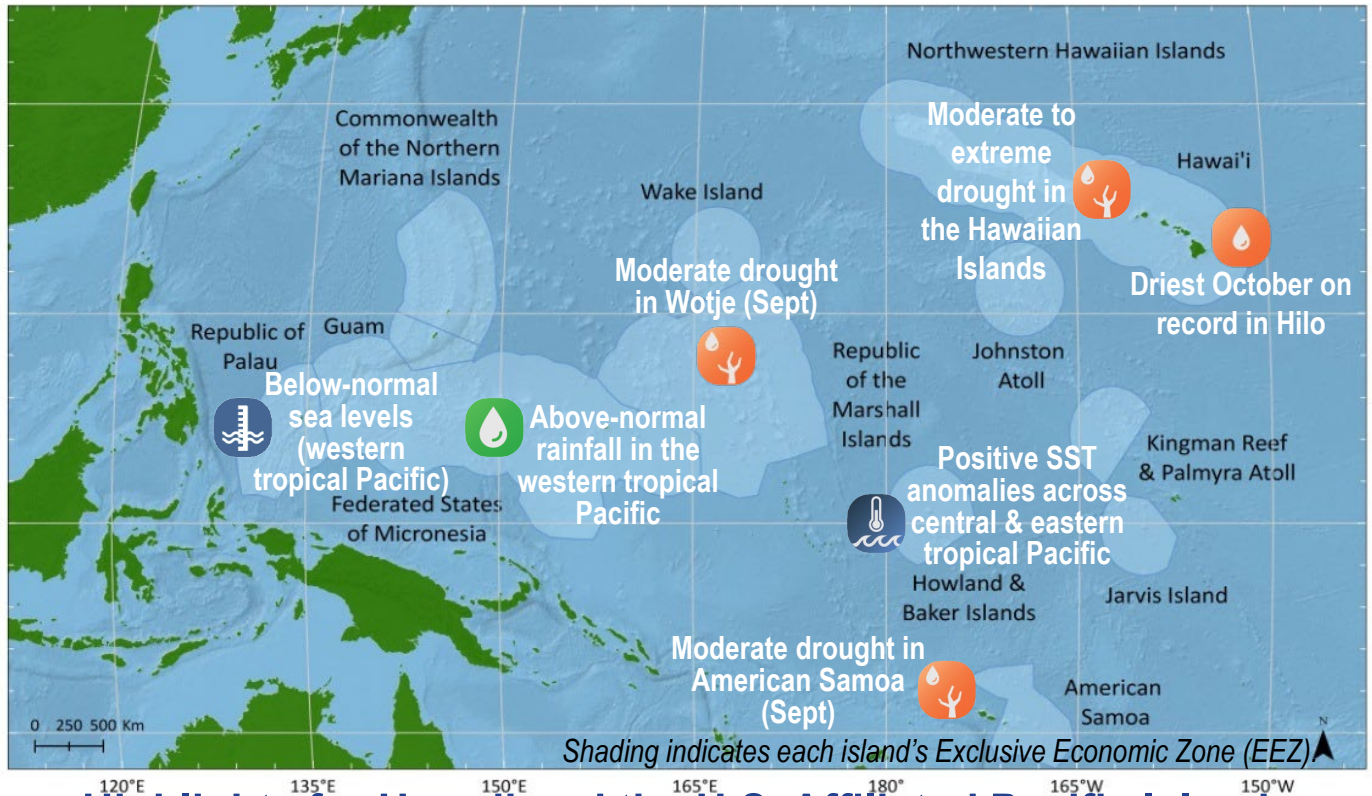




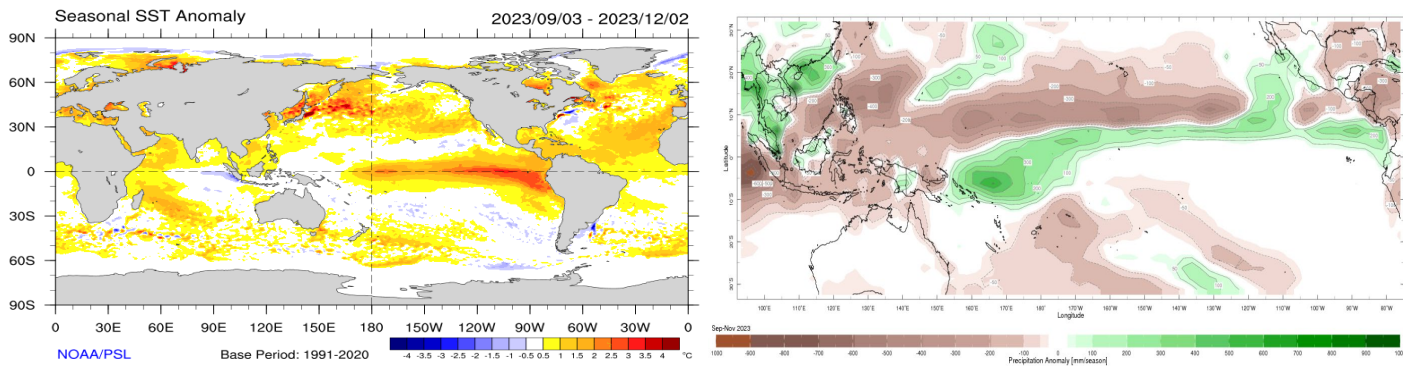
Significant Events – For September 2023–November 2023



Highlights for Hawaii and the U.S. Affiliated Pacific Islands

- El Niño Advisory was in effect (12/14/23) with above-normal sea surface temperatures (SSTs) observed across the central and eastern equatorial Pacific Ocean. El Niño is expected to continue through the Northern Hemisphere winter and favored to transition to ENSO-neutral during the April-June 2024 period (60% chance), according to NOAA Climate Prediction Center (CPC).
- For the Sept-Nov (SON) period, precipitation was above normal across much of the U.S. Affiliated Pacific Islands (USAPI) including Palau, Guam, Commonwealth of the Northern Mariana Islands (CNMI), and in the Federated States of Micronesia (FSM). Conversely, drier-than-normal conditions were observed across areas of the Republic of the Marshall Islands (RMI), American Samoa, and the Hawaiian Islands.
