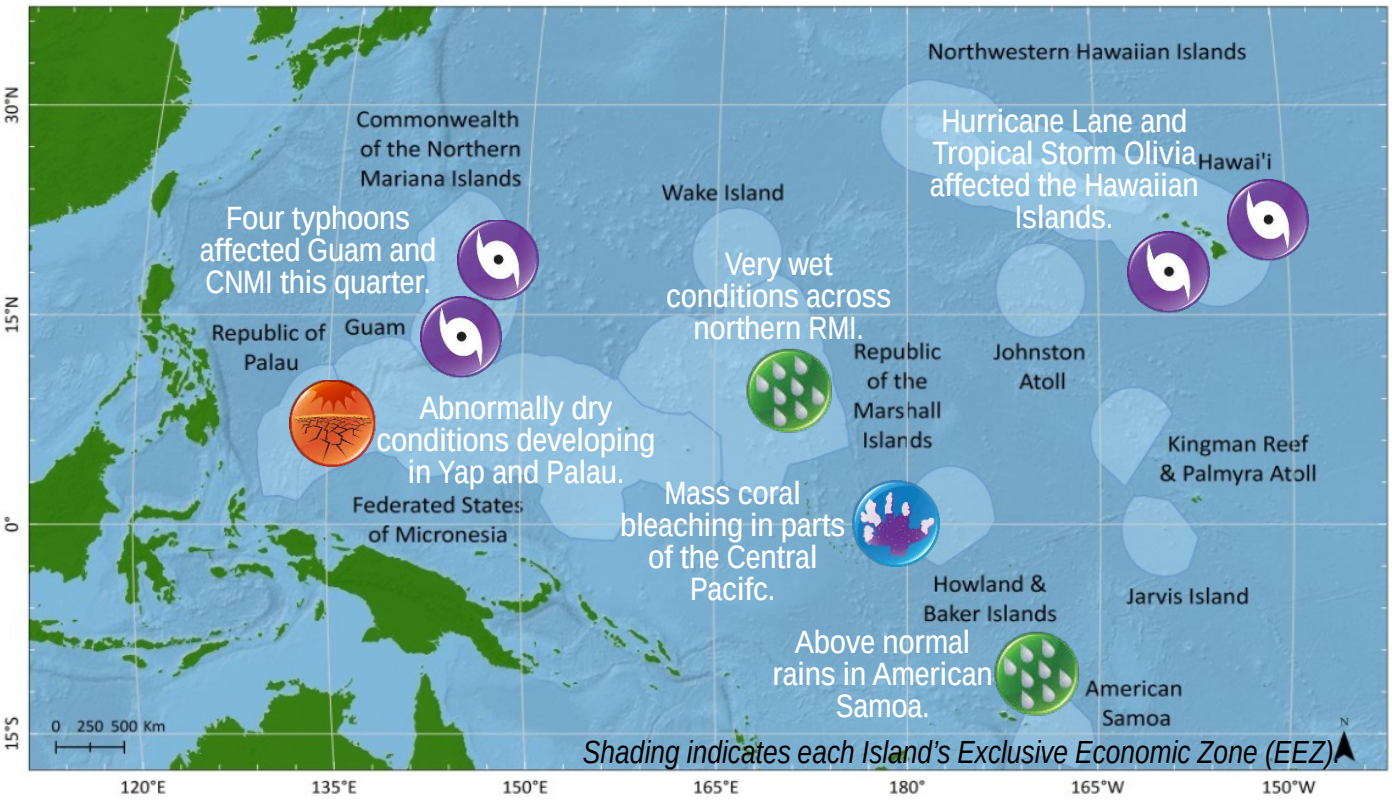
Quarterly Climate Impacts and Outlook

Hawaii and U.S. Affiliated Pacific Islands
November 2018

Significant Events – *For August 2018-October 2018*



El Niño Watch

Highlights for Hawaii and the U.S. Affiliated Pacific Islands

- Super Typhoon Yutu made a direct hit on Tinian and Saipan in the Commonwealth of the Northern Mariana's this quarter with maximum sustained winds over 180 mph; highest winds to affect any U.S. territory since 1935.
- Super Typhoon Jebi made a direct hit the northernmost islands in the Commonwealth of the Northern Mariana's this quarter.
- Typhoon Mangkhut brought torrential rains to Guam as it passed over Rota in the CNMI.
- Hurricane Lane, a Category 5 storm at its peak, came within 40 miles of Honolulu, Hawaii this quarter. All islands received above normal rainfall, especially the Big Island.
- Significant rainfall has also fallen across the Republic of the Marshall Islands this quarter while abnormally dry conditions have developed in the western parts of the Federated States of Micronesia.
- Sea-levels in parts of the Federated States of Micronesia, Yap, and Guam have fallen dramatically this quarter in response to the developing El Niño.
- "Taimasa", a Samoan word meaning stinky low tides, were observed in American Samoa.

