

Pacific Islands - Ocean and Climate Outlook Forum (OCOF) No. 191

Country: Tonga

Part 1: Recent climate

TABLE 1: Monthly Rainfall

Station (include data period)	May-2023	Jun-2023	Jul-2023				
			Total (mm)	33%tile	67%tile	Median	Rank
	Total (mm)	Total (mm)	Rainfall (mm)				
Northern Division							
Niuafo'ou (1971-2023)	362.0	153.8	232.2	60.0	143.4	106.0	47/51
Niuaatoputapu (1947-2023)	644.4	167.5	106.0	59.0	130.0	91.5	44/77
Central Division							
Vava'u (1947-2023)	357.6	149.7	130.0	66.0	120.4	80.6	54/77
Ha'apai (1947-2023)	338.8	145.3	99.5	55.0	99.7	69.5	50/77
Southern Division							
Fua'amotu (1979-2023)	75.4	86.8	60.9	70.0	137.0	105.0	13/44
Nuku'alofa (1944-2023)	119.5	89.5	56.5	64.0	117.0	82.0	24/79

TABLE 2: Three-month Total Rainfall for May to July 2023

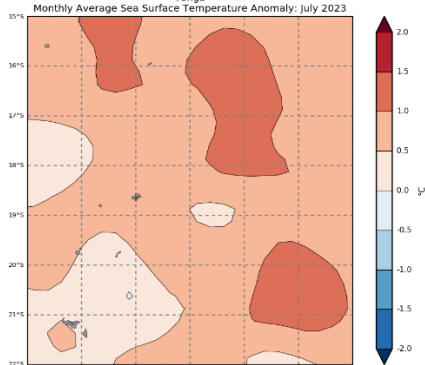
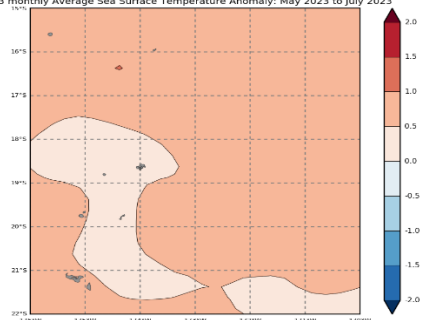
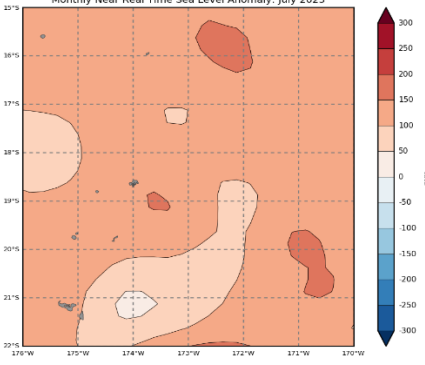
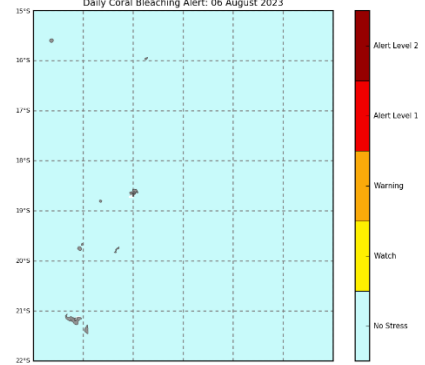
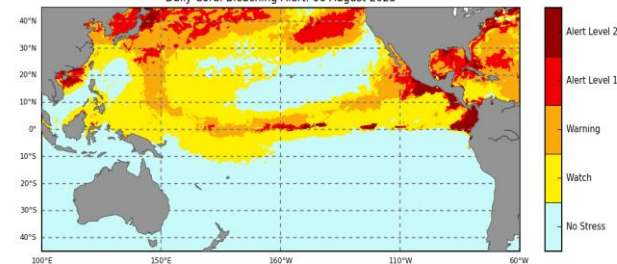
Station	Three-month Total		33%tile	67%tile	Median	Rank
	Rainfall (mm)					
Northern Division						
Niuafo'ou (1971-2023)	748.0	Above normal	365.2	476.2	430.5	44/49
Niuaatoputapu (1947-2023)	917.9	Above normal	319.7	411.7	357.0	72/73
Central Division						
Vava'u (1947-2023)	637.3	Above normal	303.0	407.0	365.0	71/77
Ha'apai (1947-2023)	583.6	Above normal	214.3	318.1	246.0	75/76
Southern Division						
Fua'amotu (1979-2023)	223.1	Below normal	268.0	440.0	366.0	11/44
Nuku'alofa (1944-2023)	265.5	Normal	242.0	343.0	298.0	34/79

Part 1i. Monthly and Seasonal Outlooks for September and September to November 2023

