NWS Climate Services

December PEAC Audio Conference Call Summary

12 December, 1430 HST (15 November 2019, 0030 GMT)

November rainfall totals reported (Sony)

% Normal: blue above normal & red below normal. Departure from normal: blue-above & red-below

	Rainfall	% Normal	Normal	Departure	3 mon
	Inches	November	Inches	inches	SON
Koror	11.29	99	11.39	-0.10	33.97
Yap	9.30	105	8.83	0.47	26.66
Chuuk	9.26	87	10.61	-1.35	30.62
Pohnpei	24.91	168	14.83	10.08	65.39
Kosrae	13.55	98	13.83	-0.28	34.02
Kwajalein	12.52	111	11.28	1.24	32.94
Majuro	14.83	110	13.44	1.39	41.51
Guam NAS	15.76	214	7.38	8.38	47.38
Saipan	7.06	126	5.61	1.45	46.97
Pago Pago	7.48	74	10.14	-2.66	22.47
Lihue	4.98	141	3.53	1.45	13.61
Honolulu	2.58	190	1.36	1.22	5.86
Kahului	0.21	11	1.84	-1.63	0.63
Hilo	10.28	90	11.38	-1.10	32.24

Reports from around the Region

Hawaii (Kevin)

Weather conditions during November 2019 was split into a dry first half and a wet second half. The main Hawaiian Islands had its first cold front passage of the 2019-2020 wet season, but it was a very weak system and did not produce much rainfall. The front was so weak it failed to even reach Oahu and dissipated in the Kauai Channel. It was also a bit late for a first frontal passage as the first front arrives in the state, on average, around mid-October.

The regional weather pattern became much more active during the second half of the month. On November 16, a complex pattern involving a cold front approaching Kauai, a surface trough near the Big Island, and a low pressure system aloft combined to produce heavy rainfall and thunderstorms across the state. Kauai was first to be impacted as a band of heavy rainfall developed over the island on November 17. Hanalei River overflowed again and closed Kuhio Highway near the Hanalei Bridge for several hours. Thunderstorms also developed over portions of Oahu, Maui County, and the Big Island on November 18 but did not cause significant flooding. The event finale occurred on November 19 when heavy rainfall closed Highway 11 for a few hours at Kawa Flats near the southeast coast of the Big Island. Trade winds resumed on November 20, reaching fresh to strong levels across the area from November 21 through 23. Abundant showers embedded within the trades produced some minor flooding along the windward slopes of Haleakala on November 23.

A cold front approached the state on November 26 but stalled just west of Kauai on November 27. Rainfall associated with this system hit north Kauai on the afternoon of November 27 but eased before Hanalei River overflowed onto Kuhio Highway. The remainder of the month included fresh to strong trade winds with showers mainly affecting the windward slopes.

Island of Kauai :

November rainfall totals were near to above average at most of the gages across the island of Kauai. The U.S. Geological Survey's (USGS) gage on Mount Waialeale had the highest monthly total of 24.99 inches (66 percent of average). However, it was their Kilohana gage that had the highest daily total, with 6.57 inches of rainfall logged on November 16. The Anahola, Hanapepe, and Wailua UH Experiment Station gages posted their highest November totals since 2009.

Rainfall totals for 2019 through the end of November were near to above average at most of the gages on Kauai. Mount Waialeale had the highest year-to-date total of 283.27 inches (78 percent of average).

Island of Oahu:

Honolulu Airport was the only site with a near average November total. All other sites posted below average totals with most amounts between 40 and 70 percent of average. Several of the gages situated on the leeward slopes of the Waianae Range had totals at less than 20 percent of average. The USGS' Poamoho Rain Gage No. 1 had the highest monthly total of 9.83 inches (45 percent of average) and the highest daily total of 2.07 inches on November 19. The Manoa Lyon Arboretum gage recorded its lowest November total since 1989.

Most of the rain gages on Oahu had near average rainfall totals for 2019 through the end of November. The Manoa Lyon Arboretum gage had the highest available year-to-date total of 122.72 inches (89 percent of average).

Maui County:

Once again, Maui County was the driest county in the state. Most of the gages had below average November totals with many less than 50 percent of average. The USGS' rain gage at West Wailuaiki Stream had the highest monthly total of 17.79 inches (90 percent of average). The highest daily total of 4.77 inches came from the Puu Alii gage on Molokai on November 7. Puu Kukui, normally one of the wettest sites in the state, had its lowest November total since 2002.

