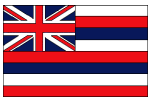
December rainfall totals reported (Joe)

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

	Rainfall	% Norm	Normal	Departure	3 mon %
	Inches	December	Inches	inches	OND
Koror	17.89	160	11.16	6.73	41.47
Yap	11.27	132	8.51	2.76	39.66
Chuuk	13.52	120	11.25	2.27	39.31
Pohnpei	20.86	130	16.08	4.78	47.30
Kosrae	19.85	123	16.11	3.74	58.71
Kwajalein	4.72	71	6.66	-1.94	23.95
Majuro	19.59	172	11.39	8.20	48.07
Guam NAS	4.49	88	5.11	-0.62	27.19
Saipan	2.31	60	3.85	-1.54	12.80
Pago Pago	12.06	94	12.84	-0.78	45.06
Lihue	1.11	35	3.17	-2.06	5.04
Honolulu	3.40	258	1.32	2.08	6.63
Kahului	7.92	298	2.66	5.26	10.79
Hilo	9.90	97	10.24	-0.34	47.62

Reports from around the Region



Hawaii (Kevin)

Kauai

Kauai missed the bulk of the significant rain events affecting the island chain in December. As a result, most of the rain gages on the island posted monthly totals below 50 percent of average. The highest monthly total of 12.98 inches (76 percent of average) came from the U.S. Geological Survey's (USGS) Kilohana rain gage rather than the usual Mount Waialeale gage. This is not surprising in a weather pattern that featured several weak cold fronts which were too shallow to push significant amounts of shower bearing clouds over the center of the island. The Kilohana gage also posted the highest daily total of 1.87 inches on December 26.

Most of the rain gages on Kauai finished 2017 with annual totals in the near average range. Mount Waialeale had the highest 2017 total of 308.64 inches (78 percent of average). The 30-year running average for Mount Waialeale dropped for a third consecutive year and has decreased in 18 out of the last 21 years.

Oahu

Largely due to the December 26 heavy rain event, most of the gages along the southeastern half of Oahu posted monthly totals in the near to above average range. Totals from most of the gages on the northwestern half were in the below average range. The Maunawili gage had the highest monthly total of 15.05 inches (158 percent of average) and the highest daily total of 7.06 inches on December 26. The Palolo Fire Station gage logged its highest December total since 2008.

Oahu rainfall totals for 2017 ended up in the near average range at most of the gages. The USGS' Poamoho Rain Gage No. 1 had the highest 2017 total of 149.65 inches (66 percent of average). Honolulu Airport had its wettest year since 2006.

Maui

Heavy rainfall on December 20 helped push most of the monthly totals across Maui County into the above average range. The USGS' Puu Kukui gage had the highest monthly total of 28.50 inches (96 percent of average). In a rare occurrence, the highest daily total of 8.69 inches on December 20 came from the Wailuku gage. The highest daily totals usually come from the USGS' rain gages at Puu Kukui or West Wailuaiki Stream. A more noteworthy statistic from that day was the 6.40 inches recorded at Kahului Airport which broke the site record for the highest single day rainfall total in a period of data going back to 1954. The previous record was 5.82 inches observed on December 21, 1955. The record rainfall helped make it the wettest December at Kahului Airport since 1996. Pukalani and Waikapu Country Club both posted their highest December totals since 2007.

Rainfall totals for 2017 were in the near to above average range at most of the gages across Maui County. The highest available total for the year was from the USGS' rain gage at West Wailuaiki Stream with 208.67 inches (93 percent of average).

Big Island

Most of the rainfall totals for the month of December were in the below average range. The USGS' rain gage at Kawainui Stream had the highest monthly total of 15.95 inches (119 percent of average). The highest daily total was 4.61 inches on December 1 from the USGS' Saddle Road Quarry gage. The Pali 2 gage recorded its lowest December total since 2006.

Overall, Big Island rainfall totals for 2017 were in the near to below average range. The USGS' rain gage at Kawainui Stream had the highest available total for 2017 at 173.54 inches (128 percent of average). Breaking it down by region, windward and Kona slope totals were mainly near average. Kau and interior Big Island totals were mostly below average.

