NWS Climate Services

October PEAC Audio Conference Call Summary

11 October, 1430 HST (12 October 2018, 0030 GMT)

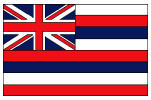
September rainfall totals reported (Joe)

% 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	September	Inches	inches	JAS
Koror	7.37	56	13.18	-5.81	*23.56*
Yap	14.65	109	13.50	1.15	44.65
Chuuk	18.55	158	11.71	6.84	43.65
Pohnpei	11.70	93	12.55	-0.85	55.42
Kosrae	9.19	65	14.22	-5.03	47.62
Kwajalein	8.65	81	10.74	-2.09	36.34
Majuro	10.46	94	11.17	-0.71	38.30
Guam NAS	23.17	183	12.66	10.51	59.90
Saipan	17.39	172	10.09	7.30	44.39
Pago Pago	8.60	132	6.53	2.07	29.04
Lihue	5.49	283	1.94	3.55	11.85
Honolulu	1.78	297	0.60	1.18	3.03
Kahului	1.97	1037	0.19	1.78	4.17
Hilo	5.51	59	9.31	-3.80	61.19

Reports from around the Region



Hawaii (Kevin)

Kauai

For a second month in a row, nearly all of the gages on Kauai recorded well above average monthly rainfall. The U.S. Geological Survey's (USGS) gage on Mount Waialeale had the highest monthly total of 27.48 inches (91 percent of average) and the highest daily total of 3.96 inches on September 13 associated with a weakening Olivia. Kokee logged its highest September rainfall on record, and the Lihue Airport weather station reported its highest September total since 1996.

Almost all of the sites on Kauai had above average rainfall for 2018 through the end of September. Only the Waialae year-to-date total was near average (83.82 inches, 93 percent). The highest year-to-date total was 430.20 inches (147 percent of average) at Mount Waialeale. If rainfall stopped today at this site it would still be the wettest year since 1994.

Oahu

Nearly all of the gages on Oahu had above average rainfall totals for the month of September. The Manoa Lyon Arboretum gage had the highest monthly total of 21.48 inches (192 percent of average). This site also had the highest daily total of 7.60 inches on September 12, which was part of the highest 2-day event total of 10.31 inches associated with the passage of Tropical Storm Olivia. Records for the wettest September were broken at Hawaii Kai Golf Course, Kamehame, Maunawili, Mililani, Pacific Palisades, Waipio, Poamoho, and Wheeler Army Airfield.

Rainfall for 2018 through the end of September was above average at most of the gages on Oahu. A couple of the sites in the Waianae area had below average year-to-date totals. The USGS' Poamoho Rain Gage No. 1 had the highest year-to-date total of 182.46 inches (110 percent of average).

Maui

Records for the wettest September were broken at several sites across Maui County, and some of the leeward locations had monthly totals more than 1500 percent of average. Having a direct tropical storm impact in the dry season will cause things like that. The USGS' Puu Kukui gage had the highest monthly total of 36.55 inches (165 percent of average), and the highest daily total of 8.06 inches on September 12. This site posted 11.86 inches in the 2-day period associated with the passage of Tropical Storm Olivia. However, the highest 2-day rainfall totals from Olivia were at the USGS' West Wailuaiki gage (12.93 inches) and the National Park Service's Puu Alii gage on Molokai (12.03 inches). The record September rainfall came from the gages at Kahului Airport, Kaunakakai Mauka, Kahakuloa, Kamalo, Lahainaluna, Mahinahina, and Pukalani.

Maui County rainfall totals for 2018 through the end of September were above average at most of the gages. The USGS' West Wailuaiki gage had the highest year-to-date total of 266.90 inches (155 percent of average).

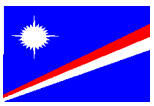
Big Island

Most of the gages in the northern half of the Big Island had above average monthly rainfall totals. In the southern half of the island, most of the monthly totals were near to below average. The USGS' Saddle Road Quarry gage had the highest monthly total of 20.95 inches (214 percent of average), but the highest daily total came from Glenwood with 7.77 inches on September 13. There were no September rainfall records broken on the Big Island, but the Kamuela and Kamuela Upper sites had their wettest September since 1992, in part due to the initial rain bands from Tropical Storm Olivia.