Rainfall totals for 2019 through the end of November were near average at most of the gages across Maui County. The West Wailuaiki gage had the highest year-to-date total of 191.91 inches (92 percent of average).

Island of Hawaii:

Big Island rain gages mostly posted below average monthly totals. Although most of the South Hilo and Puna District gages picked up more than 10 inches of rain, these totals were mostly below average because November is one of the wettest months of the year on the windward side of the island. The USGS' Saddle Road Quarry rain gage had the highest monthly total of 14.98 inches (115 percent of average). The Mountain View rain gage had the highest daily total of 3.40 inches on November 23. On the Hamakua Coast, the Honokaa rain gage posted its lowest November total since 2008.

For 2019 through the end of November, most of the rainfall totals across the Big Island remained near to above average. The Saddle Road Quarry rain gage had the highest year-to-date total of 157.87 inches (123 percent of average).

American Samoa: (not present)

Currently in rainy season but appears drier than normal. No significant weather impacts to be reported other than a flood watch issued..

Kwajalein: (not present)

Kwajalein had one day of large downpour accounting for higher rain total for November. No significant impacts reported.

Majuro: (Nover)

Majuro had some inundated areas due to rainy season. During December 4th, Majuro received over 4.39 inches of rain and December 12th over 12 inches of rain. See images below for pictures related to inundation damages (date of pictures November 27th)

Pohnpei: (Chip)

Pohnpei received a lot of rain for November.

Kosrae: (Eden)

Still plenty of rain and no damages to report.

Chuuk: (Sanchez)

Lost some observation sites from Chuuk.

Yap: (Justin)

Previous system that came through that provided lots of rain to the area. No reports of damages.

Palau: (Kiku)

The average position of the monsoon trough for the months of June to October tends to stay north of Palau and in November (and April) it's generally south of Palau. For the first 12 days into November, Palau experienced a late Monsoon event, where the trough remain north of Palau, providing moderate to strong conditions over the islands and rainfall totals of 9.39 inches (238.5mm) about 82% of the norm (median). If I recall, the monsoon trough extended from western to eastern Micronesia, almost looking like the ITCZ on Visible Satellite Imagery. Thereafter, monsoon conditions became drier and weaker. By the third week of November the trough finally shifted south of the islands, temporarily, bringing the trade-winds and a few showers to Palau but Kammuri developed within the trough in eastern Micronesia and by the time it reached western Micronesia it became Typhoon Kammuri, eventually lifting the monsoon trough north of Palau, but still keeping conditions weak and dry over the Republic for the remainder of the month.

Guam/CMNI: (Chip, Mark, Brandon, Richard)

Some what dry except for one rainy day in November. Some reported power outages and communications issues during the storm in November.

Tropical Cylone: (Lander)

Last system and storm that passed through Philippines provided some rain and passed through.

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

PEAC Teleconference: Sea-Level Outlook—December 12, 2019

All values are in inches (1 inch=25.4 mm); Seasonal cycle removed.

Tide Gauge stations	Seasonal Forecasts OND (mean[2]) (ano)	SD of SON (mean)	Monthly mean[1] anomaly — Observed rise/fall			Current State/ Trend JAS 2019	Seasonal Forecasts SON (max[2]) (ano.)	SD of SON (max)	Monthly max[2] anomaly — Observed rise/fall		
			Sep/ 2019	Oct/ 2019	Nov/ 2019				Sep/ 2019	Oct/ 2019	Nov/ 2019
Marianas, Guam	+3	3.5	+4.5	+4	+4	Above	+19	3.3	+19	+19	+18
Malakal, Palau	0	4.4	+0.5	0.5	-0.5	Normal	+36	4.2	+39	+38	+34
Yap, FSM	+3	4.7	+2	+2	+3	Normal	+30	4.9	+31	+32	+29
Chuuk, FSM***	+3	**				Above	+29				
Pohnpei, FSM	+4	4.3	+6	+6	+6	Above	+36	4.5	+33	+34	+35
Kapingamarangi	+5		+4	**	+7	**	**		+25	+29	+35
Majuro, RMI	+4	3.3	+8	+5	+5	Above	+40	3.7	+50	+47	
Kwajalein, RMI	+4	3.5	+4.5	+4	+4	Above	+40	3.8	+43	+41	+40
Pago Pago*	+7 [+10]	3.1	+7 [+12]	+7 [+12]	+7 [+12]	Above	(+35) [+40]	3.2	+38	+38	+35
Honolulu	+3	1.8	+3	+4	+5	Above	+28	2.5	+20	+22	+22
Hilo	+4	1.8	+5	+6	+6	Above	+28	2.4	+25	+29	+29