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http://apdrc.soest.hawaii.edu/Hawaii_USAPI_Climate_Summary/dashboard

Climate Overview – *For August 2018–October 2018*

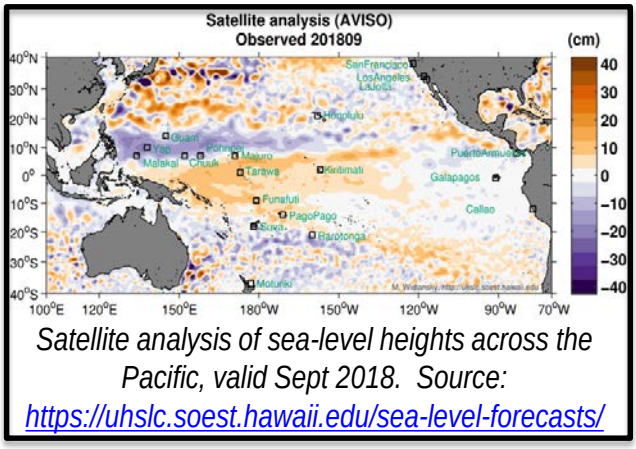
The 1 November Niño 3.4 region anomaly was +1.1° C, but the overall coupled ocean-atmosphere system reflects ENSO neutral.

Sea-surface temperatures are above normal across much of the Pacific with +1.0° C anomalies stretching from Micronesia east to Hawaii. A small area of cool SST anomalies lingers in the southeastern Pacific off the coast of South America. Extremely positive *sub-surface water temperature* anomalies exist across the entire domain, with anomalies exceeding 4° C at 100m depth between 140° and 115° W longitude.

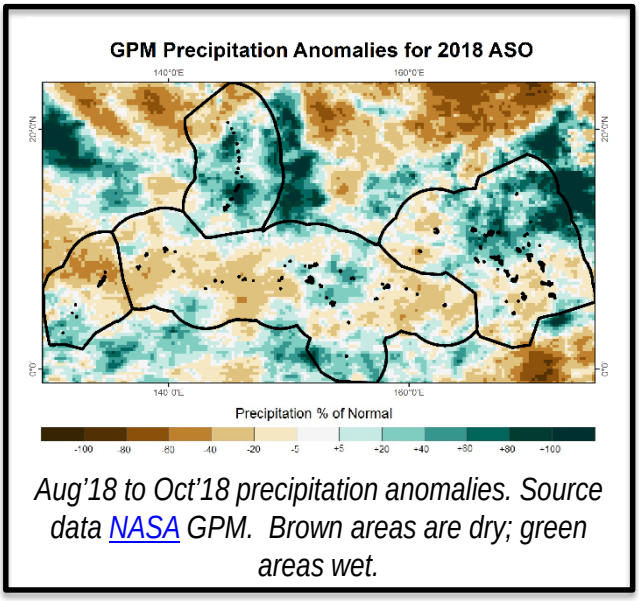
Satellite and model analyses show below-normal sea levels in the tropical northwestern Pacific, including Yap (-15cm), Chuuk (-12 cm), and Pohnpei (-6 cm) with above-normal sea levels near the equator west of the 120° W longitude, including Howland and Baker islands and southern RMI (+5 cm). This pattern is consistent with developing El Niño conditions.

In Hawaii, *rainfall* for the quarter was much above normal: Honolulu (239%), Lihue (187%), Kahului (275%), and Hilo (246%). Hilo recorded a whopping 48.85" of rain in August aided by the passage of Hurricane Lane. Elsewhere, from August-October, Saipan was above normal at 230% and Guam was above normal (136%). In Kwajalein and Majuro in the RMI, rainfall was above normal, with 134% and 104% of average respectively. In the FSM, rainfall from Aug-Oct was distributed as follows: Chuuk (114%), Kosrae (104%), and Pohnpei (103%) of normal. Further west, Aug-Oct rainfall amounts fell off substantially under the influence of a developing El Niño: Yap was 79% of normal and Palau was 68%. In American Samoa, rainfall was above normal for the quarter (126%).