Rainfall totals for 2018 through the end of September were near to above average at most of the gages on the Big Island. The Saddle Road Quarry gage had the highest year-to-date total of 308.74 inches (296 percent of average). A couple of sites on the Kona slopes were still coming at below average for 2018.

American Samoa (Clint):

August in American Samoa (AS) was influenced by the Tropical Wet climate, but it near normal now. The month of August and September received 181% and 132% of normal (% of normal and % are synonymously used throughout this call-note) rainfall. Trades are picking up! There is no report of any significant damage, but sea level stays elevated. PEAC's Model-based seasonal climate outlook is now indicating average rainfall for OND with moderate confidence. The sea level is staying above but stable. Forecasts indicate that it will stay marginally elevated over the next three months (OND).



Kwajalein (Justin):

The weather is typical now. The month of August and September recorded 193% and 81% of normal rainfall. There is a strong region of low-level convergence positioned near Kosrae and the Intertropical Convergence Zone (ITCZ) to the north. 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. The sea level currently stays marginally above normal. PEAC-model forecasts trend show average-above rainfall and normal sea level over the next 3 months. Currently there are no active TC warnings.

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

Reports from around the Region (CON'T)

Majuro (Chip):

Majuro has been receiving good rainfall since January 2018. The rainfall in July and August were 142% and 94% of normal. This downpour has sufficiently improved Majuro's drought situation. The heavy 2018 spring rains in the RMI are being treated as a red flag that the status of ENSO may soon shift to El Niño, and it is a factor in the forecast of enhanced TC activity throughout Micronesia. PEAC-model forecasts have trended average-above rainfall and near normal sea level over the next 3 months. Currently there are no active TC warnings.

Pohnpei (Wilfred, Eden, Mark):

Currently, Pohnpei has had some westerly winds and recoded near normal rainfall at 93% for the month of September. The southern part of the island is drier than the eastern part. There have been some high surf, but no inundation reported so far. PEAC-model forecasts have trended average rainfall and near normal sea level over the next 3 months. With the long-range evolution of ENSO now moving in the direction of El Niño, and with some climatic signals indicating a possible enhancement to typhoon activity, PEAC anticipates an elevation for the risk of impacts to Pohnpei Island and atolls by the near passages of tropical storms and possible typhoons in the remaining months of 2018. The greatest risk is anticipated to rise in the final months of the year (OND) to 30% chance (to 1-in-9) for at least the occurrence of large TC-related waves (> 15 feet), gales (35 kt or greater) or very heavy rainfall (> 10 inches in 24 hours).

Kosrae (Wilfred, Eden):

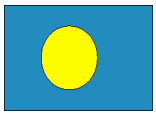
Despite 65% of normal rainfall in September, Kosrae is now at near normal conditions. The trade-winds have been strong and the sea level has gone down as well. PEAC has predicted average-above rainfall for the island state for at least the next three months. Damaging TCs are rare at Kosrae, and those rare storms that do occasionally strike Kosrae do so primarily during strong El Niño events. Therefore, depending on a move toward El Niño conditions beyond the summer months, the risk of a late-season tropical storm tracking near Kosrae could be enhanced. 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 (OND).

Chuuk (Sanchez, Joe Berdon):

Chuuk recorded 158% of normal rainfall in September. The island is normal now; there were no reports of water shortage. PEAC forecasts indicated average rainfall for the island state for at least the next three months. With the recent demise of La Niña, the regional sea level fell across nearly all major island groups of Micronesia. Although there is no operational tide gauge sited at Chuuk, based on virtual satellite data, the mean sea level throughout Chuuk State has been falling over the past few months. Now it is marginally elevated. With the long-range evolution of ENSO moving in the direction of El Niño, and with some climatic signals indicating a possible enhancement to typhoon activity in Micronesia, the PEAC anticipates an elevation of the risk of impacts in Chuuk State by the near passages of tropical storms or typhoons. The PEAC assesses the risk of potentially damaging effects from a passing TC at 20-25% chance (to 1-in-3) in the OND season.

Yap (Justin):

Yap received 109% of normal rainfall for September and is currently in their monsoon season. Everything looked normal now (e.g., reservoirs are full and streams are flowing well), but it turned out to be bit drier in August-September. PEAC forecasts are favoring average rainfall and below normal sea level in the next three months. With the long-range evolution of ENSO now moving in the direction of El Niño, and with some climatic signals indicating a possible enhancement to typhoon activity in Micronesia, the PEAC anticipates an elevated risk of impacts to Yap State by the near passages of tropical storms and/or typhoons, particularly in the fall.



