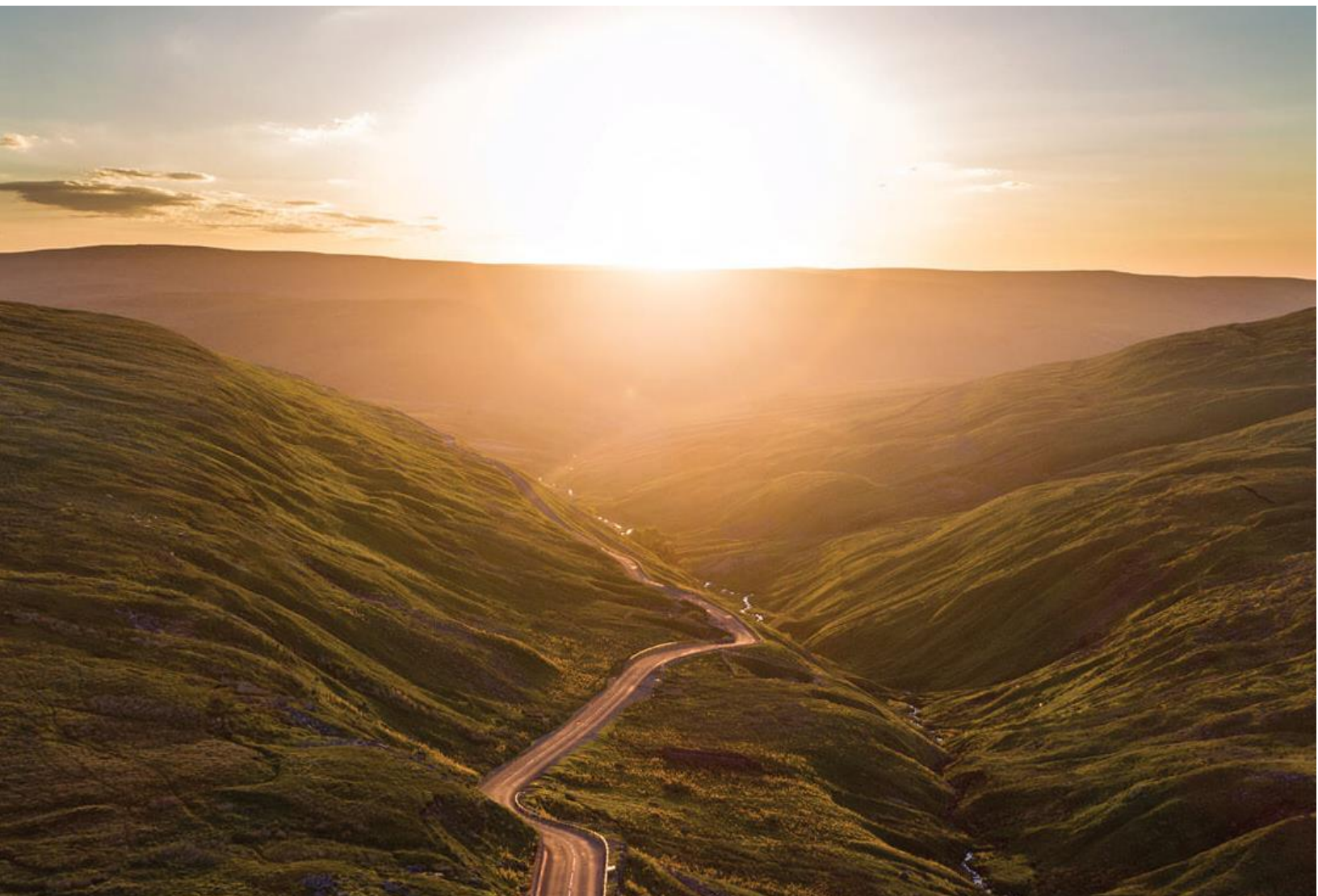


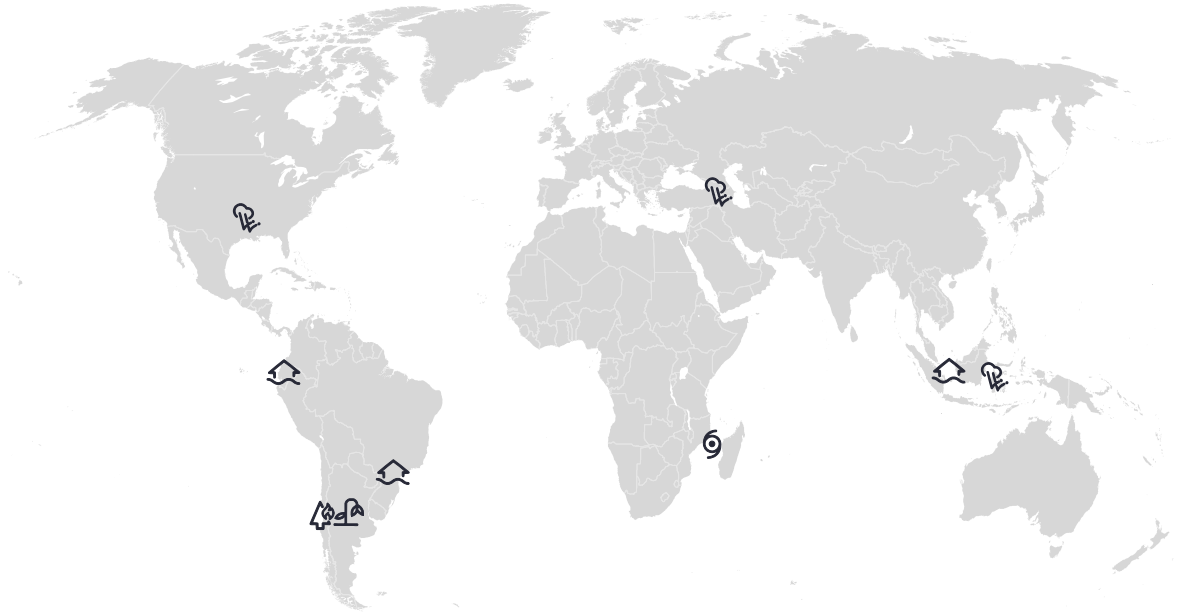
AON

Weekly Cat Report

March 10, 2023



Executive Summary



Event	Affected Region(s)	Fatalities	Economic Loss (\$)	Page
Severe Convective Storm	United States	12+	100s of millions	3
Wildfires & Heatwave (Update)	Chile, Argentina	26+	100s of millions	5
Cyclone Freddy (Update)	Mozambique, Madagascar	28+	10s of millions	7
Landslide	Indonesia	15+	Negligible	9
Severe Convective Storm	Armenia	0	Unknown	9
Flooding	Brazil	1+	Millions	9
Flooding & Landslides	Ecuador	3+	Unknown	9
Severe Convective Storm	Indonesia	1+	Unknown	9

Please note that any financial loss estimate is preliminary and subject to change. These estimates are provided as an initial view of the potential financial impact from a recently completed or ongoing