American Samoa (Mark, Clint):

American Samoa was particularly dry during July-August, but started to get back to normal in September with normal rainfall in Pago Pago. This is the rainy season in American Samoa, so currently there has been plenty of rainfall. November recorded 127% of normal **(% of normal and % are synonymously used throughout this call-note)** while December recorded 94% of normal rainfall. Sea level stays elevated but there is no report of any inundations. Model-based PEAC's seasonal climate outlook is now indicating above-average rainfall and elevated sea level over the next three months (JFM) with high confidence, and **t**here is no active TC warning now.

Reports from around the Region (CON'T)

Kwajalein (Jason):

The month of December received 71% of normal rainfall and it is currently a little drier than normal. There has not been any significant rainfall recorded so far. However, the island received some rain (2 inches) in the beginning of January, but it even didn't last long. Overall, rainfall has been nearly 70-90% of normal during the last couple of months, including December. Tides have been very high and waves are high, but no severe inundations have been reported so far. PEAC-model forecasts have trended to show average rainfall and elevated sea level over the next 3 months, and there is no active TC warning now.

Majuro (Mark/Clint):

Majuro had prolonged drought in northern islands. However, they were doing fine in October and November with 143% and 76% of rainfall. They have had good rainfall in December (172%) that is helping them to keep their water reservoirs around 31 million gallons. The island is still having drought problems and the Guam office is in the process of issuing a new drought statement. Majuro is having high sea level and high tides since October 2017. PEAC-model forecasts have trended above average rainfall and elevated sea level over the next 3 months, and there is no active TC warning now. *The rise of sea level lies between 8-10 inches above of normal. In addition to La Niña, the wind-forced equatorial Rossby wave is partly responsible for this rise. Pohnpei and Chuuk have also been affected similarly.*

Pohnpei (Wallace/ Rashed):

Despite lower-than-average rainfall in October (81%) and November (95%), Pohnpei remained sustainable without any major problem as the Island and most of the atolls of Pohnpei have lately been, "Plenty wet". It also received 130% of normal rainfall in December. On December 23rd, it received 6.9 inches of rainfall. There were floods and land-slides that caused damages in the eastern side of Pohnpei. The sea level has been high and there were high waves that inundated several places in Pohnpei. Particularly, there were some high-tides inundated roads and low-lying atolls on December 5th (Pic 1).

High-tides:

Picture-1: High-Tides and Inundation pictures in Pohnpei on December 5 (**Photo Courtesy: Wallace Jacob**, WSO-Pohnpei).

PEAC forecasts have trended above-average rainfall and continuation of elevated sea level for the next three months. *The rise, as predicted by PEAC, stays 8-10 inches above of normal sea level.*

Reports from around the Region (CON'T)

Kosrae (Wallace):

Kosrae received 168% and 123% of rainfall in November and December. After prolonged dry periods, the situation has improved in Kosrae. There were some high tides that inundated low-lying areas and caused some damages on roads (Pic. 2). Currently, the island is wet. PEAC forecasts have trended to show average-above rainfall for the next three months.

High-tides and damaged roads in Kosrae

Picture-2: High-Tides and Inundation pictures in Kosrae on December 4 (**Photo Courtesy: Wallace Jacob**, WSO-Pohnpei).

Chuuk (Sanchez/ Chip/Rashed):

Chuuk have had good rainfall in November (105%) and December (12%). The island is wet now. There were large high-tides with waves, which inundated some low-lying atolls. PEAC forecasts are favoring above average rainfall and high sea level in JFM season. *The rise may even go up to 8-10 inches above normal. In addition to La Niña, the wind-forced equatorial Rossby wave is partly responsible for this rise.*

Yap (Mark/Rashed):

Yap received 156%, 106%, and 132% of rainfall in October, November, and December. It is wet now and everything looks normal—reservoirs are full and streams are flowing well. Tradewinds are picking up and the trough is off to the west. Sea level has been relatively high (9 inches above normal), which is partly an impact of the Rossby wave. The island is relatively high and the south-west part of the island is protected by mangrove forest. Therefore, the island is relatively safe from any severe inundation problem. PEAC forecasts are favoring average rainfall and high sea level in JFM season.

