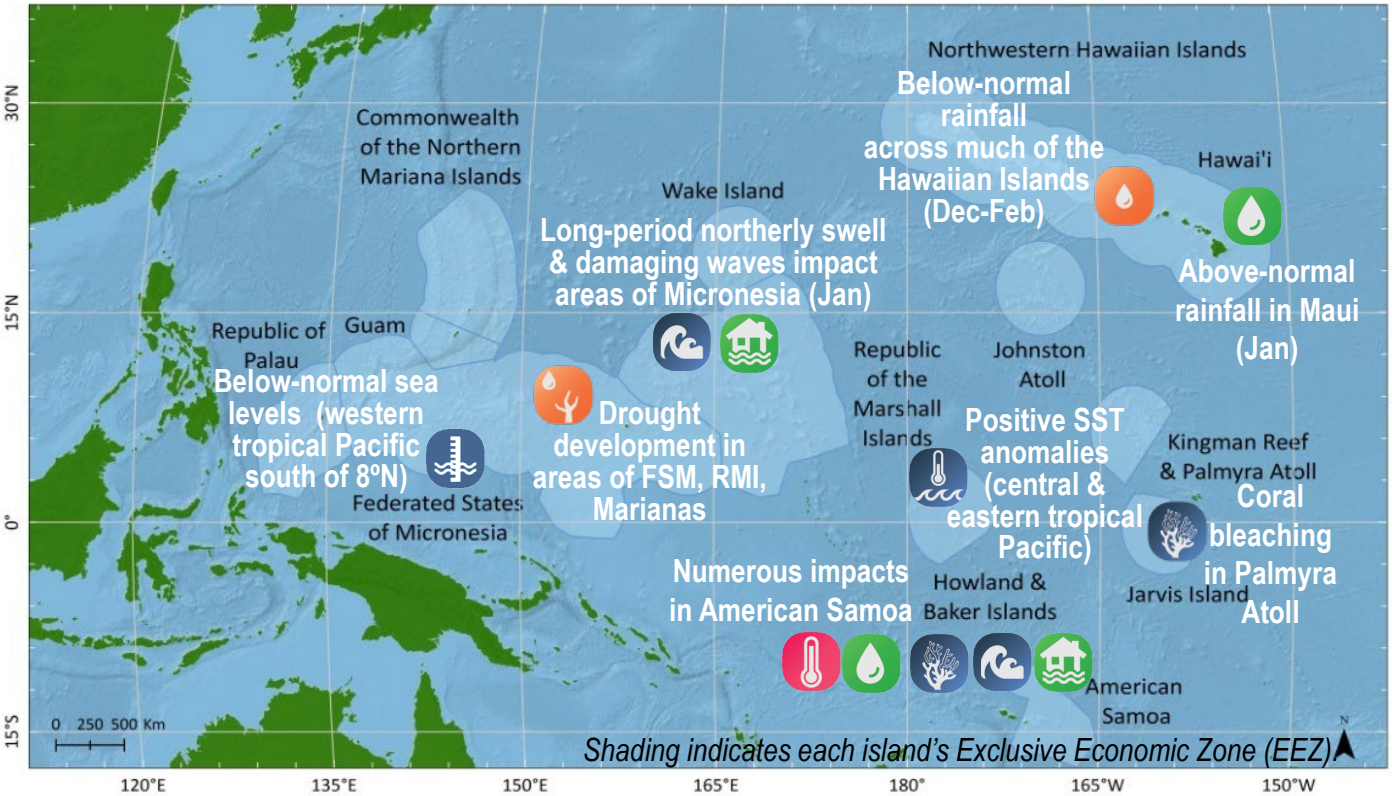
Significant Events – *For December 2023–February 2024*