- For the SON period, most of the USAPI region was drought-free, except for Moderate Drought (D1) observed in September in American Samoa and Wotje (RMI). In the Hawaiian Islands, drought intensified with Moderate-to-Extreme (D1-D3) drought observed with extreme drought occurring on the Big Island, Maui, and Molokai, according to the U.S. Drought Monitor (USDM). However, heavy rainfall associated with a Kona Low (seasonal subtropical cyclone) in late November provided relief to drought-affected areas and caused significant flooding.
- Above-normal sea levels were observed in the eastern tropical Pacific in November, while below-normal sea levels occurred in the western tropical Pacific, according to the University of Hawaii Sea Level Center.

Climate Overview – For September 2023–November 2023



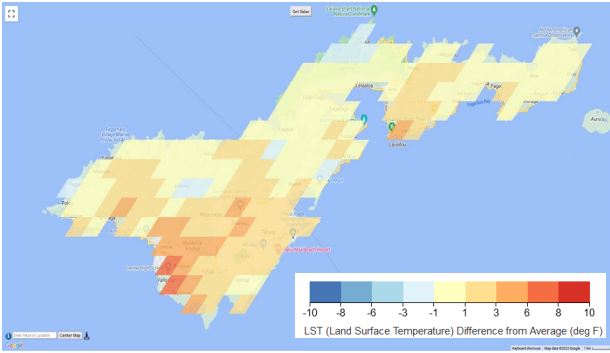
Seasonal sea surface temperature anomaly map for 9/3/23 to 12/2/23 (left) and 3-month seasonal precipitation anomalies for the September–November 2023 period (right). Areas with above-normal precipitation are depicted in green while areas with below-normal amounts are depicted in brown. Source: NOAA PSL, IRI, NOAA CPC CAMS-OPI.