Palau (Mark, Chip, Rashed):

Palau has also been wet in past two months with the monsoon trough providing good rainfall. It received 160% of normal rainfall in December. The Jelly fish are also coming back. The rainfall at Palau tracks ENSO so well that it makes a good ENSO index in its own right! During El Niño, the ONI is warm and Palau's rainfall is low; during La Niña, the ONI is cold and Palau's rainfall is high. Currently, the state of ENSO is leaning towards La Niña, so slightly above normal rainfall is expected in the forthcoming months. PEAC forecast favoring above average rainfall and elevated sea level in JFM.

Reports from around the Region (CON'T)

Guam and CNMI (Mark, Chip, Rashed):

Guam has been dry for the last two weeks with some spotty showers here and there. A delay in the onset of the western North Pacific monsoon has been responsible for a prolonged period of unremarkable weather extending into December 2017 on Guam and in the CNMI. The rainfalls recorded, so far, were close to normal in the previous months; however, November and December rainfall in Guam is significantly lower than average (57% and 88%). Saipan also received only 62% and 60% of normal rainfall. Surprisingly, both Guam and Saipan are dry now! Reasons for this persistent dryness include a weak and largely absent monsoon and a lack of tropical cyclone activity. A delay in the onset of the western North Pacific monsoon offer no extremes of rainfall, very hot days, cool nights, and persistent, light trade winds. PEAC forecasts are now indicating average rainfall for both Guam and Saipan over the next three months. The climate is now in a state of La Niña, and La Niña (0) correlates well with average-to-above average rainfall in Guam.

Tropical Cyclones (TC) (Mark, Chip, Rashed)

Throughout 2017, there was a westward and northward displacement of the TC activity. This was similar to the TC distribution during 2016, but starkly different than the TC distribution during the 2015 El Niño year. A particular characteristic of the 2017 typhoon season was a clustering of activity across the South China Sea. The westward and northward displacement of the 2017 TCs is consistent with the development of La Niña. There are many weak unnamed tropical depressions in the Pacific. TC activities in any La Niña year in the tropical Pacific is relatively less active. For all the wild and crazy hurricane activity in the Atlantic basin, the TC activity in the Pacific was well below average in many categories (Table 1). The inactivity of the Pacific was more than enough to cancel the influence of Atlantic high activity on the summation of TC activity for the whole Northern Hemisphere!

Table 1. 2017 Northern Hemisphere Tropical Cyclone Activity (through October), by basin and with hemisphere totals (http://tropical.atmos.colostate.edu/Realtime/). Numbers in parentheses are long-term averages.

Basin	Named Storms	Days	Hurri/ Typh	Days	Major Hurri	Days	ACE
Natl	16 (11)	89 (55)	10 (6)	51 (22)	6 (3)	19 (6)	224 (99)
ENP	18 (16)	66 (72)	9 (8)	20 (29)	4 (4)	5 (9)	98 (130)
WNP	22 (23)	85 (119)	11 (15)	36 (58)	4 (8)	6 (20)	144 (259)
NIO	2 (3)	4 (8)	1 (1)	0.3 (2)	0 (0.5)	0 (0.7)	4 (11)
NHem	58 (54)	244 (255)	31(31)	107(112)	14 (15)	30 (35)	469 (500)

Note: A major hurricane/typhoon is any such storm at-or-above Category 3 intensity (115 mph) as per the Saffir-Simpson Hurricane Wind Scale. ACE is a measure of the energy of a TC, and is proportional at any given time to the square of the wind speed.

Throughout 2017, there was a westward and northward displacement of the TC activity. This was similar to the TC distribution during 2016, but starkly different than the TC distribution during the 2015 El Niño year (Figure 6). A particular characteristic of the 2017 typhoon season was a clustering of activity across the South China Sea. The westward and northward displacement of the 2017 TCs is consistent with the development of La Niña.

