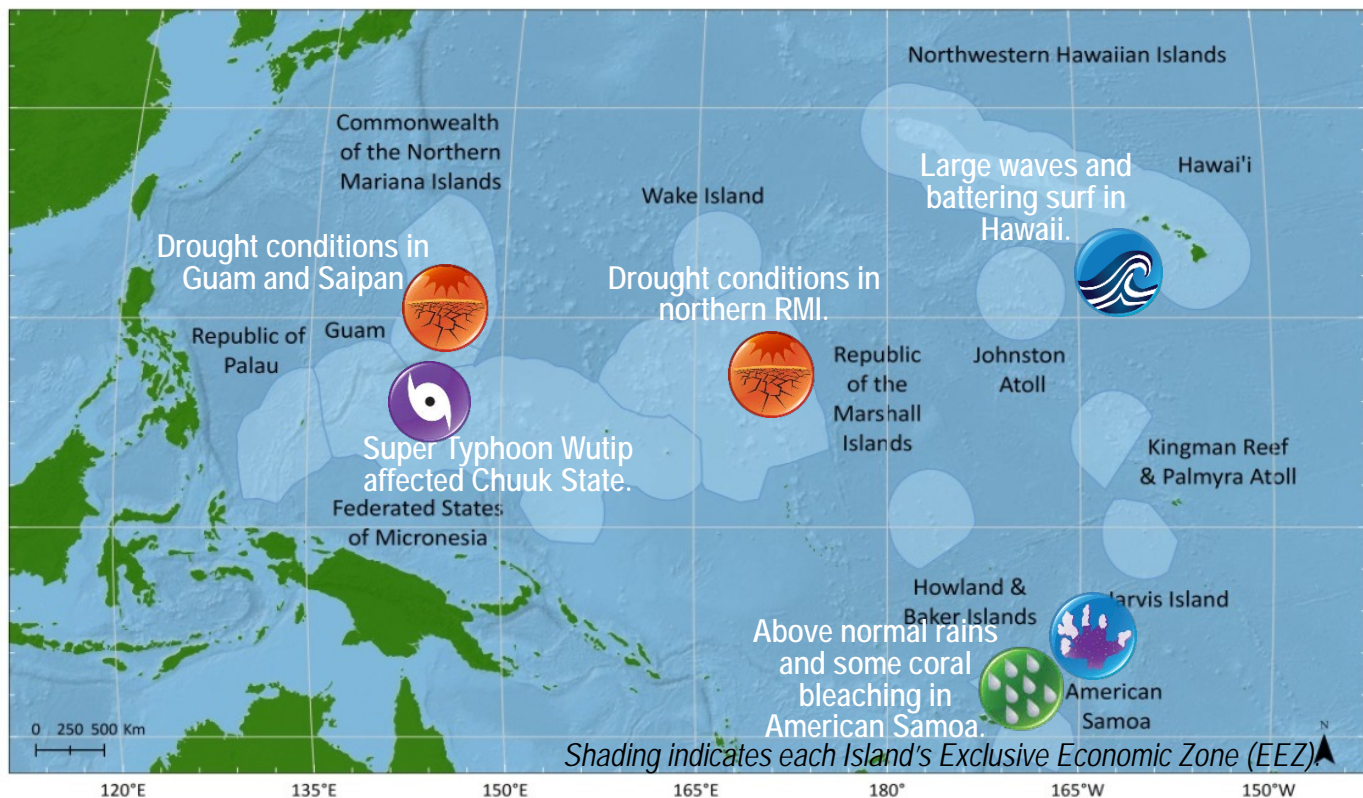


Significant Events – For November 2018-February 2019

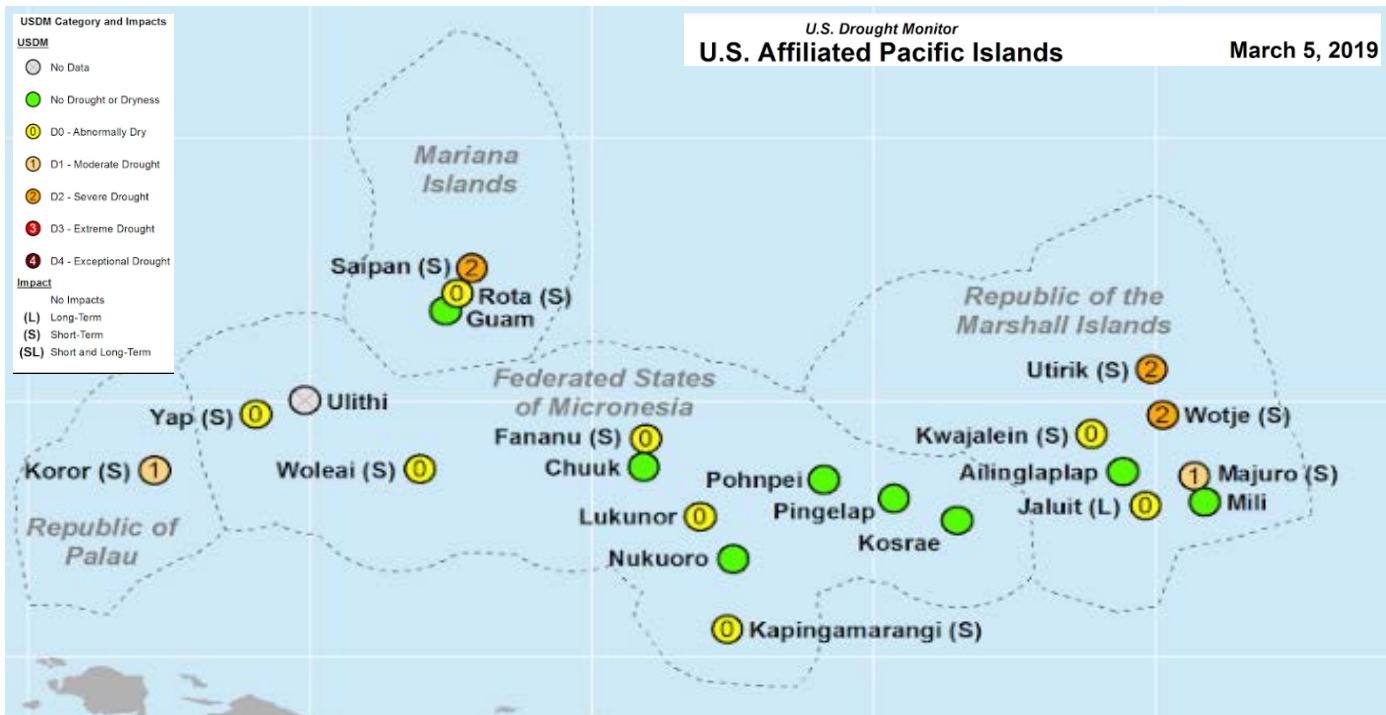


El Niño Advisory in Effect

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

- Super Typhoon Wutip became the strongest storm on record in the western North Pacific during the month of February with peak winds of 160 mph.
- Drought conditions have developed across the northern Republic of the Marshall Islands and parts of Yap State and Palau. Water conservation measures are in place across these islands.
- Heavy rainfall and large battering waves affected much of the Hawaiian Islands in mid February, which washed out roads and led to new wave records.
- Sea-levels in parts of the Federated States of Micronesia, Yap, and Guam have remained below normal due to the ongoing weak El Niño conditions.
- Abundant rainfall and some flooding have occurred in American Samoa.