By the end of the SON period, SSTs were above-normal across the central and eastern tropical Pacific Ocean with an El Niño Advisory in effect (12/4/23). According to NOAA CPC update (12/4/23), Niño region SST departures were above normal across the equatorial Pacific Ocean with Niño 3.4 at 2.0°C, Niño 3 at 2.0°C, Niño 1+2 at 2.1°C, and Niño 4 at 1.7°C.

During the SON period, above-normal sea levels (5-20 cm) were observed across much of the eastern tropical Pacific Ocean with the greatest anomalies (Nov) observed off the coast of Central America. In USAPI, below-normal sea levels (5-20 cm) were occurring across much of the region with the greatest anomalies in areas of RMI. Overall, the basin-wide sea level pattern was consistent with El Niño conditions and a moderating negative Pacific Meridional Mode, according to the University of Hawaii Sea Level Center.

During the SON period, most of the USAPI was drought-free, with exception of Moderate Drought (D1) observed during September in American Samoa and Wotje (RMI). Median precipitation for the SON period was above normal across most of the USAPI with exception of isolated areas of FSM, RMI, and American Samoa. For SON, Airai (Palau) recorded 37.71 in. (104% of normal). In FSM, Yap observed 27.15 in. (76% of normal), Kapingamarangi 49.14 in. (155% of normal, wettest SON on record), Pohnpei 58.67 in. (133% of normal, 4th wettest SON), Lukunor 34.46 in. (103% of normal), Kosrae 56.91 in. (126% of normal, 4th wettest SON), and Chuuk 40.7 in. (113% of normal). In the Mariana Islands, Saipan observed 28.27 in. (101% of normal) and Guam 36.04 in. (106% of normal). In the RMI, Majuro observed 30.76 in. (80% of normal, 10th driest SON), while Kwajalein logged 35.71 in. (112% of normal). In American Samoa, precipitation was below normal (22.32 in., 77% of normal, 2nd driest November) at Pago Pago and the average temperature was 84.4°F during November (2nd hottest on record). Across much of the Hawaiian Islands, below-normal rainfall prevailed during the SON period with September and October being very dry leading to intensification of drought conditions across areas of the Big Island, Maui, and Oahu, according to the U.S. Drought Monitor. However, some improvement in conditions occurred during late November in response to a multi-day Kona Low event that produced locally very heavy rainfall accumulations (11-20+ in.)—particularly on the windward sides of the Big Island and Maui. For the SON period, Lihue observed 7.32 in. (77% of normal), Honolulu 2.82 in. (61% of normal), Molokai 2.91 in. (56% of normal), Kahului 1.06 in. (34% of normal), Kailua Kona 2.71 in. (119% of normal), and Hilo 14.7 in. (53% of normal).

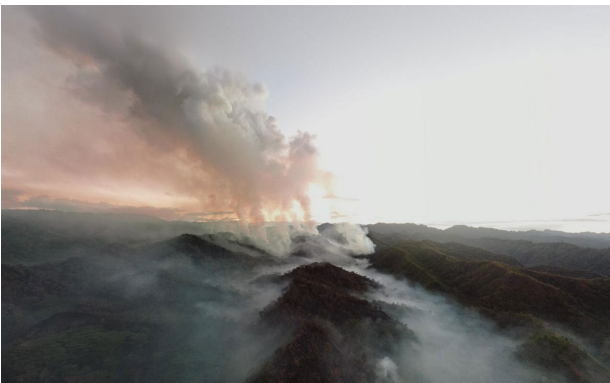
In the Northwest Pacific region (west of 135°E), tropical cyclone (TC) activity was below normal for the 2023 season, with 15 named storms with an Accumulated Cyclone Energy (ACE) Index of 271.6 (normal 285.8) by 11/30/23. In the Northeast Pacific region (east of 180°W), the ACE Index by the end of the season was above normal (164 by 11/30/23—normal for the date 132.6). In the South Pacific (east of 135°E), the season has started out above normal with an ACE Index of 17.1 (normal 2.8), according to the Colorado State University, Tropical Weather & Climate Research Group.



Satellite-based Land Surface Temperature (LST) anomalies (difference from average temperature – deg F) for Tutuila Island, American Samoa in November 2023.
Source: Climate Engine, NASA MODIS Aqua.