Palau (Chip):

Note that the rain-gauge of Palau has moved to higher location and that made Koror rainfall data availability a bit difficult. However, as Chip G reported, from statistical point of view the new location is about 15% (approximately) wetter than the old location at Koror. This assumption is very much subjective, but this is the best source of information available for us now.

Palau received 56% of normal rainfall in September. The normal sea level and drier than normal atmospheric climate is a precursor of forthcoming El Niño. PEAC forecast favors below-average rainfall and below normal sea level in the next season. PEAC anticipates an elevation of the risk of impacts to Palau by the near passages of tropical storms and typhoons later in the year (OND). The risk of damaging effects from TCs is anticipated to rise in the final months of the year (OND) to a 25% chance (to 1-in-4) for the occurrence of large TC-related waves (> 15 feet), gales (35 kt or greater) or very heavy rainfall (> 10 inches in 24 hours).

Reports from around the Region (CON'T)

Guam and CNMI (Mark, Chip):

The summer monsoon became well established in the western North Pacific Basin, and after prolonged dry conditions, Guam and Saipan are now wet. The 183% and 172% of rainfall in September in Guam and Saipan have further improved the dry conditions and changed these two islands to wet and green again. August rainfall was also significant (149%) in Guam while Saipan received 146% of normal rainfall. The overall island climate is currently normal. PEAC forecasts are now indicating average rainfall for both Guam and Saipan over the next three months and slightly below normal sea level. The long-term rainfall forecast (late fall 2018 into winter 2018-2019) is contingent upon the evolution of ENSO, with a stronger and earlier transition into El Niño bringing about the best chances for wetter than average conditions and enhanced TC activity. That means, we expect more tropical cyclone activity than in 2016 and 2017, about the same activity as in 2015 for Guam, but not quite as busy as 2015 for the CNMI.

Tropical Cyclones (Mark L)

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 nautical miles 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.

The 2017-18 South Pacific cyclone season ended on June 30, 2018, with no TC activity (< 10% risk of damaging impacts) anticipated to occur near American Samoa through September. In the South Pacific, near-normal tropical cyclone activity overall during November-April, but increased east and reduced west of the Date Line; multiple severe tropical cyclones expected Forecasters indicate another seven to 11 named tropical cyclones (TC) could occur in the Southwest Pacific basin between November and April, following the very early TC Liua that formed in September.

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

Tide Gauge stations	Seasonal Forecasts OND (mean[1]) (ano)	SD of JAS (mean)	Monthly mean[1] anomaly Observed rise/fall Jul/ 2018	Aug/ 2018	Sep/ 2018	Current State/ Trend JAS 2018	Seasonal Fore-casts OND (max[2]) (ano.)	SD of JAS (max)	Monthly max[2] anomaly Observed rise/fall Jul/ 2018	Aug/ 2018	Sep/ 2018
Marianas, Guam	**0**	3.6	+2	+2	+1.8	Normal	+17	3.4	+20	+19	+26
Malakal, Palau	**-3**	4.5	-3	-3	-4	**Below**	+36	4.6	+33	+33.5	+33
Yap, FSM	**0**	4.8	**-1.5**	**-1.5**	**-2**	Normal	+29	4.2	+27	+28.3	+26
Chuuk, FSM***	**+1**	*	**+1.2**	**+1.1**	**+1.1**	Normal	+28	*			
Pohnpei, FSM	**0**	3.4	+2.5	+1	+1	Normal	+29	3.3	**+35**	**+30**	**+27**
Kapingamarangi	**+4**	**	+8	+7	+9	**Above**	+30	**	+36	+35	+32
Majuro, RMI	**+1**	2.5	**+2**	**+2.5**	**+5**	**Above**	+40	3.2	+43	+47	+46
Kwajalein, RMI	**0**	3.0	**-2**	**-1**	**+1.7**	Normal	+38	3.5	**+29**	**+37.5**	**+38**
Pago Pago*	**+10 (+5)**	3.4	+12 [+7]	+12 [+7]	+11 [+6]	**Above**	+30 (+25)	3.6	**+37**	**+38**	**+36**
Honolulu	**+1**	1.8	+3.2	+4	+3.8	**Above**	+21	2.3	+25	+24	+23
Hilo	**+1**	1.8	+4	**+3**	**+7**	**Above**	+24	2.4	+30	+25	+28