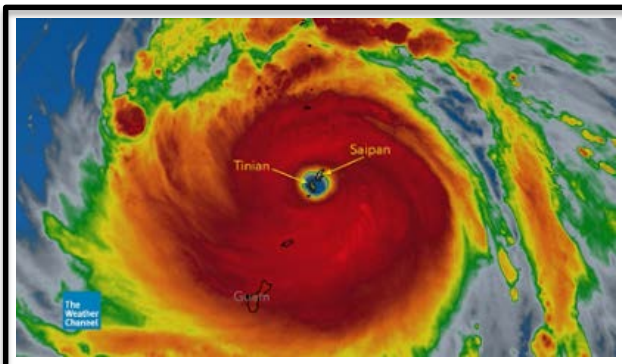
Tropical Cyclone (TC) activity in the western North Pacific basin was near normal with 13 named storms, while activity in the Central and Eastern Pacific was much above normal. The most significant storm in the western Pacific was Super Typhoon Yutu which passed right over Tinian and Saipan in late October. In the Central Pacific, Hurricane Lane with a recorded central pressure of 929 hPa was the lowest in the basin since Hurricane Ioke in 2006. Lane was only the second Category 5 storm to pass within 560 km of South Point, Hawaii in recorded history (behind Hurricane John in 1994). In the southwest Pacific, one named storm (Liua) developed south of the Solomon Islands and was short-lived from 23-29 September as a minimal Cat 1 TC.



Satellite analysis of sea-level heights across the Pacific, valid Sept 2018. Source: https://uhslc.soest.hawaii.edu/sea-level-forecasts/



Aug'18 to Oct'18 precipitation anomalies. Source data NASA GPM. Brown areas are dry; green areas wet.



Colorized infrared satellite imagery of Super Typhoon Yutu as it passed over Tinian and Saipan. Source: The Weather Channel

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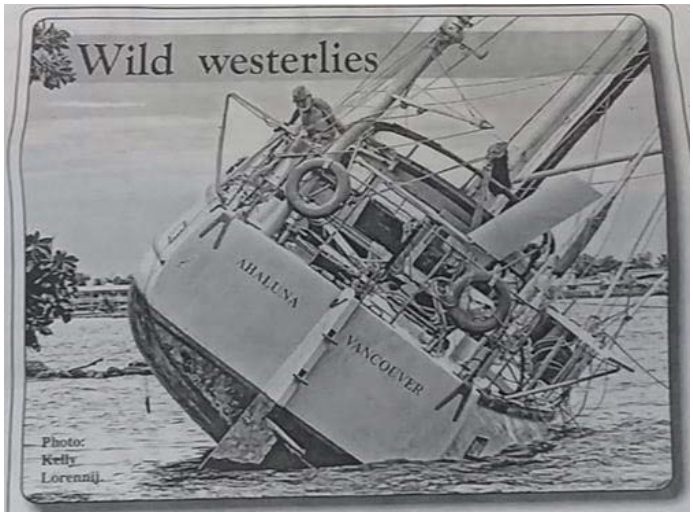
Sectoral Impacts – *For August 2018-October 2018*

Severe devastation on Saipan from Super Typhoon Yutu. Photo from Business Insider.

"Taimasa" in American Samoa. Photo courtesy of Kelley Tagarino.



West winds battered the shipping fleet in Majuro lagoon, stranding this Canadian yacht on the reef. Photo courtesy of Nover Juria, NWS Majuro.

Facilities and Infrastructure – The outer bands of Major Hurricane Lane hit Big Island of Hawaii on 22 August, triggering landslides and causing flooding that required officials to close some roads. Some residents on the Big Island had to evacuate with water rescues occurring in Hilo and Keaau. Trailing deep tropical moisture left over from Lane brought additionally heavy rainfall which washed out roads and isolated some communities. Hurricane Lane also caused widespread flooding on the islands of Maui and Oahu where a number of roads were closed by flooding and landslides. Meanwhile, strong winds from Hurricane Lane fueled a brush fire in Lahaina, Maui which damaged seven homes and knocked out power to 4,800 customers.

Hawaii was also affected by tropical Storm Olivia on 12 September as the storm passed over Lanai, forcing the evacuation of a few homes in Maui County.

Further west, Typhoon Cimaron developed in the RMI in late August and tracked westward, brining extensive flooding to Guam. This was followed quickly by Typhoon Jebi just a few days later, which passed over the sparsely populated northern islands of the CNMI, between Pagan and Alamagan. Then, just 10 days later, the center of Typhoon Mangkhut passed directly over Rota in the CNMI as a Category 2 storm and its rain bands also affected Guam causing 80% of the island to lose power and felling many trees. Finally, on 25 October, Super Typhoon Yutu made a direct landfall on the islands of Tinian and Saipan in the CNMI causing extensive destruction. All airports on Saipan, Tinian, and Rota were closed due to the storm and the Saipan airport suffered significant damage.