+/- 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: *Difference 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: Models and expert opinion suggest that El Niño has already transitioned to ENSO neutral—

- *While the ENSO status will most likely remain "neutral" over the next season, the atmosphere may respond in an El Niño Modoki-like (i.e. central Pacific) fashion at times.*
- *Since January 2019, the pattern of sea level variability corresponded very well with WP El Niño, where the positive sea level anomaly is located over/or near the central Pacific and maximum near 160°E-180 (i.e., Pohnpei, Kwajalein, and Majuro) and the negative SLA is located near 130°E-150°E (i.e., Koror) (also see Kug, J.-S., et al. (2009).*
- *The MJO displays eastward propagating signal across eight phases from the Indian Ocean to the Pacific and later the western hemisphere.*

Impacts: *There are reports of minor-to-moderate inundations in the low-lying atolls with some minor damages.*

Forecasts for OND: Other than Palau, PEAC-CCA[1] Statistical model is predicting slightly **above-normal** sea level to the north of Pacific islands (***Yap, and Chuuk***). The FSM stations (**Chuuk, Pohnpei**) and RMI's stations are likely to remain in higher than normal state. In Hawaii, both Honolulu and Hilo are likely to be elevated.

El Niño has already transitioned to ENSO neutral—this is most likely to continue through Northern Hemisphere winter 2019-20 (50-55% chance). So, the sea level is also likely to come back to normal by the end of 2019.

Kug, J.-S., et al. (2009). Two types of El Niño events: Cold tongue El Niño and warm pool El Niño. J. Climate, 22, 1499–1515 (available @ https://journals.ametsoc.org/doi/pdf/10.1175/2008JCLI2624.1).

Chowdhury M. R., Chu P-S, and Guard C. (2014): An Improved Sea Level Forecasting Scheme for Hazards Management in the U.S.-Affiliated Pacific Islands. *Int. J. Climatology* 6, 2320-2329.

Current State of ENSO and predictions: (Rashed) **ENSO Alert System Status:** ***Not Active***

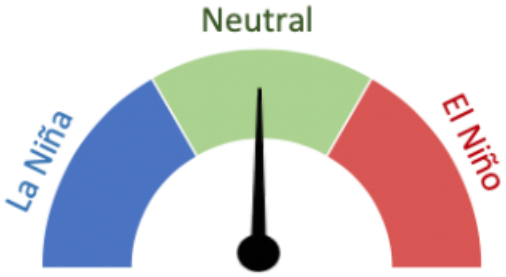
December 12,2019

Synopsis: ENSO-neutral is favored during the Northern Hemisphere winter 2019-20 (70% chance), continuing through spring 2020 (~65% chance).

Above-average sea surface temperatures (SSTs) were observed in the central tropical Pacific Ocean during November, with regions of above and below average SSTs observed farther east (Fig. 1). In the most recent week, the SST indices were near average in the east-central and eastern Niño regions (+0.1°C to +0.3°C) and were above average in the westernmost Niño-4 region (+0.9°C; Fig. 2). The equatorial subsurface temperature anomalies (averaged across 180°-100°W) returned to near zero during the month (Fig. 3), reflecting the progression of Kelvin waves to the east (Fig. 4). The low-level winds were near average during November, while easterly upper-level wind anomalies were observed over the western Pacific. Finally, tropical convection was suppressed near and east of the Date Line and also over Indonesia, and somewhat enhanced over the western Pacific northeast of Papua New Guinea (Fig. 5). The overall oceanic and atmospheric system was consistent with ENSO-neutral.

The majority of models in the IRI/CPC plume (Fig. 6) continue to favor ENSO-neutral (Niño-3.4 index between -0.5°C and +0.5°C) through the Northern Hemisphere summer. Many dynamical model forecasts suggest Niño-3.4 SST index values may remain near +0.5°C into December before decreasing toward zero. Forecasters agree with this consensus and believe the chances for El Niño to be 25-30% during the winter and spring. In summary, ENSO-neutral is favored during the Northern Hemisphere winter 2019-20 (70% chance), continuing through spring 2020 (~65% chance; click CPC/IRI consensus forecast for the chance of each outcome for each 3-month period).

El Nino-Southern Oscillation Watch



Current ENSO

Current situation

ENSO-neutral conditions continued during November 2019.