Monthly: September	Seasonal: September to November
Rainfall (Image 1)	Rainfall (Image 2)
<p>Tercile rainfall probabilities for September 2023</p> <p>Base period: 1981-2018 Model: ACCESS-S2 © Commonwealth of Australia 2023, Australian Bureau of Meteorology Shapefile data extracted from Flinders Marine Institute (2019). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 11. Available online at http://www.maritimerregions.org/. Model run: 05/08/2023 Issued: 08/08/2023</p>	<p>Tercile rainfall probabilities for September to November 2023</p> <p>Base period: 1981-2018 Model: ACCESS-S2 © Commonwealth of Australia 2023, Australian Bureau of Meteorology Shapefile data extracted from Flinders Marine Institute (2019). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 11. Available online at http://www.maritimerregions.org/. Model run: 05/08/2023 Issued: 08/08/2023</p>
Monthly Maximum temperature (Image 3):	Seasonal maximum temperature (Image 4):
<p>Tercile maximum temperature probabilities for September 2023</p> <p>Base period: 1981-2018 Model: ACCESS-S2 © Commonwealth of Australia 2023, Australian Bureau of Meteorology Shapefile data extracted from Flinders Marine Institute (2019). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 11. Available online at http://www.maritimerregions.org/. Model run: 05/08/2023 Issued: 08/08/2023</p>	<p>Tercile maximum temperature probabilities for September to November 2023</p> <p>Base period: 1981-2018 Model: ACCESS-S2 © Commonwealth of Australia 2023, Australian Bureau of Meteorology Shapefile data extracted from Flinders Marine Institute (2019). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 11. Available online at http://www.maritimerregions.org/. Model run: 05/08/2023 Issued: 08/08/2023</p>
Monthly minimum temperature (Image 5):	Seasonal minimum temperature (Image 6):
<p>Tercile minimum temperature probabilities for September 2023</p> <p>Base period: 1981-2018 Model: ACCESS-S2 © Commonwealth of Australia 2023, Australian Bureau of Meteorology Shapefile data extracted from Flinders Marine Institute (2019). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 11. Available online at http://www.maritimerregions.org/. Model run: 05/08/2023 Issued: 08/08/2023</p>	<p>Tercile minimum temperature probabilities for September to November 2023</p> <p>Base period: 1981-2018 Model: ACCESS-S2 © Commonwealth of Australia 2023, Australian Bureau of Meteorology Shapefile data extracted from Flinders Marine Institute (2019). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 11. Available online at http://www.maritimerregions.org/. Model run: 05/08/2023 Issued: 08/08/2023</p>

Part 2: Recent Ocean Observation

Monthly/Three months: May and May to July 2023

Monthly: July	Last three months: May to July 2023:
Sea Surface Temperature (Image 1):	Sea Surface Temperature (Image 4):
<div><div><div><div>Tonga</div><div>Monthly Average Sea Surface Temperature Anomaly: July 2023</div><div></div><div><div>©Commonwealth of Australia 2023 Australian Bureau of Meteorology, COSPPac</div><div>Reynolds SST</div></div></div></div></div> <div><div><div><div>Tonga</div><div>3 monthly Average Sea Surface Temperature Anomaly: May 2023 to July 2023</div><div></div><div><div>©Commonwealth of Australia 2023 Australian Bureau of Meteorology, COSPPac</div><div>Reynolds SST</div></div></div></div></div>	
Sea level (Image 2):	
<div><div><div><div>Tonga</div><div>Monthly Near Real Time Sea Level Anomaly: July 2023</div><div></div><div><div>©Commonwealth of Australia 2023 Australian Bureau of Meteorology, COSPPac</div><div>AVISO SwathOnco SLA</div></div></div></div></div>	
Daily coral bleaching alert (Image 3):	
<div><div><div><div>Tonga</div><div>Daily Coral Bleaching Alert: 06 August 2023</div><div></div><div><div>©Commonwealth of Australia 2023 Australian Bureau of Meteorology, COSPPac</div><div>NOAA Coral Reef Watch</div></div></div></div></div>	<div><div><div><div>Pacific Ocean</div><div>Daily Coral Bleaching Alert: 06 August 2023</div><div></div><div><div>©Commonwealth of Australia 2023 Australian Bureau of Meteorology, COSPPac</div><div>NOAA Coral Reef Watch</div></div></div></div></div>

Part 2i. Monthly and Seasonal Outlooks for September and September to November 2023