event based on early available assessments. Significant adjustments may inevitably occur. All losses in US dollars (\$) unless noted otherwise.

Along with this report, we continue to welcome users to access current and historical natural catastrophe data and event analysis on Impact Forecasting's Catastrophe Insight website: <http://catastropheinsight.aon.com>

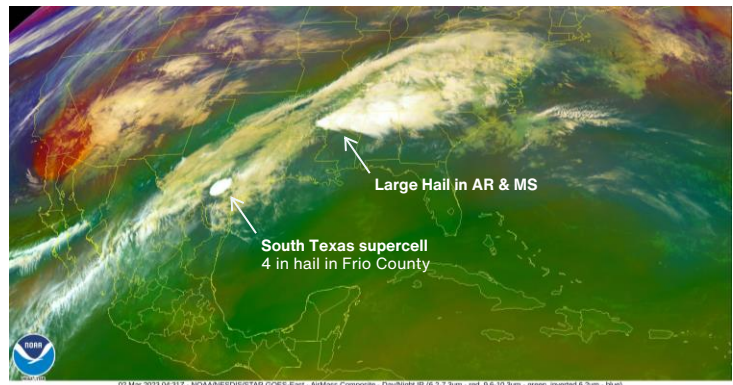
United States: Severe Convective Storm

Overview

Severe convective storms with strong winds, tornadoes, heavy rainfall, and large hail affected a broad area across the United States between March 1-3. Severe weather claimed at least 12 lives and caused notable material damage and hundreds of thousands of power outages. Total economic losses were likely to reach into the hundreds of millions USD.