Sea surface temperatures (SSTs) warmed during November but were still in the neutral range.

The Southern Oscillation Index (SOI) was -1.0 in November (on the El Niño side of neutral).

Forecast situation

70% chance for ENSO-neutral conditions persisting during December 2019-February 2020.

63% chance for ENSO-neutral conditions during March-May 2020.

Source: NIWA Island Climate Update: December 2019

Rainfall Verification and Outlooks for SON (Sony)

The verification result of **SON** rainfall forecasts was 10 hits and 4 misses (Heidke score: 0.5217). The 4 stations we missed were: Yap, Pohnpei, Kosrae, and Kahualui.

Location	UKMO	ECMWF	CA	NASA	NCEP	IRI	APCC	PEAC CCA	Rainfall Outlook	Final Probs	3 mo Verification % norm	Total (in)	Tercile
Palau													
Koror 7° 22' N, 134° 32' E	Below	Avg-below	Avg.	Avg-below	Avg-below	Clim.	Below	Below	Below	45:35:20	97	33.97	Avg.
FSM													
Yap 9° 29' N, 138° 05' E	Below	Above	Avg-above	Avg-below	Avg.	Clim.	Below	Avg.	Avg-below	35:35:30	77	26.66	Below
Chuuk 7° 28'N, 151° 51'E	Avg-above	Avg.	Avg.	Avg.	Avg.	Clim.	Avg.	Avg.	Avg.	30:40:30	91	30.62	Avg.
Pohnpei 6° 59'N, 158° 12'E	Above	Avg.	Avg.	Avg-below	Avg.	Clim.	Avg.	Avg.	Avg-above	30:35:35	153	65.39	Above
Kosrae 5° 21'N, 162° 57'E	Avg.	Avg.	Avg-below	Avg-below	Avg.	Clim.	Avg.	Avg-above	Avg.	30:40:30	87	34.02	Below
RMI													
Kwajalein 8° 43'N, 167° 44'E	Above	Above	Avg.	Avg.	Avg-above	Clim.	Avg.	Avg-above	Avg-above	30:35:35	99	32.94	Avg.
Majuro 7° 04' N, 171° 17'E	Avg-below	Below	Avg-below	Avg.	Avg.	Clim.	Avg.	Avg-above	Avg.	30:40:30	111	41.51	Avg.
Guam and CNMI													
Guam 13° 29'N, 144° 48' E	Above	Above	Avg-above	Avg-above	Avg.	Clim.	Avg.	Avg-above	Above	25:35:40	151	47.38	Above
Saipan 15° 06'N, 145° 48' E	Above	Above	Avg-above	Avg-above	Avg.	Clim.	Above	Avg-above	Above	25:35:40	178	46.97	Above
American Samoa													
Pago Pago 14° 20'S, 170° 43'W	Avg.	Avg-above	Avg.	Avg.	Avg.	Clim.	Above	Avg-above	Avg.	30:40:30	87	22.47	Below
State of Hawaii													
19.7° - 21.0' N, 155.0° - 159.5' W													
Lihue	Above	Above	Avg-above	Avg-above	Avg-above	Above	Above	Avg.	Avg-above	30:35:35	155	13.61	Above
Honolulu	Above	Above	Avg-above	Avg-above	Avg-above	Above	Above	Avg-above	Avg-above	30:35:35	182	5.86	Above
Kahului	Above	Above	Avg-above	Avg-above	Avg-above	Above	Above	Avg-above	Avg-above	30:35:35	24	0.63	Below
Hilo	Above	Above	Avg-above	Avg-above	Avg-above	Above	Above	Avg-above	Avg-above	30:35:35	110	32.24	Avg.

Hit	
Miss	
Heidke:	0.4872
RPSS:	0.1206

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

	Koror	Yap	Chuuk	Pohnpei	Guam	Saipan	Majuro	Kwaj	Lihue	Honolulu	Kahului	Hilo	Pago Pago	Kosrae
below (<)														
33.33%	30.65	32.05	32.73	41.51	30.44	26.19	34.74	30.69	9.17	2.52	2.08	24.29	26.91	38.3
near														
66.66%	41.38	38.09	38.35	47.07	33.78	29.77	42.55	34.83	11.22	5.59	4.76	40.81	31.48	43.49
above (>)														
Rainfall in inches														

Rainfall Verification and Outlooks for NDJ (Con't)