Flooded roadway at Nu'u, Kaupō Gap, Maui.
Source: Maui Police Department.



Aerial view of the Mililani Mauka Fire on 11/1/23 at 6:45 a.m.
Source: Honolulu Fire Department.

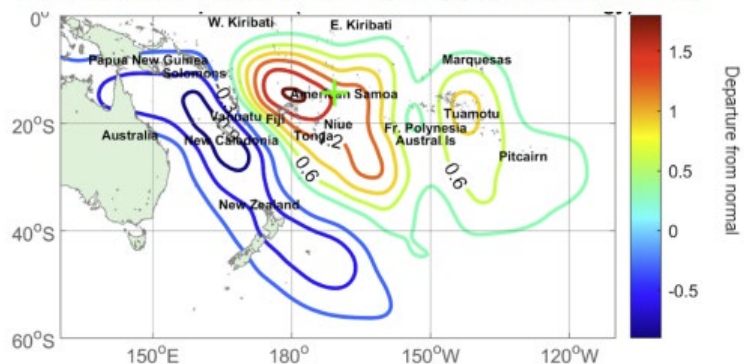
Heat – During November, the observing station at National Weather Service (NWS) office at the Pago Pago International Airport (American Samoa) reached or exceeded 90°F nine times. For the month, the mean average temperature was 84.4°F (2nd warmest November on record), while the mean maximum temperature reached 89.9°F (3rd warmest), and the mean average minimum temperature was 79.9°F (2nd warmest).

Facilities and Infrastructure – In the Hawaiian Islands, a multi-day Kona Low (late November-early December) storm system brought locally heavy rainfall and significant flooding to areas of the island chain. Impacts from the event included strong thunderstorms, widespread road closures due to flooding, debris on highways, and landslides. In American Samoa, heavy rainfall (9/17/23) caused a landslide along the main road near the village of Agugulu on the west side of the island of Tutuila, according to the National Weather Service Pago Pago.

Water Resources – In Majuro (RMI), reservoir storage reached 88% of total capacity (36,000,000 gallons) on 11/30/23. In Maui, the Department of Water Supply (Maui County) declared a Stage 2 Water Shortage on 11/8/23.

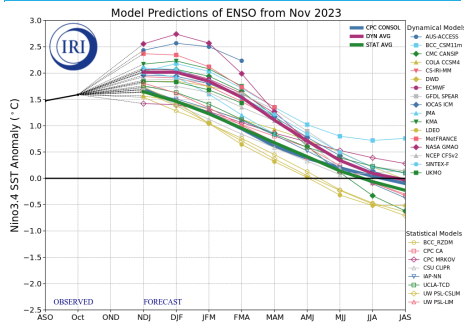
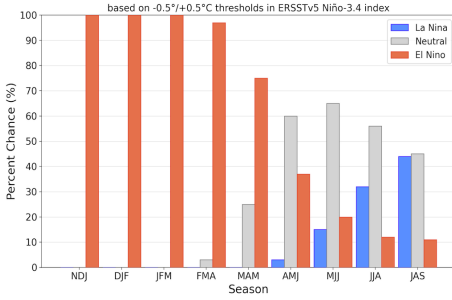
Wildfires – In central Oahu, the Mililani Mauka Fire burned ~1700 acres of native rainforest, mainly within the Oahu Forest National Wildlife Refuge (Ko'olau Range)—home to 22 species listed as endangered or threatened. The location where the fire started was described as unusual in relation to its geographic location within the normally wet upper slopes of the Ko'olau Range—with very low rainfall (and associated dry vegetation) during October as a likely contributing factor.

2023-24 Seasonal Outlook of TC Frequency (Departure from Normal)



American Samoa tropical cyclone (TC) forecast for the 2023-24 season (above right). The green plus symbol (+) shows the location of American Samoa. Red (blue) areas indicate more (less) TC activity compared to normal. Source: NWS Pago Pago.