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

Tide Gauge stations			Monthly mean[1] anomaly						Monthly max[2] anomaly		
			Observed rise/fall						Observed rise/fall		
			Oct/ 2017	Nov/ 2017	Dec/ 2017	OND/ 2017			Oct/ 2017	Nov/ 2017	Dec/ 2017
Marianas, Guam	+5	**4.1**	+6.3	+6.6	+7	Above/ Stable	+22	**3.6**	+22(0)	+22(0)	+22(0)
Malakal, Palau	+5	**4.3**	**	**	+4	Above/ Stable	+41	**4.4**	+41(5)	+42(6)	+44(8)
Yap, FSM	+6	**4.6**	+7.3	+7.4	+9	Above/ Stable	+34	**5.1**	+35(8)	+34(7)	**+40(13)**
Chuuk, FSM***	+6	**	+6	+8	+9	Above/ Stable	+34	**	**	**	**
Pohnpei, FSM	+7	**4.7**	**+9.2**	**	**	Above/ Stable	+36	**4.9**	+33(3)	**	**
Kapingamarangi	+6		+4.2	+5.1	**	Above/ Stable			+26(-1)	+31(4)	**
Majuro, RMI	+7	**3.5**	**+8.2**	**	**	Above/ Stable	+45	**3.7**	+45(5)	**	**
Kwajalein, RMI	+6	**3.6**	+5.8	+7	+6	Above/ Stable	+44	**3.8**	+41(4)	+43(6)	**+47(10)**
Pago Pago*	+6 (0)	**3.1**	+10.2 [+5]	+11.2 [+6]	+11.5 [+6.5]	Above/ Stable	+32 (+27)	**3.3**	+30(-3) [25]	+34(1) [29]	+38(5) [33]
Honolulu	+4	**1.7**	+4.8	+4	+4.7	Above/ Falling	+23	**2.5**	+21(1)	+24(4)	+26(6)
Hilo	+5	**1.8**	+6	+5.5	+5.5	Above/ Stable	+26	**2.2**	+23(0)	+26(3)	+28(5)

+/- 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.*

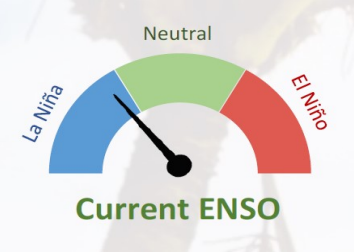
**** In Pago Pago,*** There was a level shift (approximately 5 inches) in American Samoa at the time of September 2009 earthquake. So, -5 inches has been adjusted (shown in parenthesis) to the current tide-gauge values of Pago Pago.

Current Conditions: Atmospheric and oceanic signals are leaning towards La Niña. La Niña means higher-than-average sea level—currently all stations are 4-9 inches above normal. This could potentially impact islands with minor coastal flooding or salt water intrusions and increase vulnerability to flooding from storms or large waves.

Forecasts for DJF: PEAC-CCA Statistical model is predicting 5-7 inches above normal sea levels with reasonably high skill for the whole USA-PI region. ***Complementary to PEAC forecasts, some dynamical models are also predicted high sea levels.*** At two months lead (Jan-March), sea levels are likely to stay above-normal (5-8 inches) for Majuro, Pohnpei, and Chuuk. High sea levels may propagate as far west as Yap and Malakal.

As a result of by "King Tides", Hawaii was slightly affected by elevated sea levels. Current forecasts indicate that the highest tides of the year ("king tides") occurred again in the early mornings on January 2. There was no inundation or damage reported.

5. Current State of ENSO and predictions: (Rashed) **ENSO Alert System Status: La Niña Advisory**



Synopsis: La Niña is likely (~85-95%) through Northern Hemisphere winter, with a transition to ENSO-neutral expected during the spring.

La Niña continued during the past month, as indicated by the pattern of below-average sea surface temperatures (SSTs) across the central and eastern equatorial Pacific Ocean. The latest weekly Niño-3.4 index value was -0.8°C, and the Niño-3 and Niño-1+2 indices were at or below -1.0°C during much of the month. Negative sub-surface temperature anomalies in the central and east-central equatorial Pacific weakened at the end of the month as anomalously warm waters in the western Pacific at depths greater than 100 m propagated eastward to approximately 140°W. The atmospheric conditions over the tropical Pacific Ocean also reflected La Niña, with suppressed convection near and east of the International Date Line and enhanced convection to the north of Indonesia. Also, the low-level trade winds continued to be stronger than average over the western and central Pacific. Overall, the ocean and atmosphere system remained consistent with La Niña.

Nearly all models in the IRI/CPC plume predict La Niña will persist through the Northern Hemisphere winter 2017-18. Based on the latest observations and forecast guidance, forecasters believe this weak-to-moderate La Niña (3-month Niño-3.4 values between -0.5°C and -1.5°C) is currently peaking and will eventually weaken into the spring. In summary, La Niña is likely (~85-95%) through Northern Hemisphere winter, with a transition to ENSO-neutral expected during the spring.