+/- 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 to forthcoming **Warm Pool El Niño (WPE)**, all of the north Pacific stations displayed marginal fall in September. Some of the stations recorded rise too. Hawaii sea levels are also elevated—Hilo recorded a 4 inches rise in September. Note that the south Pacific station (i.e., Pago Pago) is elevated (+6). 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, t*ides have been high with high waves for some of the islands. However, there is no noticeable inundation in low-lying atolls and there is no report for damage, so far.*

Forecasts for OND: PEAC-CCA Statistical model is predicting **normal to marginally** below-normal sea level in the forthcoming OND season. 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**

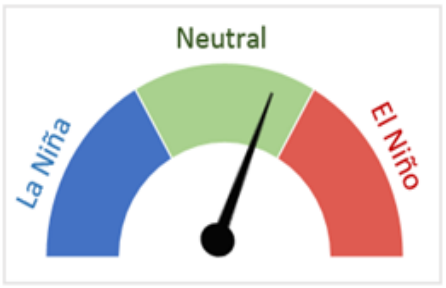
Synopsis: El Niño is favored to form in the next couple of months and continue through the Northern Hemisphere winter 2018-19 (70-75% chance).

ENSO-neutral continued during September, but with increasingly more widespread regions of above-average sea surface temperatures (SSTs) across the equatorial Pacific Ocean. Over the last month, all four Niño index values increased, with the latest weekly values in each region near +0.7°C. Positive subsurface temperature anomalies (averaged across 180°-100°W) also increased during the last month, due to the expansion and strengthening of above-average temperatures at depth across the equatorial Pacific. Convection was increasingly suppressed over Indonesia and around the Date Line. Low-level westerly wind anomalies were evident over the western and east-central Pacific, with some of the strongest anomalies occurring over the eastern Pacific during the past week. Upper-level wind anomalies were easterly over the east-central Pacific. Overall, the oceanic and atmospheric conditions reflected ENSO-neutral, but with recent trends indicative of a developing El Niño.

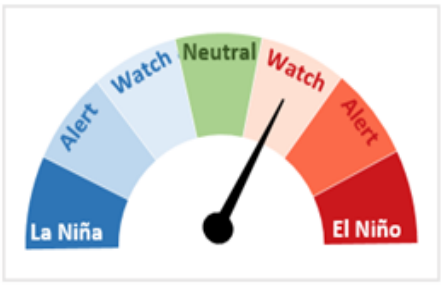
The majority of models in the IRI/CPC plume predict El Niño to form during the fall and continue through the winter. The official forecast favors the formation of a weak El Niño, consistent with the recent strengthening of westerly wind anomalies and positive temperature trends in the surface and subsurface ocean. In summary, El Niño is favored to form in the next couple of months and continue through the Northern Hemisphere winter 2018-19

WMO Summary:

- Conditions in the ocean and atmosphere in the tropical Pacific have remained neutral since April 2018;
- Model predictions and expert opinion indicate that El Niño/Southern Oscillation conditions are about 70% likely to reach weak El Niño levels by the fourth quarter of 2018 and into the Northern Hemisphere winter 2018-19;
- While predictions of El Niño and La Niña have relatively high confidence at this time of the year, some uncertainty is reflected by the broad range of model forecasts currently available, which generally indicate the sea surface temperatures to be 0.6 to 1.2 degrees Celsius above average in the east-central topical Pacific during the period of November 2018 through January 2019. A strong El Niño event appears unlikely.
- Through Northern Hemisphere winter 2018-19, the development of La Niña can be practically ruled out.



Current situation



Forecast situation

ENSO-neutral conditions persisted in the tropical Pacific during September 2018.

The Southern Oscillation Index was negative at -1 (i.e. on the El Niño side) in September.

68% chance for El Niño conditions to emerge during October-December 2018

71% chance for El Niño conditions during April-June 2019

Source: NIWA , The Island Climate Update Bulletin

6. Rainfall Outlooks for OND (Joe)

The verification result of **JAS** rainfall forecasts has been found to be encouraging with 12 hits and only 1 miss (Heidke score: 0.5909). The stations that hit the forecasts were: Yap, Chuuk, Pohnpei, Kwajalein, Majuro, Guam, Saipan, Pago Pago, Lihue, Honolulu, Kahului, and Hilo. The 1 missed station was Kosrae. PEAC forecasts are based on six GCMs and two statistical models.