Meanwhile, strong westerly winds in early September, which are unusual, propagated across the western Pacific and impacted shipping fleets in the lagoons of Chuuk in FSM and Majuro in the RMI.

Natural Resources – Hawaii's eastern and northern shores had well above average breakers 7 September and 12-13 September from hurricanes Norman and Olivia, respectively. The Ehukai region of the north shore of Oahu had aggravated erosion from these cyclonic sources upon the existing above average beach sand loss that began mid summer. In American Samoa, exceptionally low sea levels exposed coral reefs resulting in increased bleaching and heat stress.

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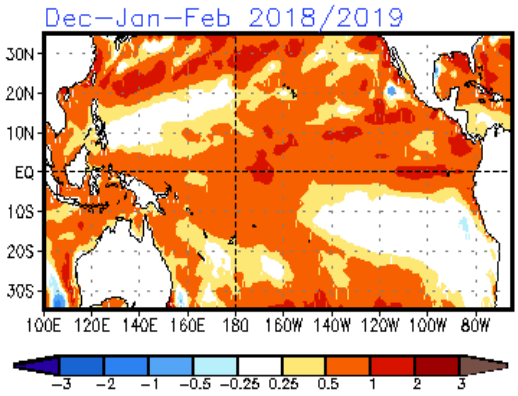
Seasonal Outlook – *For Nov 2018-Feb 2019*



Sea-Surface Temperature Anomalies for Dec-Feb 2018/2019. Source: http://www.cpc.ncep.noaa.gov/

According to ENSO prediction models, **there is an 80% chance of El Niño conditions from November '18 through February '19**. Of note, some international agencies have odds of El Niño occurring at greater than 90%.

The SST anomaly outlook indicates at least +0.5° C anomalies across nearly all of the Pacific Islands, including American Samoa. NOAA's Coral Reef Watch 4-month bleaching outlook projects continued severe heating (Alert Level 2) in the western Pacific around Nauru and the Gilbert Islands. By early December 2018 Tuvalu and surrounding islands are expected to reach Alert Level 1 with the possibility of Alert Level 2 by mid-January 2019. American Samoa and locations eastward are expected to reach Bleaching Warning by January and Alert Level 1 by February 2019. Further heat stress is expected as El Niño conditions continue to mature.

Over the next six months, gradually rising sea levels are projected in the northwestern Pacific (returning to near normal) with gradually falling sea levels in the southwestern Pacific (tending towards near normal), and quickly rising sea levels in the equatorial eastern Pacific. Around Hawaii, no major sea level changes are predicted during the next six months.

During the period Nov-Feb, under the anticipated influence of El Niño, **rainfall is projected to be below normal in Chuuk, Pohnpei, Yap, and Koror**. Above normal rainfall is projected for much of the RMI, Guam, and southern CNMI. Hawaii is projected to start out wet and get drier through the winter months. Below normal rainfall is anticipated for American Samoa.

Tropical cyclone (TC) activity in the western north Pacific is expected to continue to be above normal from Micronesia toward Guam. In the southwes
the Date Line, includin
Vanuatu and New Caledonia.

Regional Partners

Pacific ENSO Applications Climate Center:
http://www.prh.noaa.gov/peac/

NOAA NWS Weather Forecast Office Honolulu:
http://www.prh.noaa.gov/pr/hnl/

NOAA NWS Weather Forecast Office Guam:
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NOAA National Centers for Environmental Information:
http://www.ncei.noaa.gov/

NOAA NMFS Pacific Island Fisheries Science Center:
http://www.pifsc.noaa.gov/

NOAA OceanWatch - Central Pacific:
http://oceanwatch.pifsc.noaa.gov/

NOAA Coral Reef Watch:
http://coralreefwatch.noaa.gov/

USGS Pacific Islands Water Science Center: http://hi.water.usgs.gov/

USGS Science Center – Pacific Coastal and Marine Science Center:
http://walrus.wr.usgs.gov/

University of Hawaii - Joint Institute of Marine and Atmospheric Research:
http://www.soest.hawaii.edu/jimar/

University of Guam - Water and Environmental Research Institute:
http://www.weriguam.org/

University of Hawaii Sea Level

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