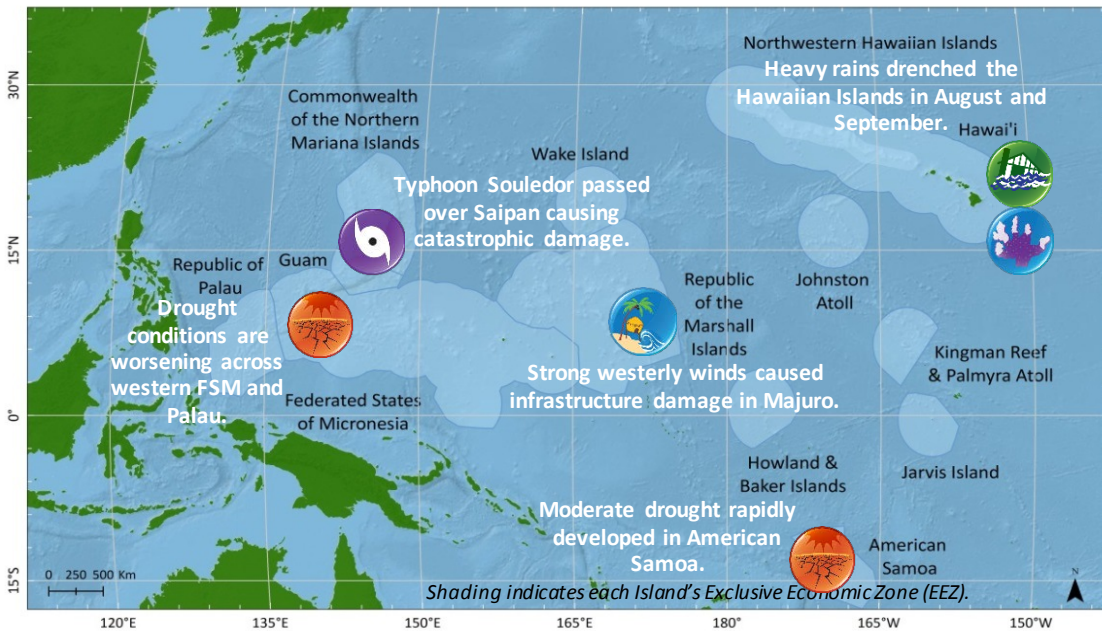


Climate Impacts and Outlook

Hawaii and U.S. Pacific Islands Region

4th Quarter 2015

Significant Events and Impacts for 3rd Quarter 2015



El Niño is Here

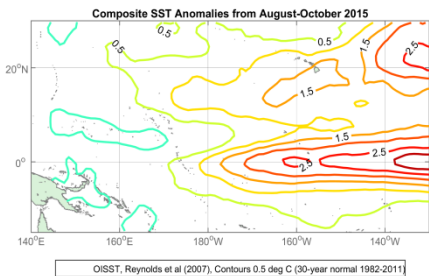
Near normal rainfall fell over most of the eastern Federated States of Micronesia, the Marshall Islands, Guam and the Commonwealth of the Northern Marianas.

Below-normal rainfall was observed in American Samoa, Yap, and Palau.

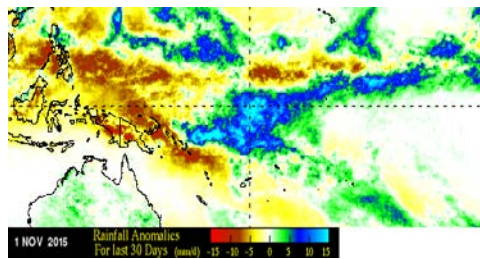
Severe coral bleaching was observed in Hawaii.

Through October, there have been 27 tropical cyclones in the western North Pacific.