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

- El Niño Advisory/La Niña Watch was in effect (3/14/24) with above-normal sea surface temperatures (SSTs) observed across the central and eastern equatorial Pacific Ocean. A transition from El Niño to ENSO-neutral is expected by April-June 2024 (83% chance) with increasing odds of La Niña developing (62%) during June-August 2024, according to the NOAA Climate Prediction Center (CPC).
- For the Dec-Feb (DJF) period, above-normal rainfall was observed across American Samoa, while drier-than-normal conditions prevailed across much of FSM, RMI, Mariana Islands, and the Hawaiian Islands. For the DJF period, moderate to severe drought conditions (D1-D2) were observed in areas of USAPI including Guam, CNMI (Rota, Saipan), FSM (Pingelap, Woleai, Ulithi, Yap Proper), and RMI (Kwajalein, Wotje).
- In late January, a strong storm system in the far northern Pacific generated a very long-period north swell that propagated across the western tropical Pacific impacting areas of Micronesia (FSM, RMI) and south of the equator in American Samoa. Powerful waves generated by the swells caused coastal flooding and erosion as well as significant damage to homes, facilities, and infrastructure in several low-lying islands in RMI and FSM.
- Numerous climate-related impacts were observed during DJF in American Samoa, including periods of excessive heat, above-normal sea surface temperatures (SSTs), coral bleaching, coastal erosion, inundation, numerous flash flooding events, and landslides.

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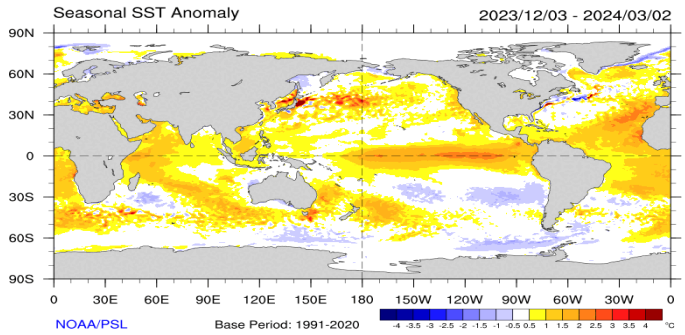
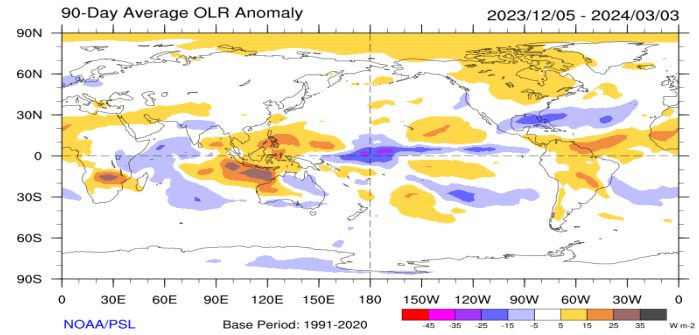
Climate Overview – *For December 2023–February 2024*





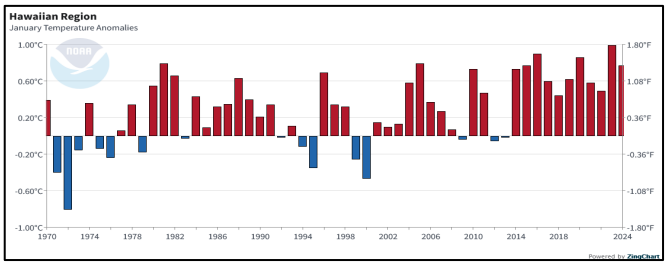
Seasonal sea surface temperature anomaly map for 12/3/23 to 3/2/24 (left) and 90-day seasonal outgoing long-wave radiation (OLR) anomalies for the 12/5/23-3/3/24 period (right). Areas with more clouds/rain are depicted in blue-violet colors while areas with fewer clouds/less rain are depicted in yellow-orange colors. Source: NOAA Physical Sciences Laboratory.

By the end of the DJF period, SST anomalies were above-normal across the central and eastern tropical Pacific Ocean with an El Niño Advisory/La Niña Watch in effect, according to the latest NOAA CPC update (3/14/24). During February, Niño region SST anomalies continued to weaken across most of the equatorial Pacific with an area of below-normal SSTs emerging in a small region of the eastern equatorial Pacific Ocean (~100ºW). This week, the Niño indices weakened but remained positive with Niño 3.4 at 1.4˚C, Niño 3 at 1.0˚C, Niño 1+2 at 1.0˚C, and Niño 4 at 1.1˚C.

During the DJF period, above-normal sea levels (5-20 cm) were observed across much of the eastern tropical Pacific Ocean and areas north of ~10ºN in the northwestern tropical Pacific Ocean, while below-normal sea levels (5-20 cm) were observed in the northwestern tropical Pacific near the equator (south of ~8ºN) extending southward to areas around the Solomon Islands and Samoan Islands. By late February, the basin-wide sea level pattern was consistent with having passed the peak of El Niño conditions, according to the University of Hawaii Sea Level Center.