Location	*Rainfall Outlook*	*Final Probabilities*
Palau		
Koror	Average	**20:50:30**
FSM		
Yap	Avg.	**30:40:30**
Chuuk	Average-Above	**30:35:35**
Pohnpei	Average-Above	**30:35:35**
Kosrae	Average-Above	**30:35:35**
RMI		
Kwajalein	Average-Above	**30:35:35**
Majuro	Average-Above	**30:35:35**
Guam and CNMI		
Guam	Avg.	**30:40:30**
Saipan	Avg.	**30:40:30**
American Samoa		
Pago Pago	Avg.	**30:40:30**
State of Hawaii		
Lihue	Average-Above	**30:35:35**
Honolulu	Average-Above	**30:35:35**
Kahului	Average-Above	**30:35:35**
Hilo	Average-Above	**30:35:35**

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 DJ Fseason, **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*

Drought monitoring updates.

A. End-of-November Monthly Drought Assessment:

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

ii. November was dry (less than the 4- or 8-inch monthly minimum needed to meet most water needs) only at Lukonor and wet most everywhere else. The end-of-November monthly analysis (November 30) is consistent with the weekly analyses for November 26 and December 3. Compared to the end-of-October monthly analysis:

a. The status is the same on November 30 as on October 31, except Jaluit went from D2-SL (due then to probable rainfall under-catch or under-reporting) to D-Nothing (wet).

b. Conditions stayed the same at Lukunor and Woleai (D0-S)

c. Others: The rest of the stations continued at D-Nothing (no drought or abnormal dryness)

d. Fananu, Pingelap, and Ulithi were plotted as missing (could not be analyzed) due to missing data for the last 2 months (Fananu) and most of November (Pingelap and Ulithi).

iii. Jaluit: interesting that, once we decided to not analyze/plot Jaluit due to questionable rainfall amounts (possible under-catch or under-reporting), the rainfall reports became wet and more consistent with surrounding stations.

iv. Some November 2019 precipitation ranks:

a. Sixth driest November at Lukonor (in 36 years of data), driest Sep-Nov (35 years), Aug-Nov & May-Nov (23 years)

b. Nukuoro: 15th driest Nov (36 yrs), 4th driest Sep-Nov (36 yrs)

c. Woleai: 19th driest Nov (36 yrs), 2nd driest Jul-Nov (27 yrs)

d. Yap: 34th driest Nov (69 yrs), 2nd driest Jul-Nov (69 yrs)

e. Chuuk: 27th driest Nov (69 yrs), 6th driest Oct-Nov (69 yrs), 7th driest Apr-Nov (68 yrs)

f. Ailinglapalap: 11th wettest Nov (36 yrs), 8th driest Apr-Nov & Mar-Nov (35 yrs)

g. Pago Pago: 12th driest November (54 years)

h. wet: 2nd wettest Nov at Mili (36 yrs) and Utirik (18 yrs)

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 10.

The December 10 analysis is the same as the end of November analysis, except Ulithi is analyzed as D-Nothing.

Drought monitoring updates (CON'T).

C. November 2019 NCEI State of the Climate Drought Report: The November 2019 NCEI SotC Drought report was put online just a few hours ago.

i. The web page url:

a. https://www.ncdc.noaa.gov/sotc/drought/201911#det-reg-pacis-usapi

D. North America Commission for Environmental Cooperation Survey: As part of a project to improve drought indices, drought monitoring, and drought products in the US, Canada, & Mexico, a group of us are working with a contractor to run a survey on drought indices used in the 3 countries. We plan to have the contractor send the survey request to you for USAPI input, so please do participate in the survey! T**he contractor (Ernest Cooper Environmental Consulting) is converting the survey into a web-based format and expects to have it ready by early next month.**

Participants:

NWS Climate Services Program Managers (CSPMs):

WSO Climate Service Focal Points (CSFPs):

(Majuro) Sanchez (Chuuk) Eden (Pohnpei)
Wilfred (Kosrae) Jay, Drievus (Yap) (Pago Pago)
Kikuko, Rick (Palau) Jason (Kwajalein) Chip, Brandon, Mark,
Jay, (Guam & CNMI)

PEAC Principal Research Scientist: Rashed Chowdhury

WERI Scientist:

CPC Forecaster: Anthony Artusa

WFO Guam : Chip Guard

NWS MIC, Honolulu: Christopher Brenchley

NCEI: Richard Heim

Pacific RISA: Krista

NWS Hydrologist: Kevin Kodama

Additional Attendees:

*** Next Call– 9 January 2020, 1430 HST (10 January 2020, 0030 GMT)***