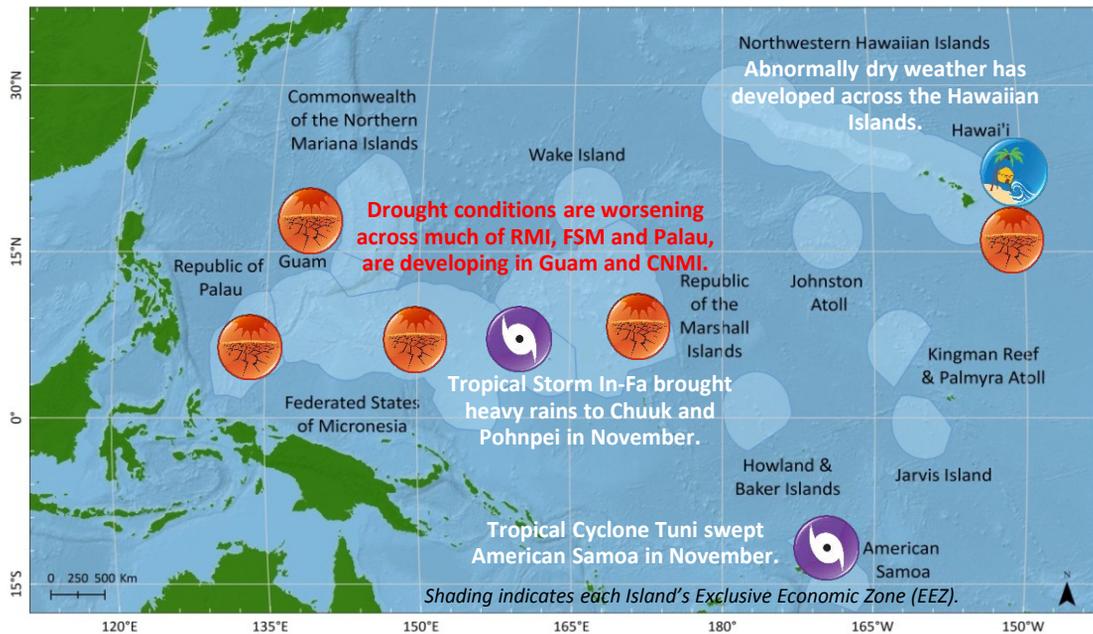


## Significant Events and Impacts for 4<sup>th</sup> Quarter 2015



### El Niño Continues

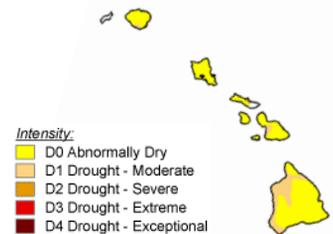
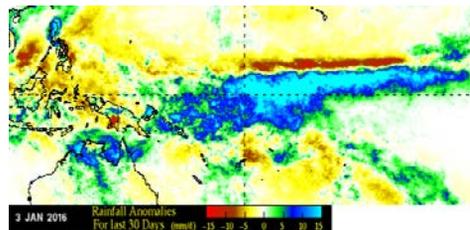
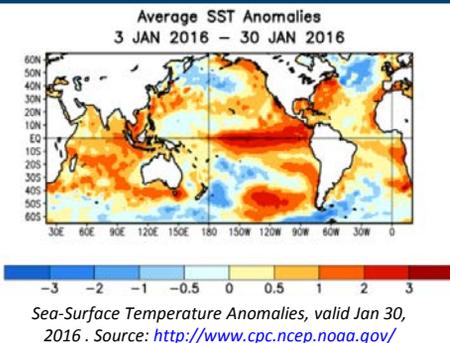
Below normal rainfall fell over most of Hawaii, the Federated States of Micronesia, the Marshall Islands, Guam and the Commonwealth of the Northern Marianas.

Very wet weather was reported in American Samoa in November and December.

There have been an above normal number of giant wave events in Hawaii.

In 2015, there were a total of 31 tropical cyclones in the western North Pacific.

## Regional Climate Overview for 4<sup>th</sup> Quarter 2015



December 2015 precipitation anomaly. Source: <http://iridl.ldeo.columbia.edu/>

Current Hawaii Drought Status as of Jan 26, 2016. Source: <http://www.drought.gov>

The region is under an **El Niño Advisory**, and weather patterns were in a climate state of El Niño during the quarter (e.g., abundant typhoons, decadal-low sea levels, and worsening drought conditions in Micronesia). As of February 1<sup>st</sup>, the Niño 3.4 region anomaly was +2.5° C, supporting a strong El Niño state.

Sea-surface temperatures were above normal across the central and eastern equatorial Pacific, with the warmest anomalies exceeding 0.5° C around Hawaii, eastern FSM, and RMI, while cold anomalies near -0.5° C surfaced across Guam and CNMI. **Sub-surface water temperature anomalies are still 2-4° C above normal** to a depth of 150m across much of the central and eastern equatorial Pacific, especially east of 170° W.

The monthly mean sea level at most of the stations (except Guam, Majuro, and Kwajalein) stayed below normal. Some stations like Majuro and Kwajalein recorded slight rise—these stations are still below normal, but the rise may indicate a turning point towards normal sea level within the next couple of months.

