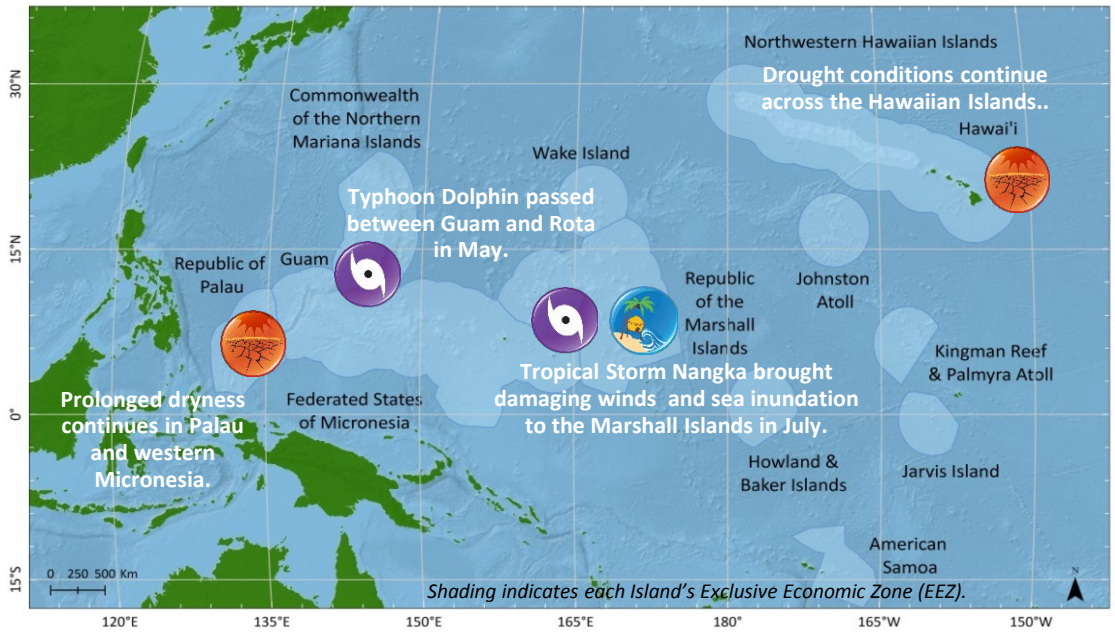
Climate Impacts and Outlook

Hawaii and U.S. Pacific Islands Region

3rd Quarter 2015

Significant Events and Impacts for 2nd Quarter 2015



El Niño Advisory

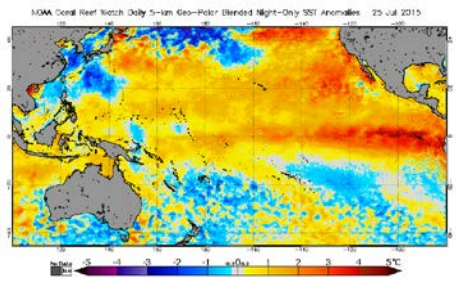
Above normal rainfall fell over most of the Federated States of Micronesia, Guam and the Commonwealth of the Northern Marianas.

Near-normal rainfall was observed in American Samoa and the Marshall Islands.

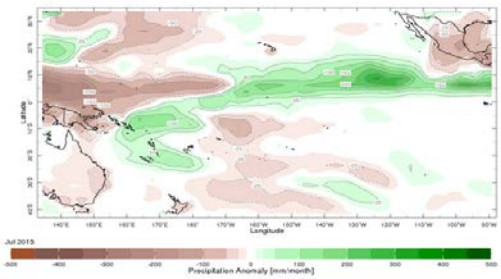
Hot and dry weather was recorded across Hawaii.

Through July, there have been a **record 11 typhoons so far this season** in the western North Pacific.

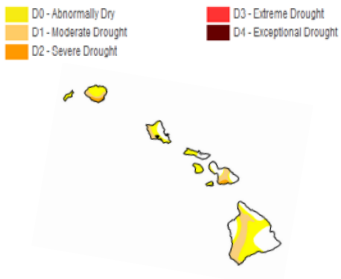
Regional Climate Overview for 2nd Quarter 2015



Sea-Surface Temperature Anomalies, valid Jul 25, 2015 . Source: http://coralreefwatch.noaa.gov



July 2015 precipitation anomaly. Source: http://iridl.ldeo.columbia.edu/



U.S. Drought Monitor for Hawaii, Aug 4, 2015. Source: http://www.drought.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., abundant early-season typhoons, decadal -low sea levels, and wet weather across most of Micronesia). **As of August 3rd, the Niño 3.4 region anomaly was +1.7°C, supporting a strong El Niño state.**

S*ea-surface temperatures* were above normal across the central and eastern equatorial Pacific, with the warmest anomalies exceeding 1.5°C from Hawaii southwest to the Marshall Islands and further west toward Guam. ***Sub-surface water temperature*** **anomalies are still 4-6°C above normal across much of the central and eastern equatorial Pacific**, especially east of 150°W. *Sea-levels* continued to record further falls, and **most stations are below normal and are much lower than sea-levels seen over the last decade**.

In Hawaii, *rainfall* was below normal at Honolulu (62%), Lihue (47%), and Hilo (80%), keeping each of the Hawaiian Islands in at least some stage of drought/dryness. In Guam, Typhoon Chan-hom brought 10-15" of rain in 24-hours in early July and for the quarter was 150% of normal, and Saipan was also 150% of normal. In Kwajalein and Majuro in the RMI, rainfall was near to above normal with 140% and 103% of normal respectively. In the FSM, quarterly rainfall was above normal: Chuuk (101%), Kosrae (104%), and Pohnpei (158%). Further west, **dry conditions continued in Palau as rainfall was only 56% of normal**. In American Samoa, rainfall was above normal for the quarter (132%)**.**

Honolulu, Hawaii experienced its warmest July on record with an *average temperature* of 83.3°F, or 2.1°F above average, breaking the old record set in 1995.

