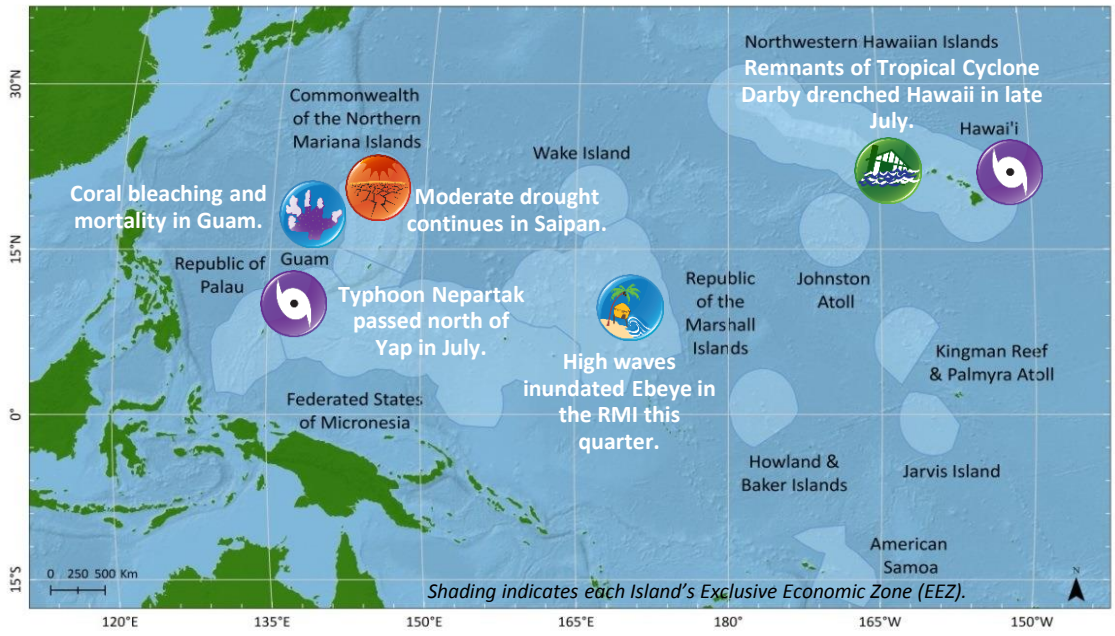
Climate Impacts and Outlook

Hawaii and U.S. Pacific Islands Region

3rd Quarter 2016

Significant Events and Impacts for 2nd Quarter 2016



La Niña Watch

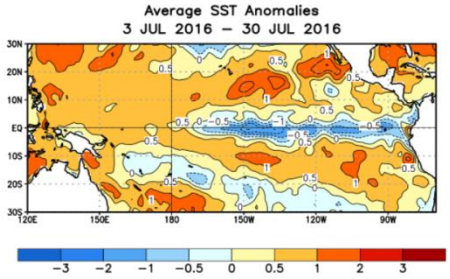
Well below normal rainfall was recorded in Guam and the Commonwealth of the Northern Mariana Islands.

Meanwhile, near-normal rainfall returned to Hawaii, the Federated States of Micronesia, the Republic of Palau, and the Marshall Islands. Slightly below normal rains were reported in American Samoa.

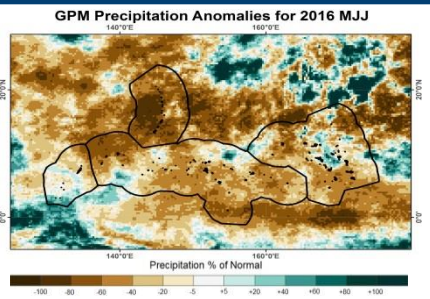
Sea levels have markedly increased across the western Pacific since March 2016.

As of August 1st, there has been a total of 4 tropical cyclones in the western Pacific.

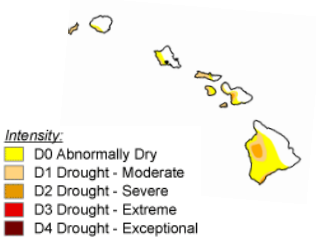
Regional Climate Overview for 2nd Quarter 2016



Sea-Surface Temperature Anomalies, valid July 25, 2016 . Source: http://www.cpc.ncep.noaa.gov/



May-July 2016 precipitation anomaly. Source data NASA GPM. Brown areas are dry; wet areas green.



Current Hawaii Drought Status as of July 28, 2016. Source: http://www.drought.gov

The region is under a La Niña Watch. Current weather patterns were in a climate state of ENSO neutral during the quarter (e.g., near normal air temperatures, sea levels, and rainfall). **As of August 1st, the Niño 3.4 region anomaly was -0.5° C, suggesting the beginnings of a weak La Niña state.**

Sea-surface temperatures are above normal across the western Pacific, with a localized region of cold anomalies along the equatorial eastern Pacific. The warmest anomalies exceeding 0.5° C are found throughout the RMI, FSM, and CNMI, while cold anomalies near -0.5° C are evident near the Howland and Baker Islands. ***Sub-surface water temperature* anomalies have continued to cool and are now 2-4° C *below normal* to a depth of 200m across much of the equatorial Pacific**, especially between 140° E and 100° W.

The monthly mean *sea level* in most of the stations recorded rises in the past quarter and currently all are above normal. Majuro recorded a very sharp rise in June; currently it is 8 inches above normal—this is quite significant! Despite a rise of 2 inches, Guam is currently stable. Pago Pago is currently above normal too. In Hawaii, Honolulu and Hilo recorded notable rises over the last quarter.