Climate Overview – For November 2018–February 2019



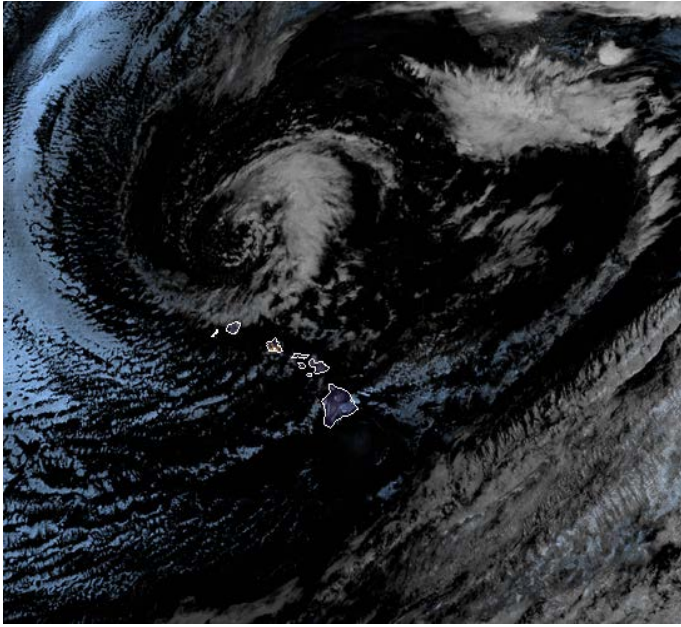
The 1 March Niño 3.4 region anomaly was $+0.4^{\circ}$ C, and the overall coupled ocean-atmosphere system reflects weak El Niño conditions.

Sea-surface temperatures are above normal across much of the Pacific with $+1.0^{\circ}$ C anomalies in parts of southern RMI, and $+0.5^{\circ}$ C anomalies across the Howland and Baker islands. A small area of cool SST anomalies was located over the Hawaiian Islands and parts of the far western Pacific (west of 150° E). Positive *sub-surface water temperature* anomalies greater than 1° C to a depth of 200m between 170° E and 120° W longitude.

Satellite and model analyses show below-normal sea levels in the tropical northwestern Pacific and above-normal sea levels near the equator, especially near the Dateline, which is consistent with weak El Niño conditions. Tide gauges are recording above-normal sea levels on the equator across the basin as well as in parts of the southwestern Pacific. Sea levels in northern Micronesia remain below normal, especially around Yap (-20 cm). Hawaii sea levels remain mostly near-normal.

In Hawaii, *rainfall* from November through February was below normal: Honolulu (35%), Lihue (68%), Kahului (87%), and Hilo (74%). Elsewhere, from November '18 to February '19, Saipan was below normal at 81% and Guam was near normal (95%). The close passage of Super Typhoon Wutip brought much-needed widespread rains to Guam, on the order of 5-12". In Kwajalein and Majuro in the RMI, rainfall was below normal, with 95% and 72% of average respectively. In the FSM, rainfall from November '18 to February '19 was distributed as follows: Chuuk (129%), Kosrae (67%), and Pohnpei (97%) of normal. Further west, rainfall amounts were near to above normal despite the weak El Niño: Yap was 127% of normal and Palau was 93%. In American Samoa, rainfall was much above normal for the quarter (131%). Measurable snow was also recorded at Polipoli Spring State Park on Maui, Hawaii, in February, under the influence of a very strong Kona Low.

Tropical Cyclone (TC) activity in the western North Pacific basin was above normal, and Super Typhoon Wutip is now the strongest storm to occur in the basin during February (160 mph). In the southwest Pacific, the number of storms formed was four (4), which was a near-normal start for the season.



A strong Kona Low was positioned just north of the Hawaiian Islands on 8 February. Photo from GOES-17.

Facilities and Infrastructure –From February 19–22, Typhoon Wutip passed over FSM's Chuuk, Pohnpei, and Yap states, with wind speeds reaching up to 105 miles per hour. Gusty winds from Tropical Storm Wutip caused numerous fallen trees and powerlines on the island of Pohnpei in late February. The entire island was in the dark for a period before power was restored. Typhoon Wutip destroyed 54 homes and caused major damage to at least 69 houses in Pattiw in Chuuk state.

Large waves and surf from a very strong Kona Low pounded the Hawaiian Islands in early February. Peak wave heights were near 60' at the north shore of Oahu. Coastal roads were inundated with seawater and sand. Hanalei, Kauai buoy measured 38' significant wave height and the Waimea, Oahu registered a 30' significant wave height during the latter event, both setting records. Heavy rains in Hawaii caused a landslide on the island of Oahu which closed part of the Pali Highway on 19 February.