Median precipitation (DJF) was below normal across most of the USAPI, while near-normal totals were observed in Palau and Saipan. For DJF, Airai (Palau) recorded 33.28 in. (98% of normal). In FSM, Yap Proper observed 12.1 in. (55% of normal), Kapingamarangi 43.56 in. (132% of normal, 5th wettest DJF on record), Pohnpei 30.68 in. (76% of normal), Lukunor 22.79 in. (71% of normal), Kosrae 37.53 in. (70% of normal), Chuuk 26.76 in. (90% of normal), and Pingelap recorded its 3rd driest DJF on record. In the Mariana Islands, Saipan observed 9.99 in. (99% of normal) and Guam 9.75 in. (65% of normal). In the RMI, Majuro observed 17.45 in. (62% of normal), while Kwajalein logged 10.45 in. (67% of normal). In American Samoa, precipitation was well above normal (68.08 in.,169% of normal, 4th wettest DJF) at Pago Pago. Across much of the Hawaiian Islands, below-normal rainfall prevailed during the DJF period despite wetter-than-normal conditions observed in Maui during January. For the DJF period, Lihue observed 7.46 in. (67% of normal), Honolulu 3.82 in. (64% of normal), Molokai 7.57 in. (87% of normal), Kahului 6.77 in. (94% of normal), Kailua Kona 3.15 in. (88% of normal), and Hilo 16.6 in. (55% of normal).

In the South Pacific region (east of 135ºE), tropical cyclone (TC) activity has been slightly below normal for the 2023-24 season, including 7 named storms with an Accumulated Cyclone Energy (ACE) Index of 43.5 (normal 45.2) by 2/29/24, according to the Colorado State University Tropical Weather & Climate Research Group.



Time-series plot of combined land and ocean surface temperature anomalies (departure from 1910-2000 average) for the month of January between 1970-2024—Hawaiian Region (left). Positive anomalies (red) indicate warmer-than-normal temperatures and negative anomalies (blue) cooler-than-normal temperatures. Source: NOAA Global Surface Temperature Analysis; NOAA NCEI.

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http://apdrc.soest.hawaii.edu/Hawaii_USAPI_Climate_Summary/dashboard

Sectoral Impacts – *For December 2023–February 2024*

The U.S. Coast Guard Cutter, Oliver Henry (WPC 1140), arriving (2/1/24) at Dekhitik Harbor in Pohnpei, FSM as part of an international effort delivering essential supplies and equipment to drought-affected outer islands of Nukuoro and Kapingamarangi Atolls.
Source: U.S. Coast Guard News.

Water Resources – On 1/12/24, a drought state of emergency was declared by the Pohnpei Governor Stevenson A. Joseph. On 2/17/24, Governor Joseph visited Pingelap Atoll as part of a delegation to assess the drought conditions (water supply shortage) and discuss the ongoing collaborative mitigation efforts. As part of the international drought relief effort, the governments of the United States and Australia joined in the effort delivering much-needed fresh water and other relief supplies to affected islands in Pohnpei, Chuuk, and Yap states. In Majuro (RMI), reservoir storage reached 71% of total capacity (36,000,000 gallons) on 2/29/24.

Key officials, including Governor Joseph, visiting drought-stricken Pingelap Atoll (2/17/24) where critical relief supplies were delivered to help meet local water needs.
Source: Office of the Governor, Pohnpei State, FSM.

Facilities and Infrastructure – In late January, a powerful storm system (1/17/24) in the far northern Pacific generated a very long-period northerly swell that propagated across the western tropical Pacific impacting areas of Micronesia (FSM, RMI) on 1/20/24 and south of the equator in American Samoa. Powerful waves associated with the swell caused significant flooding, evacuations, and damage to homes and infrastructure. Moreover, U.S. military installations, most notably Roi-Namur (below) in the northern sector of Kwajalein Atoll (RMI), were impacted during the event. Other islands affected included Ailinglaplap Atoll and Arno Atoll (RMI) as well as areas of FSM including eastern Yap, Pohnpei, and Kosrae states. On 2/22/24, the long-period swell reached American Samoa producing damaging waves (15-20 feet), which caused considerable damage in low-lying villages on the northern shores of American Samoa (Tutuila, Olosega, and Ta'u islands) including localized flooding and scattering ocean debris (bottom left), according to the NWS Pago Pago.