Monthly: September	Seasonal: September to November
Monthly sea surface temperature (Image 5):	Seasonal sea surface temperature (Image 6):
<div><p>Difference from average sea surface temperature forecast for September 2023</p><p>Base period: 1981-2018 Model: ACCESS-S2 © Commonwealth of Australia 2023. Australian Bureau of Meteorology Shapefile data extracted from Flinders Marine Institute (2019). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 11. Available online at http://www.maritimerregions.org/</p><p>Model run: 05/08/2023 Issued: 07/08/2023</p></div>	<div><p>Difference from average sea surface temperature forecast for September to November 2023</p><p>Base period: 1981-2018 Model: ACCESS-S2 © Commonwealth of Australia 2023. Australian Bureau of Meteorology Shapefile data extracted from Flinders Marine Institute (2019). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 11. Available online at http://www.maritimerregions.org/</p><p>Model run: 05/08/2023 Issued: 07/08/2023</p></div>
Monthly sea level (Image 7):	Seasonal sea level (Image 8):
<div><p>Difference from average sea surface height forecast for September 2023</p><p>Base period: 1981-2018 Model: ACCESS-S2 © Commonwealth of Australia 2023. Australian Bureau of Meteorology Shapefile data extracted from Flinders Marine Institute (2019). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 11. Available online at http://www.maritimerregions.org/</p><p>Model run: 05/08/2023 Issued: 07/08/2023</p></div>	<div><p>Difference from average sea surface height forecast for September to November 2023</p><p>Base period: 1981-2018 Model: ACCESS-S2 © Commonwealth of Australia 2023. Australian Bureau of Meteorology Shapefile data extracted from Flinders Marine Institute (2019). Maritime Boundaries Geodatabase: Maritime Boundaries and Exclusive Economic Zones (200NM), version 11. Available online at http://www.maritimerregions.org/</p><p>Model run: 05/08/2023 Issued: 07/08/2023</p></div>
4-week Coral Bleaching (Image 9):	
<div><p>Tonga 4 Weeks Coral Bleaching Outlook: 27 August 2023</p><p>©Commonwealth of Australia 2023 Australian Bureau of Meteorology, COSPPac</p><p>NOAA Coral Reef Watch</p></div>	<div><p>Pacific Ocean 4 Weeks Coral Bleaching Outlook: 27 August 2023</p><p>©Commonwealth of Australia 2023 Australian Bureau of Meteorology, COSPPac</p><p>NOAA Coral Reef Watch</p></div>

Summary Statement

Monthly and last three months: July 2023/May to July 2023 statement

For July 2023, above normal rainfall was recorded at Niuafu'ou and Vava'u, near-normal rainfall was registered at Niuatoputapu and Ha'apai, while below normal rainfall was recorded at Nuku'alofa and Fua'amotu. Niuafu'ou recorded its fifth highest July rainfall.

For May to July 2023, above normal rainfall was recorded across the Northern and Central Divisions, while near-normal to below normal rainfall was recorded at Nuku'alofa and Fua'amotu (Southern Division). Niuafu'ou, Niuatoputapu and Ha'apai recorded their second highest May-July rainfall in 73 years and 76 years of record respectively, while Vava'u had its seventh highest in 77 years of record.

Part 1i. Monthly and Seasonal Outlooks for September and September to November 2023

Monthly /Seasonal rainfall and temperature Outlook statements

The rainfall for September is likely to be below normal at Niuafu'ou and above normal at Niuatoputapu. In remaining parts of the country, the outlook offers little guidance.

The rainfall for September to November is likely to be above normal at Niuafu'ou and below normal over the Southern Division (Fua'amotu and Nuku'alofa). In remaining parts of the country, the outlook offers little guidance.

Maximum and minimum temperatures during September are likely or very likely to be above normal over the Northern Division and at Vava'u and the Niuaus, while near-normal temperatures are likely for the remaining main islands of the country.

Maximum and minimum temperatures averaged over September to November are likely or very likely to be above normal over most parts of the country.

Part 2: Recent Ocean summary statement

Monthly and last three months: July 2023/May to July 2023

July ocean temperatures around Tonga were utmost 1.5°C above normal.

Averaged over May to July, ocean temperatures around Tonga were utmost 1.0°C above normal.

July sea levels around Tonga were 100mm to 150mm above normal.

Coral bleaching alert reveals no thermal stress for Tonga.

Part 2i. Monthly and Seasonal Outlooks for September and September to November 2023

Ocean Variable statement

September ocean temperatures around Tonga are predicted to be 0.4 to 0.8°C above normal. The remaining parts of Tonga are predicted to be near normal.

Averaged over September to November, ocean temperatures around Tonga are predicted to be 0.4 to 0.8°C above normal for the Niua and Vava'u. The remaining parts of Tonga is predicted to be near normal.

September sea levels around Tonga are predicted to be 30mm to 60mm below normal for the Niua. The remaining parts of Tonga is predicted to be near normal.

Averaged over September to November, sea levels around Tonga are predicted to be near normal.

Coral bleaching outlook for the next four weeks reveals no thermal stress for Tonga.

TABLE 3: Stakeholder Engagement- Evaluations of how effective NMS engage with stakeholders

Product	Date: July 2023	Stakeholder	Total Number of Participants	Number of Male	Number of Female	Comments (If there are comments from you Stakeholders)
Tonga Climate Outlook	12 July	General Public	100	65	35	
EAR Watch						
Monthly Climate Briefing						
Tonga Ocean Outlook	12 July	Government ministries, NGOs, Media, Private Sectors.	100	65	35	
Climate data request	1-31 July	Various stakeholders and academia	25	20	5	
Total			125	85	75	