Tropical Cyclone **(TC) activity in the western North Pacific basin set a new record with 11 named storms through July 15**. Typhoon Noul passed just 10 miles south of Yap in early May, with the airport recording wind gusts to near 70 mph and Typhoon Souledor slammed Saipan in early August (more on TY Souledor will be covered next quarter). In the South Pacific Ocean, TC activity was slightly higher than normal; in May a weak depression formed north of the Solomon Islands, and sub-tropical storm Katie developed outside the easternmost part of the basin off the coast of Chile. In very late June, TC Raquel formed near the Solomon Islands, and was the first named TC to exist in the South Pacific Ocean during July on record, while it was the third TC on record in the Australian region.

Sectoral Impacts for 2nd Quarter 2015

Coastal Hazards – Above average southerly swell periodically affected Hawaii with warning-level surf on May 31 and July 25 as wave faces were 15-20'. The high waves were a result of a strong winter storms near New Zealand.

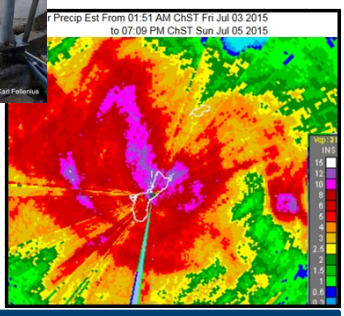
Facilities and Infrastructure – Anomalous westerly swell inundated parts of Majuro's eastern lagoon coastline due to passing tropical storm Nangka in early July. Many boats were ripped from their moorings and were thrown ashore. Parts of the Robert Reimers Hotel lagoon-side seawall was destroyed while high winds tore roofs from houses causing widespread blackouts.

Water Resources – As of the end of July, the reservoir in Majuro, RMI is at 78% capacity.

Agriculture – Severe drought on Maui, Hawaii, has affected the available cattle feed near Kaupo Ranch. Prolonged dryness and feral goats have contributed to the loss of grass, impacting grass-fed beef processing on the island.

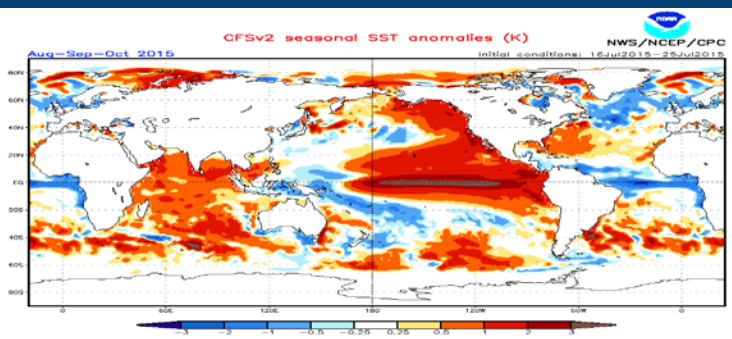
Natural Resources – Coral bleaching hotspots persisted through the central equatorial Pacific and new hotspots have developed stretching into parts of the northeastern Pacific Ocean toward the Hawaiian Islands. Other hotspots have developed near Guam and the Mariana Islands.

Lagoon-side inundation on Majuro due to T.S. Nangka. Photos courtesy of Karl Fellenius, Hawaii Sea Grant.



Radar-estimated rainfall on Guam (center) from Typhoon Chan-hom. Pink areas are greater than 10".

Regional Outlook for 3rd Quarter 2015 (Aug-Oct)



SST Anomaly Forecast, Valid Aug-Oct. Source: http://www.cpc.ncep.noaa.gov/products/people/wwang/cfsv2fcst/

The latest climate model consensus continues to suggest greater than 90% chance of El Niño conditions continuing during the August-October period. Further strengthening of El Niño is forecast through northern hemisphere Fall 2015.

The SST anomaly outlook for the 3rd quarter indicates near-normal values in American Samoa, with slightly below normal values across CNMI and Palau. Above-normal SST anomalies are forecast in the Hawaiian Islands and northern Marshalls. **The 3-month coral bleaching outlook indicates that thermal stress is expected to continue through at least the end of November in the central equatorial Pacific Ocean and around Hawaii. High stress may cause significant coral bleaching in the Hawaiian Islands through the quarter.**

The forecast values for sea level in the 3rd quarter indicate that most of the USAPI stations are likely to be below normal. Palau, Yap, and Chuuk are expected to be well below normal, while other USAPI stations remain near decadal lows. Due to the strengthening El Niño, we may see a considerable fall of sea-level in the region in October 2015.

Rainfall is anticipated to be near-normal for Pohnpei, CNMI, Chuuk, Majuro, Yap , Palau, and Kosrae. Rainfall for American Samoa is also projected to be near normal. **Drought persistence and expansion is expected in leeward areas of the Big Island of Hawaii.**

Tropical cyclone activity in the western Pacific is expected to be above normal, which is typical during developing El Niño periods. In the southwest Pacific, the period from August-October is the most inactive period of the year. However, in the last strong El Niño season in 1997, 2 TCs developed in October.

Regional Partners

Pacific ENSO Applications Climate Center:
http://www.prh.noaa.gov/peac/

NOAA NWS Weather Forecast Office Honolulu:
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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/