*(**Note**: Because of missing data, Koror's forecast verification could not be calculated)*

JAS Verification Location	Rainfall Outlook	Final Probs	3 mo Verification		
			% norm	Total (in)	Tercile
Palau					
Koror 7º 22' N, 134º 32' E	Avg-above	**30:35:35**	**54**	23.56	
FSM					
Yap 9º 29' N, 138º 05' E	Avg-above	**30:35:35**	103	44.65	**Avg.**
Chuuk 7º 28'N, 151º 51'E	Avg-above	**30:35:35**	119	43.65	**Avg.**
Pohnpei 6º 59'N, 158º 12'E	**Above**	**25:35:40**	131	55.42	**Above**
Kosrae 5º 21'N, 162º 57'E	Avg.	**30:40:30**	110	47.62	**Above**
RMI					
Kwajalein 8º 43'N, 167º 44'E	Avg-above	**30:35:35**	120	36.34	**Above**
Majuro 7º 04' N, 171º 17'E	**Above**	**25:35:40**	113	38.30	**Above**
Guam and CNMI					
Guam 13º 29'N, 144º 48' E	**Above**	**25:35:40**	**160**	59.90	**Above**
Saipan 15º 06'N, 145º 48' E	**Above**	**25:35:40**	138	44.39	**Above**
American Samoa					
Pago Pago 14º 20'S, 170º 43'W	**Above**	**25:35:40**	**166**	29.04	**Above**
State of Hawaii					
19.7º - 21.0' N, 155.0º - 159.5' W					
Lihue	Avg-above	**30:35:35**	**217**	11.85	**Above**
Honolulu	Avg-above	**30:35:35**	**263**	3.03	**Above**
Kahului	Avg-above	**30:35:35**	**397**	4.17	**Above**
Hilo	Avg-above	**30:35:35**	**225**	61.19	**Above**

	Hit
	Miss
Heidke:	**0.5909**
RPSS:	**0.1089**

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

	Koror	Yap	Chuuk	Pohnpei	Guam	Saipan	Majuro	Kwaj
below (<)								
33.33%	45.13	41.9	34.86	40.06	37.2	29.48	31.17	28.97
near								
66.66%	57.54	46.11	44.29	50.76	44.54	35.85	38.16	33.09
above (>)								

Lihue	Honolulu	Kahului	Hilo	Pago Pago	Kosrae
5.27	1.02	0.84	25.17	15.04	41.49
7.79	1.67	1.64	33.44	23.4	47.32
Rainfall in inches					

Koror rainfall collection station changed in August 2018 to new location. According to Chip Guard this new location is 15% wetter than the old one, so we will add 15% to the old Tercile cut-offs for Koror

6. Rainfall Outlooks for OND (Con't)

Location	*Rainfall Outlook*	*Final Probabilities*
Palau		
Koror	Avg-below	**35:35:30**
FSM		
Yap	Average	**30:40:30**
Chuuk	Average	**30:40:30**
Pohnpei	Avg-above	**30:35:35**
Kosrae	Avg-above	**30:35:35**
RMI		
Kwajalein	Avg-above	**30:35:35**
Majuro	Avg-above	**30:35:35**
Guam and CNMI		
Guam	Average	**30:40:30**
Saipan	Average	**30:40:30**
American Samoa		
Pago Pago	Average	**30:40:30**
State of Hawaii		
Lihue	Avg-above	**30:35:35**
Honolulu	Avg-above	**30:35:35**
Kahului	**Above**	**25:30:45**
Hilo	**Above**	**25:30:45**

Note:

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

Participants:

NWS Climate Services Program Managers (CSPMs): Joe Brinkley

WSO Climate Service Focal Points (CSFPs):

(Majuro)	Joe Berdon & Sanchez (Chuuk)	Wilfred & Eden (Pohnpei)
Wilfred & Eden (Kosrae)	Justin (Yap)	(Pago Pago)
(Palau)	Jason (Kwajalein)	Mark, Chip, & Clint (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: Jim Potemra

***** Next Call– 08 November 2018, 1430 HST (09 November 2018, 0030 GMT)*****