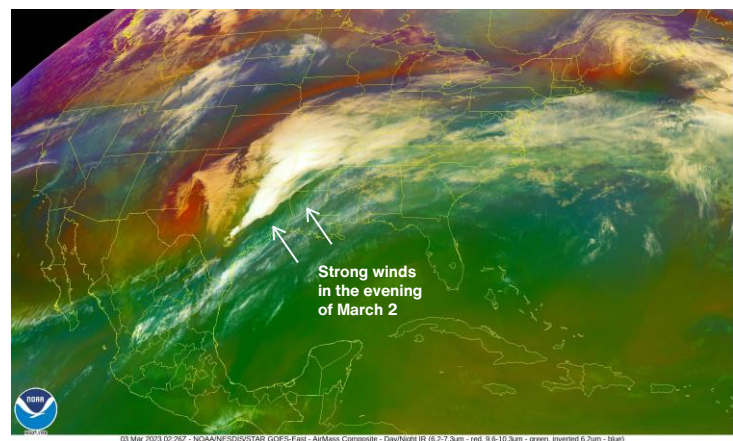
Meteorological Recap

The primary hazards related to multiple rounds of severe weather were damaging winds, large hail, and heavy precipitation that triggered localized flooding. On **March 1**, most impacts were associated with hail as severe storms developed in the morning hours in north-central Texas, Indiana/Kentucky border region, and Arkansas and Mississippi and south-central Texas.

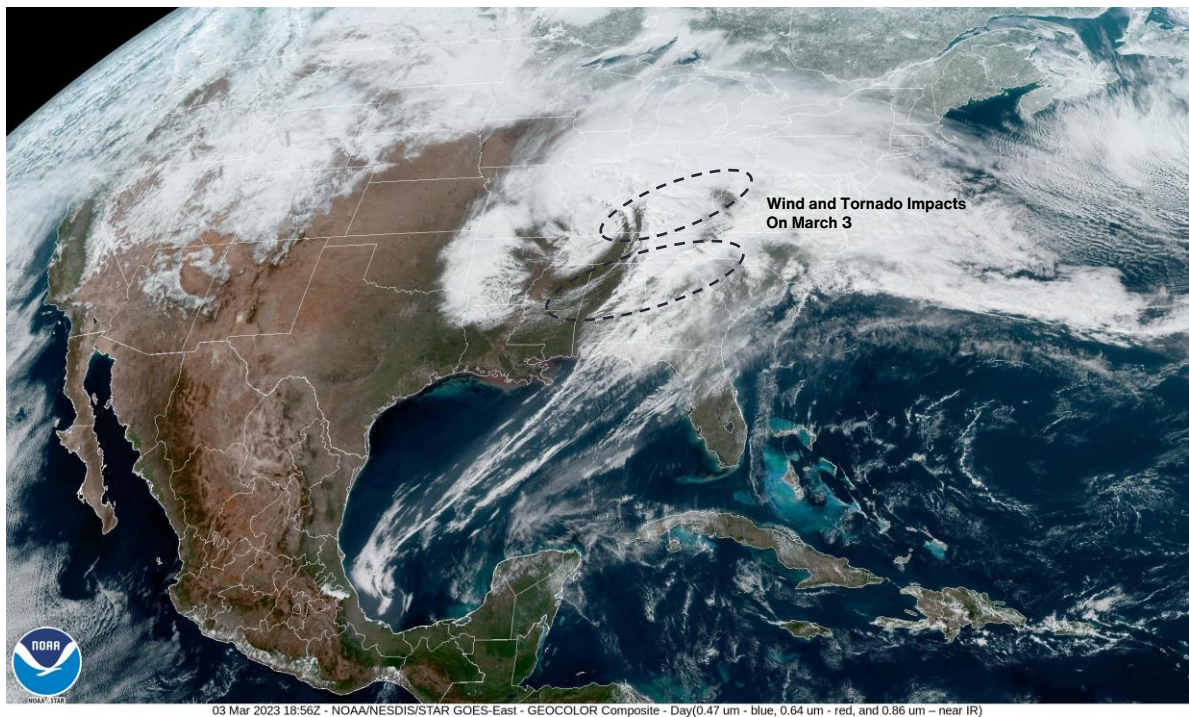


The largest hailstones were observed in the late evening as a lone supercell developed in southern Texas and produced hailstones with a diameter of up to 4 inches (10 cm) in Frio County.

