

Climate Impacts and Outlook

Hawaii and U.S. Pacific Islands Region

2nd Quarter 2016

Significant Events and Impacts for 1st Quarter 2016



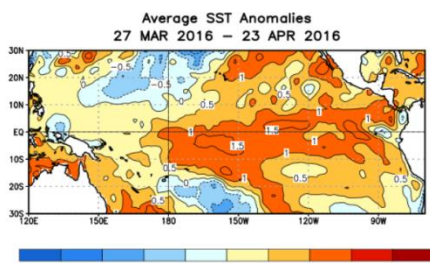
El Niño Advisory La Niña Watch

Well below normal rainfall was recorded in Hawaii, the Federated States of Micronesia, the Republic of Palau, the Marshall Islands, Guam and the Commonwealth of the Northern Marianas.

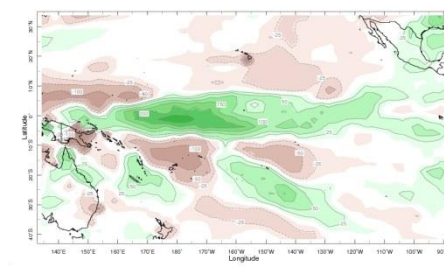
Low sea levels and above normal rainfall were observed in American Samoa.

Near Johnston and Kiritimati atolls persistent elevated ocean temperatures since June 2015 have killed 80% of the corals in the region.

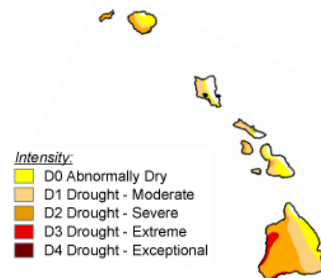
Regional Climate Overview for 1st Quarter 2016



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



March 2016 precipitation anomaly. Source: <http://iridl.ldeo.columbia.edu/>



Current Hawaii Drought Status as of April 25, 2016. Source: <http://www.drought.gov>

The region is under an El Niño Advisory and a La Niña Watch. Current weather patterns were in a climate state of El Niño during the quarter (e.g., above normal air temperatures, decadal-low sea levels, and widespread drought conditions). **As of May 2nd, the Niño 3.4 region anomaly was +0.8° C, supporting a moderate El Niño state. However, this represents a net cooling of 1.8° C since February 2016.**

Sea-surface temperatures were still above normal across the central and eastern equatorial Pacific, with the warmest anomalies exceeding 0.5° C around Hawaii and American Samoa, while cold anomalies near -0.5° C are evident in northern CNMI. **Sub-surface water temperature anomalies have cooled significantly and are now 1-3° C below normal to a depth of 200m across much of the equatorial Pacific, especially between 140° E and 140° W.**

All north Pacific stations recorded a moderate rise in sea level during the month of April, which brought all stations marginally above normal, but still below levels seen over the last decade. Sea levels in American Samoa remain below normal.

In Hawaii, rainfall was below normal for the quarter at Honolulu (18%), Lihue (43%), Kahului (70%), and Hilo (52%), resulting in the expansion and intensification of drought conditions across the state. From February-April, Saipan was 100% of normal while Guam was below normal with 65% of average rainfall. In Kwajalein and Majuro in the RMI, rainfall was much below normal with 18% and 27% of normal respectively. In the FSM, quarterly rainfall was also below normal: Chuuk (71%), Kosrae (48%), and Pohnpei (49%). Further west, drought conditions persisted in Yap (35%) and Palau (55%) as rainfall was below normal. In American Samoa, rainfall was above normal for the quarter (137%) associated with a strong monsoon and the close passage of tropical cyclones. In fact, Pago Pago reported 30.43" in April! An intense heat wave baked American Samoa from 30 January to 18 February, with a daily maximum temperature averaging 92.2° F and a daily minimum temperature average of 80.3° F; both of which are significantly above the long-term normals.

Tropical Cyclone (TC) activity in the western North Pacific basin was below normal with no storms. From Feb-Apr, the SW Pacific TC season was nearly average with a total of 6 TCs; however, one of those, TC Winston, was the most powerful storm in recorded history to impact the nation of Fiji with maximum sustained winds of 149 knots at landfall resulting in 44 deaths. TC Amos and Zena were Australian Category 4 storms with TC Amos bringing 3.03" of rain to Tutuila, American Samoa in mid-April.

Sectoral Impacts for 1st Quarter 2016

Facilities and Infrastructure – The eye of Hurricane Amos passed over American Samoa on 23 April. The storm was not as ferocious as feared, but still toppled trees and resulted in localized power outages. Extreme surf-induced coastal flooding occurred on the west, north, and east sides of Oahu, Hawaii, in February causing severe damages to homes and partial destruction of coastal highways.