Numerous low-pressure systems, associated with the South Pacific Convergence Zone, brought periods of very heavy rainfall accumulations to Tutuila, American Samoa during the DJF period. Local storm-related impacts included widespread flooding, damage to homes, debris on roadways, power outages, and disruptions to broadband and telecommunications services, according to reports from the National Weather Service (NWS) Pago Pago.

Large swells/high surf (1/22-23) caused coastal flooding and erosion in Faleāsao Village on the island of Ta'u in the Manu'a Islands, American Samoa.
Source: FB Manu'atele Community Worldwide; NWS Pago.

Flooded runway and debris at the Woja Island Airport, Ailinglaplap Atoll, RMI (above left). Storm surge damage to infrastructure in Roi-Namur, Kwajalein, RMI (above right).
Source: Marshall Islands Journal; U.S. Army.

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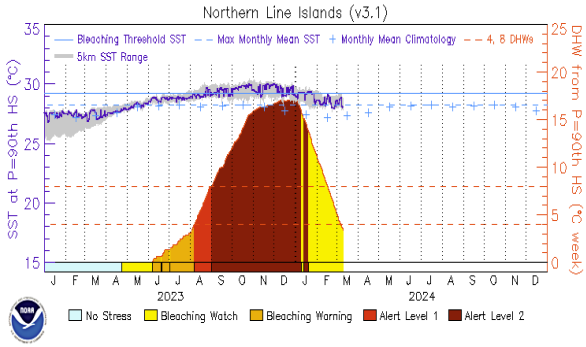
Exposed coral reef during an extreme low tide, coupled with low sea levels, event near the village of Faga'alu, Tutuila Island, American Samoa.
Source: Eric Brown, National Park Service.



Time-series graphs depicting satellite-based sea surface temperatures, and associated coral bleaching alert levels (red, maroon) for the Northern Line Islands (includes Palmyra Atoll) in the central Pacific Ocean for 2023-24. Areas in maroon indicate bleaching Alert Level 2.
Source: NOAA Coral Reef Watch.

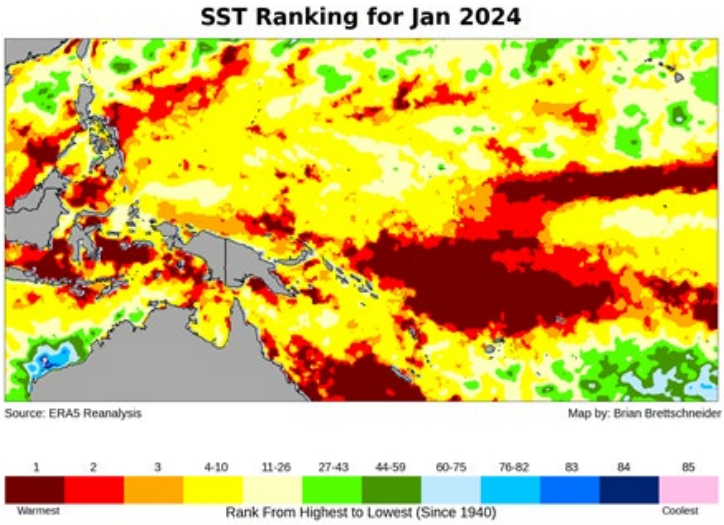
Observed mass bleaching event in coral reef terraces in Palmyra Atoll, Northern Line Islands (January 2024).
Source: Molly Ginther/The Nature Conservancy.

Facilities and Infrastructure cont. – Numerous landslides were reported in Tutuila, American Samoa including in the villages of Āmanave, Poloa, 'Aoa, Asili, Auto, and Āmouli.

Heat – The ongoing El Niño event brought periods of excessive heat to areas of the southwestern Pacific including Tutuila Island, American Samoa where the observing station at NWS office at the Pago Pago International Airport reached or exceeded 90ºF on 19 of 31 days during January 2024. Moreover, the Siufaga Ridge (480 ft.) and Toa Ridge (1285 ft.) observing stations in the National Park of American Samoa recorded maximum temperatures of 98ºF and 94ºF respectively, on 2/25/24 (based on preliminary data).