La Niña is anticipated to affect temperature and precipitation across the United States during the upcoming months (the 3-month seasonal temperature and precipitation outlooks will be updated on Thursday January 18th). The outlooks generally favor above-average temperatures and below-median precipitation across the southern tier of the United States, and below-average temperatures and above-median precipitation across the northern tier of the United States.

IN SUMMARY, **weak La Niña conditions are currently present in the Pacific Ocean**, despite weakened atmospheric signals during the course of last month (December 2017). The international consensus is that **La Niña conditions are likely (85-95% chance projected by IRI-CPC and 72% chance projected by NIWA) to persist over the next 3 month period (January – March 2018).** The models agree however that La Niña is **likely to decay rapidly during the following three month period,** and a **return to ENSO-neutral conditions is most likely (74% chance) over the April – June 2018 period.**

6. Rainfall Outlooks for JFM (Joe)

Note

Interpretation of tercile probability: The **20:40:40** probability forecasts in JFM season means there is a **40%** chance (probability) for occurrence of excess rainfall during the JFM season, **40%** chance for occurrence of rainfall within a pattern considered normal during the JFM season, and **20%** chance for occurrence of deficit rainfall during the JFM season. *Also note that excess and deficit limit for each of the stations are different*

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

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

A. End-of-December Monthly Drought Assessment:

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

ii. December was dry (less than the monthly minimum required to meet most water needs) in the Marianas (Rota & Saipan), northern Marshalls (Kwajalein & Wotje), and Lukonor & Woleai in FSM; it was wet elsewhere in Micronesia and in American Samoa. Utirik has been missing since December 8 and could not be analyzed. The December monthly analysis (December 31) is consistent with the weekly analyses for December 26 and January 2 and, in fact, matches both of these analyses. Compared to the end-of-November analysis, drought conditions at the end of December worsened in the Marianas (Rota & Saipan) and stayed the same at the rest of the stations:

a. D-Nothing worsened to D1-S at Saipan.

b. D-Nothing worsened to D0-S at Rota.

c. All other stations continued at a D-Nothing classification (no drought or abnormal dryness).

B. Current (Weekly) Drought Conditions: The discussion above is the monthly (end of December) analysis. The latest weekly USAPI USDM assessment may show different USDM classifications. The latest weekly USAPI USDM assessment is for January 9 and has D0-S at Guam and Wotje and D1-S at Rota.

C. December NCEI State of the Climate Drought Report: I will include a discussion of USAPI drought conditions in my December and Annual 2017 NCEI SotC Drought reports (which will go online tomorrow or Tuesday).

i. The web page urls are:

a. https://www.ncdc.noaa.gov/sotc/drought/201712#det-reg-pacis-usapi

b. https://www.ncdc.noaa.gov/sotc/drought/201713#usapi-sect

D. USDM author: I will be USDM author the last 2 weeks of this month (January 22 & 29 USDM).

E. Automated Ingest of Daily Rainfall Data: We are working with NWS, WRCC, and HPRCC personnel to have the WxCoder III daily data transmitted near-real time every day so we can incorporate it into our GHCN-Daily data base here at NCEI. This will enable us to automate the processing, which is a required step before we can make the USAPI USDM weekly analyses official and release them publicly (they are considered experimental now). **– Status: The computer program, that automates the ingest and processing of the data, is running every morning at 10 a.m. EST; I'm in the process of doing routine checking of the output.**

F. Weekly USAPI Drought Assessment:

i. I assessed drought conditions for each week from December 9, 2014 through January 9, 2018.

ii. Stations that don't have data (or enough data) for the week in question are designated as having No Data for that weekly assessment.

iii. Source of the daily data for the weekly assessments: Guam and Pago Pago NWS web sites; Kwajalein PLCD web site; WRCC web sites for the automated stations; WcCoder III for most of the stations.

iv. I will continue this on a weekly basis (Monday afternoons EST).

v. Preferred process: I can do the weekly rainfall analysis, send my drought classification recommendation to the USAPI folks (either just Guam or Guam and all WSOs) for confirmation and local impacts, then send it after any modification to the USDM author.

***** Next Call– 8 February 2018, 1430 HST (9 February 2018, 0030 GMT)*****