In Hawaii, *rainfall* was above normal for the quarter at Honolulu (436%) and Kahului (315%), and near-normal at Lihue (83%) and Hilo (93%), resulting in a reduction of drought conditions across the state. From May-July, Saipan and Guam were below normal with 53% and 66% of average rainfall respectively. In Kwajalein and Majuro in the RMI, rainfall was near-normal with 103% and 88% of normal. In the FSM, quarterly rainfall was also near normal: Chuuk (124%), Kosrae (90%), and Pohnpei (96%). Further west, drought conditions eased as rains slowly returned to the islands of Yap (70%) and Palau (77%). In American Samoa, rainfall was on the lower side of normal for the quarter (81%).

***Tropical Cyclone* (TC) activity in the western North Pacific basin was below normal** with just one storm (Typhoon Nepartak), which formed north of Yap and moved northwestward away from the USAPI. From May-July, there was no tropical cyclone activity in the SW Pacific. Meanwhile in the eastern Pacific, TC Darby brought heavy rains to Hawaii at the end of July, with over 5" of rain in parts of Kauai, and many locations over 10" of rain on Oahu.

Sectoral Impacts for 2nd Quarter 2016

Facilities and Infrastructure **–** Large, long-period, southerly swell generated east of New Zealand in mid-June created well-above average surf on southerly exposures of the Hawaiian Islands. In addition, well-above average, rough, surf from tropical storm Darby affected primarily eastern exposures of the Hawaiian Islands near the end of July. On the island of Ebeye in the RMI, an inundation event destroyed most of the seawalls and shoreline protection on the northern end of the lagoon. In addition, the inundation event affected other atolls north of Ebeye, blocking a causeway and seizing traffic as debris and rock blocked the access road.

Water Resources **–** The water storage reservoir on Majuro, RMI was 84% full as of 1 August. As a result of renewed rains, Majuro Water and Sewer has expanded its water hours to 8 hrs/day, 24-hours a week.

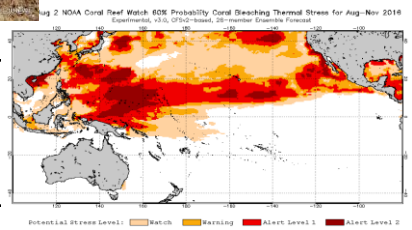
Agriculture **–** In early May, wildfires in Hawaii had burned twice as much land as they did in all of 2015, owing to the moderate drought conditions at the time. On the island of Maui, a large wildfire forced the evacuation of homes near the Ma'alaea area and temporarily closing the main road that links western and central Maui.

Natural Resources **–** Taimasa (low stands) conditions continue to be reported in American Samoa, exposing coral reefs. Reports of coral bleaching from the RMI, and Guam and Saipan in CNMI have already begun as sea-surface temperatures in the region climb above 31° C.

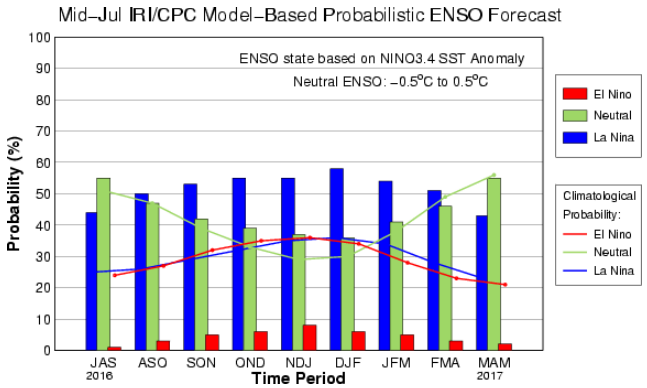
Damage to the seawalls on Ebeye (RMI) from an inundation event. Photo courtesy of Wesley Lemari.

Bleached corals already showing up in the RMI. Photo courtesy of Karl Fellenius, University of Hawaii Sea Grant

NOAA Coral Reef Watch 4-month Bleaching Thermal Stress Outlook for Aug-Oct 2016.



Regional Outlook for 3rd Quarter 2016 (Aug-Oct)



ENSO Probabilities, Valid April 2016. Source: http://iri.columbia.edu/our-expertise/climate/forecasts/enso/current/

Following the latest ENSO prediction models, there is a 50% chance of La Niña conditions developing during August or September and lasting through the northern hemisphere winter season.

The SST anomaly outlook for the 3rd quarter indicates 1-2° C above-normal values in Hawaii, RMI, FSM, Guam, and CNMI. Near-normal SST anomalies are projected to continue around American Samoa. NOAA's Coral Reef Watch most recent four-month Bleaching Outlook projects continued thermal stress in the western Pacific through November. Alert level 2 bleaching is expected in Guam, CNMI, and eastern FSM this quarter. The Hawaiian Islands may see Alert Level 1 conditions by October.

The forecast values for sea level in the 3rd quarter indicate that all western Pacific stations are likely to be above normal with high-to-very high sea level within the next couple of months, coincident with the development of La Niña. American Samoa is expected to be near normal, with further falls expected as the year continues. In Hawaii, both Honolulu and Hilo are likely to be slightly elevated.

Average to slightly below average rainfall is projected for FSM and RMI during their seasonal wet period and average to above normal rainfall is projected for American Samoa. In Guam and CNMI, near to below normal rainfall is anticipated for the quarter, with near to above normal rains across the Hawaiian Islands.

Tropical cyclone (TC) activity in the western north Pacific is expected to be near-normal in the 3rd quarter, with the 30-year average of 18 storms. In the southwest Pacific, for the period Aug-Oct, TC activity is historically quite low with only 4 storms ever recorded between 1981-2010.

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:
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/