In Hawaii, rainfall was below normal for the quarter at Honolulu (55%), Lihue (55%), Kahului (68%), but near normal at Hilo (105%), bringing drought declaration back into the State. Several new temperature records were observed across the Hawaiian Islands. From November-January, Saipan was 74% of normal and Guam was below normal with 66% of average rainfall. In Kwajalein and Majuro in the RMI, rainfall was much below normal with 69% and 39% of normal respectively. In the FSM, quarterly rainfall was also below normal: Chuuk (69%), Kosrae (52%), and Pohnpei (79%). Further west, drought conditions worsened in Yap (40%) and Palau (46%) as rainfall was below normal. In American Samoa, rainfall was above normal for the quarter (127%) associated with a strong monsoon and the close passage of tropical cyclones.

Tropical Cyclone (TC) activity in the western North Pacific basin was above normal. In FSM, Tropical Storm In-Fa brought 3-5" of rain in 24-hours in early November, From Nov-Jan, the Southwest Pacific TC season has been nearly average with a total of 4 storms; of those 3 have been named and 2 of those were major on the Australian scale which are both slightly above average (averages based on the 1981-2010 period). Tropical cyclone Tuni brought 3.26" of rain to Tutuila, American Samoa in just 24 hours on 28 November.

## Sectoral Impacts for 4<sup>th</sup> Quarter 2015

**Facilities and Infrastructure** – Significant surf-induced coastal flooding occurred on the north shore of Oahu in late January from 40' waves. The swell was enough to wash over Kam Highway, sending onlookers into the sea. In American Samoa, tropical cyclone Tuni resulted in flooding which closed much of the main road around the Independent Samoa island of Upolu.

**Water Resources** – The water storage reservoir on Majuro, RMI was 60% full as of 1 February, but household water tanks were critically low and some have gone dry. **As a result, the RMI Government has declared a State of Emergency**, activating the emergency operations center and mobilizing additional resources. Meanwhile, CNMI and Guam are being advised to begin water conservation measures as drought sets in. Residents on the islands of Palau, Yap, Chuuk, and the Marshalls are encouraged to check their water wells for excessive salinity as drought intensifies across the region.

**Agriculture** – Significant yellowing of food crops and vegetation have been observed in Guam, CNMI, Palau, and Yap, along with an increase in grass fires due to severe drought conditions. Yellowing of breadfruit tree leaves and pandanus fronds have been observed in Majuro.

**Natural Resources** – Coral bleaching HotSpots are concentrated on the central equatorial Pacific Ocean but have diminished throughout most of the northeastern Pacific Ocean. Taimasa (low stands) conditions have been reported in American Samoa.

**Public Health**– Drought is causing school attendance rates to drop across the Pacific Islands as hungry and dehydrated children face a high risk of malnutrition due to crop failure, water shortages, and poor sanitation.

Significant 40' waves on the north shore of Oahu on 27 January. Image courtesy of Steve Businger, University of Hawaii..

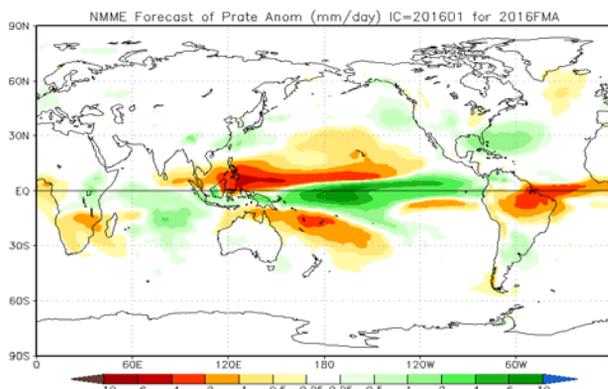


Burn scar from wildfires on Guam. Photo courtesy of Mark Lander, UoG.



Dried banana and pandanus crops on Majuro, RMI. Photos courtesy of Karl Fellenius, Hawaii Sea Grant.

## Regional Outlook for 1<sup>st</sup> Quarter 2016 (Feb-Apr)



Rainfall Anomaly Forecast, Valid Feb-Apr. Source: <http://www.cpc.ncep.noaa.gov/>

**El Niño has reached its peak and a slow decline towards neutral conditions is expected to begin in the 1<sup>st</sup> quarter 2016. However, many islands will continue to feel the effects of El Niño throughout much of 2016.**

The SST anomaly outlook for the 1<sup>st</sup> quarter indicates near-normal values in American Samoa, with slightly below normal values across CNMI, FSM, and Palau. Above-normal SST anomalies are forecast to continue across the Hawaiian Islands. The 4-month coral bleaching outlook projects continued thermal stress to last through at least the end of May across the central equatorial Pacific. Alert Level 2 is expected to be widespread in the Eastern Pacific while the southwestern Pacific around the Great Barrier Reef, Vanuatu, and Fiji, reaches Alert Level 1.

The forecast values for sea level in the 1<sup>st</sup> quarter indicate that most of the USAPI stations are likely to be much closer to normal. American Samoa is expected to be marginally below 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 develop and/or 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.** Below-normal rainfall is projected for American Samoa.

**Tropical cyclone (TC) activity in the western north Pacific is expected to be quiet in the 1<sup>st</sup> quarter.** During the last major El Niño event in 1998, Feb-Apr saw zero typhoons or tropical storms. In the southwest Pacific, due to strong El Niño conditions, the chances for TC activity remains elevated for a majority of the Pacific Island countries, and particularly in the eastern portion of the basin, including American Samoa.

## 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/>