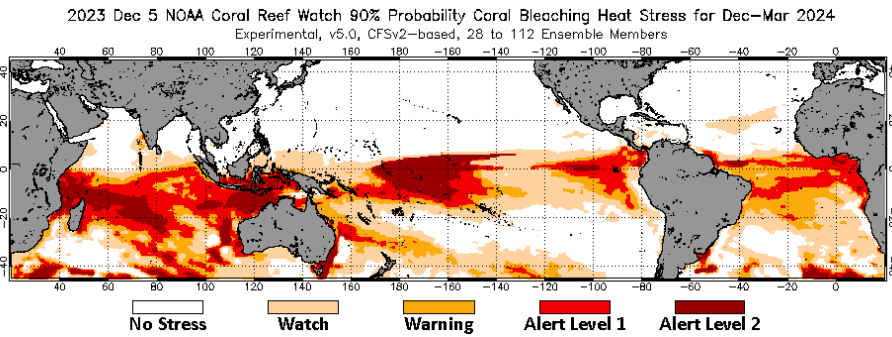
Official NOAA CPC ENSO Probabilities (issued Dec. 2023)



Forecast for each of the three possible ENSO categories for the next 8 overlapping 3-month seasons. Blue bars show the chances of La Niña, gray bars the chances for neutral, and red bars the chances for El Niño (left) and ENSO forecast model predictions (right).
Source: NOAA CPC, Columbia University IRI.

According to the latest ENSO prediction model simulations (above right), there is relatively strong agreement amongst the dynamical models in the IRI ENSO prediction plume that the positive SST anomalies will peak during the Dec-Feb 2024 period and is favored to transition to ENSO-neutral conditions during April-June 2024 (60% chance).

NOAA's Coral Reef Watch four-month coral bleaching heat stress outlook (Dec 2023-Mar 2024) calls for a high probability (90%) of high heat stress (Alert Level 1-2) developing in areas of the tropical Pacific Ocean extending from ~90°W to ~170°E. Moreover, a heat stress Watch is forecast for areas of RMI, Palau, and American Samoa.



NOAA Coral Reef Watch four-month coral bleaching heat stress outlook for Dec-Mar 2024. Red and maroon colors represent areas with a high probability of coral bleaching heat stress Alert Levels 1 & 2. Source: NOAA NESDIS.

During the period of December 2023 through February 2024, below-normal precipitation is forecasted for areas across USAPI, including FSM, Guam, CNMI, Palau, and American Samoa. Likewise, below-normal precipitation is expected across the Hawaiian Islands, according to the NOAA Pacific ENSO Applications Climate Center.

According to NOAA's latest tropical cyclone forecast (10/26/23) for the 2023-24 season, the ongoing El Niño event is forecasted to bring an elevated risk of tropical cyclones for American Samoa from November 2023 through April 2024.

- NOAA Coral Reef Watch:
<https://coralreefwatch.noaa.gov/>
- NOAA National Centers for Environmental Information:
<https://www.ncei.noaa.gov/>
- NOAA NMFS Pacific Island Fisheries Science Center:
<https://www.fisheries.noaa.gov/region/pacific-islands#science>

- NOAA NWS Weather Forecast Office Honolulu & Guam:
<https://www.weather.gov/hfo/>
<https://www.weather.gov/gum/>

- NOAA OceanWatch - Central Pacific:
<https://oceanwatch.pifsc.noaa.gov/>

- NPS Pacific Island Inventory & Monitoring Network:
<https://www.nps.gov/im/pacn/index.htm>

- University of Guam - Water and Environmental Research Institute:
<https://weri.uog.edu/>

- University of Hawaii - Asia Pacific Data Research Center (APDRC):
<http://apdrc.soest.hawaii.edu/index.php>

- University of Hawaii - Joint Institute of Marine and Atmospheric Research:
<https://www.soest.hawaii.edu/jimar/>

- University of Hawaii - Sea Level Center:
<https://uhslc.soest.hawaii.edu/>

- USGS Science Center - Pacific Coastal and Marine Science Center:
<https://www.usgs.gov/centers/pcmssc>

- USGS Pacific Islands Water Science Center:
<https://www.usgs.gov/centers/piwsc>

- Western Regional Climate Center:
<https://wrcc.dri.edu/>