Significant waves on the north shore of Oahu on 10 February. Image courtesy of Steve Busingier, University of Hawaii.



Water Resources – The water storage reservoir on Majuro, RMI was 36% full as of 1 May. Household water tanks were critically low and some have gone dry. The water storage reservoir in Yap is also critically low. As a result of dry conditions across the region, **the Governments of the RMI, Chuuk, and Palau have declared a State of Emergency, and President Obama has signed the federal disaster declaration notice.** Resources are being shipped to the region, which includes bottled water and reverse osmosis machines.

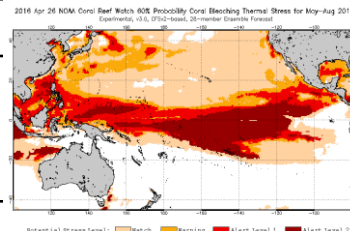


Juvenile rabbit fish kill near Utulei Beach Park, American Samoa. Photo courtesy of Kelley A. Tagarino, University of Hawaii Sea Grant

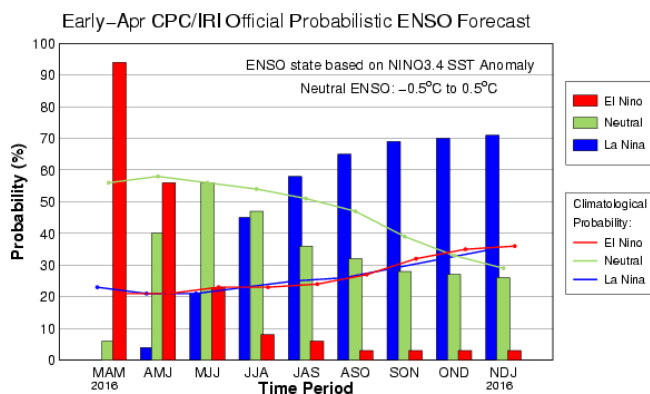
Agriculture – Farmers on the Kona slopes of the Big Island of Hawaii have indicated that conditions are worst in recent memory, while ranchers are reporting loss of cattle and have been forced to reduce the size of their herds. Brush and grass fires have been commonly observed in Saipan, Yap, Palau, and Hawaii. Yellowing of breadfruit is reported in RMI.

Natural Resources – Coral reefs in Kiribati, Northern Phoenix Islands, and the Marquesas Islands are experiencing significant bleaching and widespread mortality. Taimasa (low stands) conditions have been reported in American Samoa, exposing coral reefs. Warm waters are suspected to be the cause of death of several thousand rabbit fish there in April. In Palau, Jellyfish Lake has lost more than 7 million jellyfish due to very low lake temperatures and high salinity which are killing their symbiotic food sources.

NOAA Coral Reef Watch 4-month Bleaching Thermal Stress Outlook for May-August 2016.



Regional Outlook for 2nd Quarter 2016 (May-July)



ENSO Probabilities, Valid April 2016. Source: <http://iri.columbia.edu/our-expertise/climate/forecasts/ens0/current/>

El Niño has peaked and neutral conditions are expected to return by June 2016. However, many islands will continue to feel the effects of El Niño throughout much of 2016, even as La Niña and its impacts enter the scene. There is a 70% chance of La Niña conditions by October 2016.

The SST anomaly outlook for the 2nd quarter indicates near-normal values in RMI, Guam, and CNMI. Above-normal SST anomalies are forecast to continue across the Hawaiian Islands and American Samoa. NOAA's Coral Reef Watch most recent four-month Bleaching Outlook projects continued thermal stress in the central equatorial Pacific Ocean through August. Waters around the Federated States of Micronesia are expected to reach Alert Level 2 and the Marshall Islands are expected to reach Alert Level 1. Guam, CNMI, and Hawaii are projected to reach Bleaching Watch levels by the end of August.

The forecast values for sea level in the 2nd quarter indicate that Guam, Pohnpei, Majuro, and Kwajalein are likely to be slightly above normal. Sea levels in CNMI, Chuuk, and Kosrae are expected to be below normal. 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.

Severe drought is expected to continue across nearly all of the USAPI, including Palau, Yap, Chuuk, Pohnpei, and Kosrae, as well as all islands in the RMI, Guam and CNMI, and the Hawaiian Islands. However, rains will gradually return to these locations during the seasonal wet period. Near-normal rainfall is projected for American Samoa.

Tropical cyclone (TC) activity in the western north Pacific is expected to be quiet in the 2nd quarter. In the southwest Pacific, for the period May-Jul, there is a slightly elevated chance for up to two TCs to occur in May which would be above the 30-year average of 0.5 storms.

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 NESDIS National Climatic Data Center: <http://www.ncdc.noaa.gov/sotc/>

NOAA NESDIS National Oceanic Data Center: <http://www.nodc.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/>