and spring (~60% chance).

NIWA Island Climate Update Summary:

- Sea surface temperatures (SSTs) across the east-central tropical Pacific have reached weak El Niño conditions. Over the past month, SSTs in the central Pacific (NINO3.4 Index) have continued to warm, increasing to an anomaly of +0.9^0 C. This marks the third consecutive month SST anomalies in the central Pacific have exceeded 0.7oC, which meets an oceanic definition for El Niño. However, the atmosphere has yet to respond to this additional warmth and become truly coupled with the ocean in a manner typically associated with an El Niño event, and the atmospheric indicators so far fail to signal El Niño conditions.
- A significant Westerly Wind Burst (WWB) between the Date Line and 120^{0}W is expected through to the first week of December. This WWB will likely result in an additional downwelling Kelvin wave, which will may tip the atmosphere toward El Niño over the coming weeks in what would become an unusually late onset.
- The consensus from international models is for the tropical Pacific to transition towards El Niño over the next three-month period (94% chance over December 2018 – February 2019). The probability for El Niño remains high through autumn 2019, with an 85% chance for occurrence in the March – May 2019 period. The probability of El Nino remains unusually elevated (66% chance) through to the next Southern Hemisphere winter season (signalling the possibility of a protracted El Niño event extending over two years).



Source: NIWA Island Climate Update: December 2018

6. Rainfall Outlooks for DJF (Joe)

The verification result of **SON** rainfall forecasts was 8 hits and 6 misses (Heidke score: 0.4139). The stations that hit the forecasts were: Koror Yap, Chuuk, Guam, Saipan, Lihue, Honolulu, and Kahului. The 5 missed stations were Pohnpei, Kosrae, Kwajalein, Majuro, Pago Pago, and Hilo. PEAC forecasts are based on six GCMs and two statistical models.

SON Verification Location	Rainfall Outlook	Final Probs	3 mo Verification		
			% norm	Total (in)	Tercile
Palau					
Koror 7º 22' N, 134º 32' E	Avg-below	**35:35:30**	94	37.41	**Avg.**
FSM					
Yap 9º 29' N, 138º 05' E	Avg.	**30:40:30**	93	32.24	**Avg.**
Chuuk 7º 28'N, 151º 51'E	Avg-above	**30:35:35**	131	44.23	**Above**
Pohnpei 6º 59'N, 158º 12'E	Avg-above	**30:35:35**	89	37.98	**Below**
Kosrae 5º 21'N, 162º 57'E	Avg.	**30:40:30**	**54**	20.98	**Below**
RMI					
Kwajalein 8º 43'N, 167º 44'E	Avg-above	**30:35:35**	84	27.82	**Below**
Majuro 7º 04' N, 171º 17'E	Avg.	**30:40:30**	76	28.28	**Below**
Guam and CNMI					
Guam 13º 29'N, 144º 48' E	Avg-above	**30:35:35**	116	36.55	**Above**
Saipan 15º 06'N, 145º 48' E	Avg-above	**30:35:35**	129	33.95	**Above**
American Samoa					
Pago Pago 14º 20'S, 170º 43'W	Avg.	**30:40:30**	125	32.33	**Above**
State of Hawaii					
19.7º - 21.0' N, 155.0º - 159.5' W					
Lihue	**Above**	**25:35:40**	**162**	14.24	**Above**
Honolulu	**Above**	**25:35:40**	**200**	6.43	**Above**
Kahului	**Above**	**25:30:45**	**202**	5.22	**Above**
Hilo	**Above**	**25:30:45**	120	35.19	**Avg.**

	Hit
	Miss
Heidke:	**0.4139**
RPSS:	**0.0541**

Tercile Cut-offs for SON Season based on 1981-2010 Pacific Rainfall Climatologies (Luke He)

	Koror	Yap	Chuuk	Pohnpei	Guam	Saipan	Majuro	Kwaj
below (<)								
33.33%	30.65	32.05	32.73	41.51	30.44	26.19	34.74	30.69
near								
66.66%	41.38	38.09	38.35	47.07	33.78	29.77	42.55	34.83
above (>)								

Lihue	Honolulu	Kahului	Hilo	Pago Pago	Kosrae
9.17	2.52	2.08	24.29	26.91	38.3
11.22	5.59	4.76	40.81	31.48	43.49

Rainfall in inches

6. Rainfall Outlooks for DJF (Con't)

Location	*Rainfall Outlook*	*Final Probabilities*
Palau		
Koror	Below	**40:30:30**
FSM		
Yap	Avg-below	**35:35:30**
Chuuk	Avg-below	**35:35:30**
Pohnpei	Average	**30:40:30**
Kosrae	Average	**30:40:30**
RMI		
Kwajalein	Avg-below	**35:35:30**
Majuro	Average	**30:40:30**
Guam and CNMI		
Guam	Avg-below	**35:35:30**
Saipan	Avg-below	**35:35:30**
American Samoa		
Pago Pago	Avg-above	**30:35:35**
State of Hawaii		
Lihue	Average	**30:40:30**
Honolulu	Average	**30:40:30**
Kahului	Average	**30:40:30**
Hilo	Average	**30:40:30**

Note:

Interpretation of tercile probability Example: The Avg-above probability, **30:35:35** forecasts in DJF season means there is a **35%** chance (probability) for occurrence of excess rainfall during the DJF season, **35%** chance for occurrence of rainfall within a pattern considered normal during the DJF season, and **30%** chance for occurrence of deficit rainfall during the DJF season. *Also note that excess and deficit limit for each of the stations are b different*

7. Drought monitoring updates (Richard Heim)**.**

A. End-of-November Monthly Drought Assessment:

i. With WxCoder III data, we have 23 stations in the monthly analysis.

ii. November was dry at spotty locations in Micronesia – Rota (just barely with 3.91"), Fananu & Lukonor & Woleai (but all 3 had some missing data), Mwoakilloa, Ailinglapalap, Utirik, and especially Jaluit (1.49") – but wet (more than the monthly min) elsewhere. The November monthly analysis (November 30) is consistent with the weekly analyses for November 27 and December 4. Compared to the end-of-October analysis:

a. D0-S continued at Woleai & Wotje.
b. D0-S worsened to D1-S at Kosrae.
c. D1-S worsened to D2-S at Jaluit.
d. D0-S improved to D-Nothing at Majuro.
e. Pingelap was missing in November, so they could not be analyzed.
f. All other stations continued at a D-Nothing classification.

B. Current (Weekly) Drought Conditions: The discussion above is the monthly (end of November) analysis. The latest weekly USAPI USDM assessment may show different USDM classifications. The latest weekly USAPI USDM assessment is for December 11.

Participants:

NWS Climate Services Program Managers (CSPMs): Joe Brinkley

WSO Climate Service Focal Points (CSFPs):

Lee (Majuro)	Sanchez (Chuuk)	Wallace (Pohnpei)
Eden (Kosrae)	Justin (Yap)	Taylor (Pago Pago)
Kikuko(Palau)	Jason (Kwajalein)	Mark/Chip/Brandon B. (Guam & CNMI)

PEAC Principal Research Scientist: Rashed Chowdhury

WERI Scientist: Mark Lander

CPC Forecaster:

WFO Guam : Chip Guard, Clint Simpson

NWS MIC, Honolulu: Christopher Brenchley

NCEI: Richard Heim

Pacific RISA: Krista Jaspers

NWS Hydrologist: Kevin Kodama

Additional Attendees:

***** Next Call– 10 January 2018, 1430 HST (11 January 2018, 0030 GMT)*****