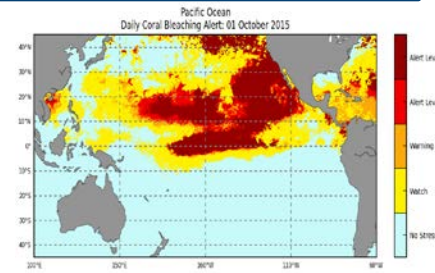
Regional Climate Overview for 3rd Quarter 2015



Sea-Surface Temperature Anomalies, valid Oct 15, 2015. Source: <https://www.ncdc.noaa.gov/oisst>



October 2015 precipitation anomaly. Source: <http://irdl.ldeo.columbia.edu/>



Coral Bleaching Alert Areas as of October 1. Source: <http://www.coralreefwatch.noaa.gov>

The region is under an El Niño Advisory, and weather patterns were unambiguously in a climate state of El Niño during the quarter (e.g., a abundant typhoons, decadal-low sea levels, and developing dry weather in western Micronesia). **As of November 2nd, the Niño 3.4 region anomaly was +2.7°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 1.0°C from Hawaii eastward, while cold anomalies near -0.5°C surfaced across the Marshall Islands and much of FSM. **Sub-surface water temperature anomalies are still 4-6°C above normal to a depth of 150m** across much of the central and eastern equatorial Pacific, especially east of 150°W. **Sea-levels continued to record further falls**, with Palau and Yap 8" below normal, Kwajalein 5" below normal, and Majuro 4" below normal.

In Hawaii, rainfall was substantially above normal for the quarter at Honolulu (412%), Lihue (182%), Kahului (167%), and Hilo (180%), eradicating all drought from the State. Honolulu, Hawaii experienced its wettest August on record with rainfall of 7.63" breaking the old record of 3.74" set in 2004, while Hilo, Hawaii recorded an astounding 53.18" of rain during the quarter. In Saipan, Typhoon Souledor brought 10-15" of rain in 24-hours in early August, and in mid-October, Tropical Storm Champi brought another 20" of rain to the island. For the quarter, Saipan was 146% of normal and Guam was wet as well with 113% of normal. In Kwajalein and Majuro in the RMI, rainfall was above normal with 115% and 119% of normal respectively. In the FSM, quarterly rainfall was also above normal: Chuuk (128%), Kosrae (105%), and Pohnpei (127%). Further west, dry conditions continued in Palau as rainfall was 84% of normal. In American Samoa, rainfall was below normal for the quarter (66%).

Tropical Cyclone (TC) activity in the western North Pacific basin was abundant with many USAPI being affected by heavy rain, large surf, and gale force winds associated with tropical cyclones. In early August, the eye of Typhoon Souledor passed directly overhead Saipan with peak winds near 125 mph. Typhoons Koppu and Champi produced heavy rains, strong winds, and high seas from Kosrae westward through Guam and CNMI. A peak wind gust of 81 mph was measured on Saipan as cyclone Champi made it's closest approach to the island in mid-October. To date, the Central North Pacific basin had 15 tropical cyclones in 2015 which easily breaks the previous record of 11 set back in 1992 and repeated in 1994

Sectoral Impacts for 3rd Quarter 2015

Facilities and Infrastructure – Unusual gusty westerly winds in September continued to cause swells in the Majuro lagoon resulting in minor erosion. The eye of Typhoon Souledor passed directly over Saipan in early August causing widespread power outages, building damages, communication failures, and overturned vehicles.

Water Resources – The water storage reservoir on Majuro was 83% full as of 3 November. Extreme dryness in September in Pago Pago has accelerated water conservation measures, including the frantic repair of leaky pipes in the distribution system.

Agriculture – Typhoon Souledor completely defoliated and uprooted many trees on Saipan in early August. Moderate drought in American Samoa sparked wildfires and trees dropped their leaves.