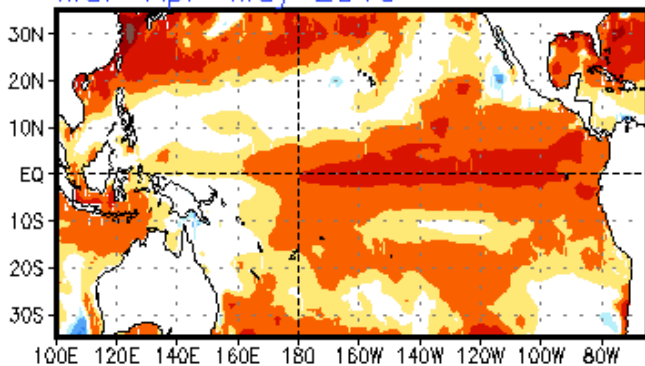


Damage from Typhoon Wutip across parts of Chuuk State. Photo courtesy of Pacific Daily News.

Water Resources – Since December 2018, the northern RMI have received much less rainfall than normal. Residents here have been advised to implement water conservation measures, including cleaning roofs and gutters to improve catchment. In Saipan, the draw-down of freshwater has begun and vegetation has started to dry out, elevating the risk of wildfires. The water reservoir at Majuro is now down to 23.05 million gallons, which is 60% of capacity. Sea water inundation and strong winds from Typhoon Wutip destroyed food sources, including breadfruit and taro, and water in affected areas is no longer safe to drink in parts of Chuuk state. As a result, immediate needs include food and safe drinking water.

Natural Resources – Jellyfish Lake in Palau is open to the public again! Ongoing monitoring conducted by the Coral Reef Research Foundation (CRRF) indicated that the jellyfish populations were now rebounding after the declines that were a result of the drought conditions experienced throughout Palau in 2016.

Mar–Apr–May 2019



Sea-Surface Temperature Anomalies for March through May 2019.

Source: <http://www.cpc.ncep.noaa.gov/>

According to ENSO prediction models, **there is a 55% chance of El Niño conditions continuing through the Northern Hemisphere spring 2019.**

The SST anomaly outlook indicates at least $+0.5^{\circ}$ C anomalies across much of the eastern Pacific, including American Samoa. NOAA's Coral Reef Watch 4-month bleaching outlook projects heating in the eastern and equatorial Pacific Ocean to increase (Alert Levels 1 and 2) and expand through April and May 2019. Waters surrounding American Samoa and the Cook Islands are expected to remain at Alert Level 1 and possibly reach Alert Level 2 by April. Bleaching heat stress is predicted to return to the Kiribati region in the coming months, as the season changes and the El Niño continues.

Over the next six months, dynamical forecast models suggest rising sea levels in the northwestern Pacific (returning to near normal around Yap), steady sea levels in the southwestern Pacific (near or above normal), and above normal sea levels in the equatorial eastern Pacific. In the southwestern Pacific, some statistical models are predicting a drop in sea levels (~ 10 cm), which sometimes occurs after El Niño peaks. Around Hawaii, only small changes are projected during the next six months.

During the period March through May, under the anticipated influence of a weak El Niño, rainfall is projected to be below normal in Hawaii, Chuuk, Pohnpei, Yap, and Koror. **Well below normal rainfall is projected for the northern RMI, Guam, southern CNMI, and Yap state.** Near 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 southwest Pacific, climatologically from 1981-2010, during the period from February to May, the basin typically experiences 7.1 named TCs.

NOAA NWS Weather Forecast Office Honolulu:

<http://www.prh.noaa.gov/pr/hnl/>

NOAA NWS Weather Forecast Office Guam:

<http://www.prh.noaa.gov/pr/guam/>

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 Center:

<https://uhslc.soest.hawaii.edu/>

University of Hawaii Asia Pacific Data Research Center (APDRC) -

<http://apdrc.soest.hawaii.edu/index.php>