Ecosystems – In American Samoa, subaerial exposures of shallow-water coral reefs were observed in Tutuila, including in the villages of Nu'uuli and Faga'alu (top left). These events were driven by a combination of factors including El Niño-related sea level drops in the region and extreme low tide events. In addition, anomalously warm sea surface temperatures were observed in areas of American Samoa around Tutuila Island, Swains Island, and Rose Atoll—reaching Alert Level 1 during January and February 2024, according to the NOAA Coral Reef Watch.

In the central Pacific, extensive coral bleaching, mortality, and algal overgrowth were observed in Palmyra Atoll (bottom left), according to field observations from The Nature Conservancy staff and the NOAA Coral Reef Watch.



Sea surface temperature (SST) ranking for the western Pacific Ocean for January 2024.
Source: ERA5 Reanalysis, B. Brettschneider.

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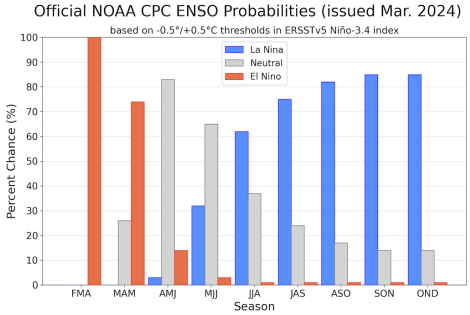
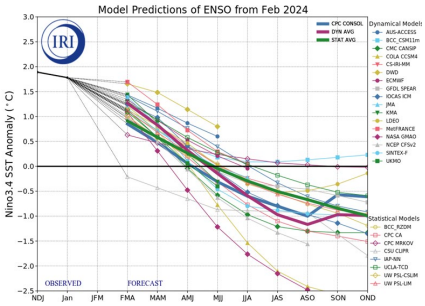
Seasonal Outlook – *For March 2024–May 2024*

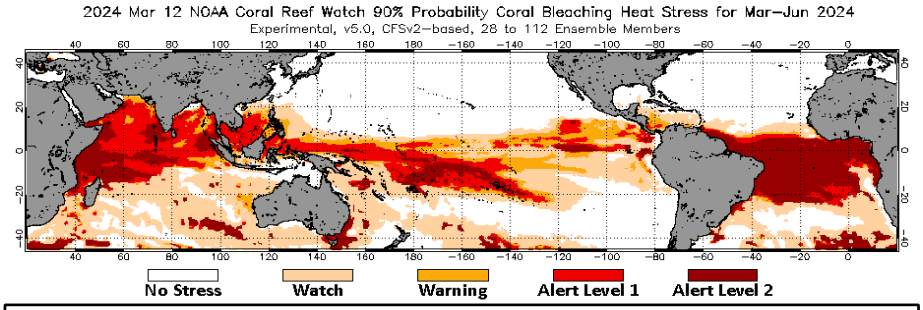




Forecast for each of the three possible ENSO categories for the next 8 overlapping 3-month seasons. Blue bars show the chances of La Niña, gray bars the chances for neutral, and red bars the chances for El Niño (left); and ENSO forecast model predictions (right). Source: NOAA CPC; Columbia University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

According to the latest ENSO prediction model simulations (above right), the majority of models indicate El Niño will persist through March-May 2024 and then transition to ENSO-neutral during April-June 2024 (83% chance). After a brief period of ENSO-neutral conditions, there are increasing odds of a transition to La Niña during the June-August 2024 (62% chance), according to the NOAA CPC (3/14/24).

The NOAA's Coral Reef Watch four-month coral bleaching heat stress outlook (Mar-Jun 2024) calls for a high probability (90%) of high heat stress (Alert Level 1-2) developing in areas across much of the tropical Pacific Ocean, especially in areas of the central and western tropical Pacific Ocean south of the equator.



NOAA Coral Reef Watch four-month coral bleaching heat stress outlook for Mar-Jun 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 March-May (MAM) 2024, below-normal precipitation is forecasted for areas across USAPI, including CNMI, Guam, Palau, FSM, and RMI, while above-normal rainfall is expected in American Samoa. Likewise, below-normal precipitation is expected across the Hawaiian Islands, according to the NOAA Pacific ENSO Applications Climate Center.

During the next three-to-six months, there is a likelihood of below-normal sea level anomalies expanding southward and eastward in the tropical Pacific. Above-normal sea levels are likely to return in parts of the northwestern Pacific, such as around Guam, according to the University of Hawaii Sea Level Center.

Regional Partners

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/pcmsc

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

Western Regional Climate Center:
https://wrcc.dri.edu/

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