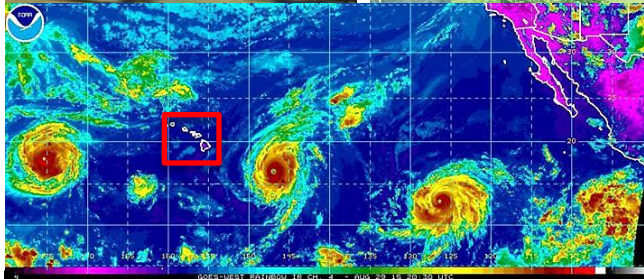
Natural Resources – The tuna catch rate was substantially above average across the Hawaiian Islands forcing a 2-month closure of fishing waters to longline vessels. Meanwhile, fishing on Kosrae and Pohnpei has been severely disrupted by the incessant westerly winds and high surf. Significant coral bleaching was observed around the Hawaiian Islands.

Public Health – Southwest winds have blown haze and smoke from intense wildfires across Indonesia over parts of Guam, CNMI, and Palau this quarter, causing respiratory issues and allergies. Excessive rainfall in August on the island of Oahu resulted in the closure of famed Waikiki Beach due to an infection risk posed by the release of 500,000 gallons of sewage into the ocean.

Trees stripped bare and blown over in Saipan from Typhoon Souledor. Photos courtesy of Mark Lander, University of Guam.

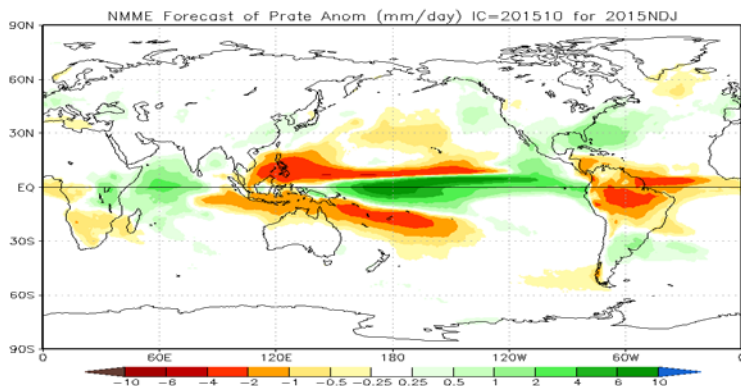


Mudslide in Chuuk due to heavy rains. Photo courtesy of Sanchez Salle, NOAA.



A record three (3) simultaneous Major Hurricanes in the Central Pacific basin, with Hawaii just left of center. NOAA. 31-Aug-2015.

Regional Outlook for 4th Quarter 2015 (Nov-Jan)



Rainfall Anomaly Forecast, Valid Nov-Jan. Source: http://www.cpc.ncep.noaa.gov/products/NMME/current/prate_Seas1.html

The latest climate model consensus indicates there is a 100% chance of El Niño conditions continuing throughout the November-January period.

The SST anomaly outlook for the 4th quarter indicates below-normal values in American Samoa, with slightly below normal values across CNMI, FSM, RMI, and Palau. Above-normal SST anomalies are forecast in the Hawaiian Islands. The 4-month coral bleaching outlook projects thermal stress to last through at least the end of February in the central equatorial Pacific Ocean, but is not forecast to affect any of the USAPI.

The forecast values for sea level in the 4th quarter indicate that most of the USAPI stations are likely to be considerably below normal. Palau, Yap, Pohnpei, Chuuk, and Majuro are expected to be well below normal, while other USAPI stations continue to remain near decadal lows.

Severe drought is likely across Palau and much of FSM, including Yap, Chuuk, Pohnpei, and Kosrae. Drought will expand to include Kwajalein and Majuro in the RMI, American Samoa, and eventually the Hawaiian Islands by late in the quarter. Near normal rainfall is anticipated in Guam and CNMI.

Tropical cyclone (TC) activity in the western north Pacific is expected to remain above normal, which is typical during El Niño periods. During the last major El Niño event in 1997, Nov-Jan an additional 4 typhoons were spawned. In the southwest Pacific, due to strong El Niño conditions, the chances for TC activity are 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/>