On **March 2**, widespread storm activity, associated with a quasi-stationary front, ensued in parts of Texas, Oklahoma, Mississippi and Arkansas. Most impacts were associated with non-tornadic winds, as some locations experienced winds gusting at 100 mph (161 kph) – this was recorded in Bryan County, Texas. The Storm Prediction Center also noted 15 tornado reports, with some damage reported and preliminary rating of EF1.



The storm activity concluded on **March 3**, as the main focus shifted further east into a favourable environment of abundant instability, moisture and vertical wind shear, while a surface low developed over Kentucky. Relatively strong storms, which produce gusting winds, moved towards Indiana and Ohio. Further activity affected Mississippi, Alabama, Georgia and as far as the Carolinas. Multiple tornadoes developed in Kentucky, Indiana or Alabama; notably, an EF2 event hit the McCracken County in Kentucky.



Event Details

Multiple rounds of severe storms generated notable property and vehicular damage, along with infrastructural impacts with downed trees and power lines across several states, which resulted in widespread power outages. Electricity services to no fewer than 1.2 million customers were lost, particularly in Kentucky, Michigan, Tennessee, Ohio, Pennsylvania, and West Virginia. Property damage was also incurred in Alabama, Louisiana, Arkansas, Texas, Georgia, Indiana, Mississippi, and Ohio. Northeast and Midwest were additionally affected by heavy snowfall and subsequent traffic disruptions with many flights cancelled.

The storm claimed at least 12 lives in Kentucky (5), Alabama (3), Tennessee (2), Arkansas (1), Mississippi (1). Several others were injured.

Financial Loss

Aggregate impacts from severe storms on March 1 to 3 are anticipated to result in notable economic and insured losses, likely running into the hundreds of millions USD. Most impacts were associated with strong winds and tornadoes, additionally with large hail on March 1.

Chile and Argentina: Wildfires & Heatwave (Update)

Overview

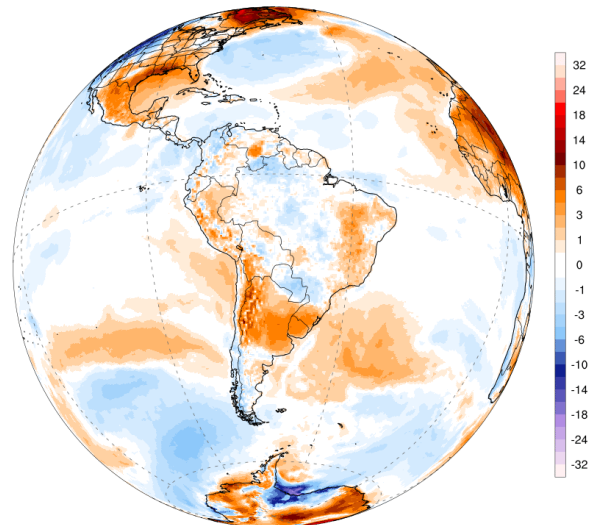
Parts of the South American continent are currently enduring a significant heatwave period. Extreme heat broke several temperature records in Argentina, and enhanced wildfire conditions across central and southern Chile. As of March 6, wildfires in Chile claimed at least 26 lives, destroyed thousands of houses, and burned more than 400,000 hectares (1,100,000 acres) of land.

Meteorological Recap

Central parts of South America, particularly **Argentina and Chile**, have experienced several intense heatwaves since mid-January. A new heatwave hit the region in early March, broking many monthly temperature records. Table below highlights selected monthly records that were seen during this early-March heatwave in Argentina, noting that many record surpassed the previous maximums by more than 2°C (3.6°F). According to Argentina’s Meteorology Service (SMN), the capital city of **Buenos Aires** experienced the hottest summer since the measurement started in 1906. 2022/23 summer season average temperature of 25.6°C (78.1°F) surpassed the previous record of 25.3 (77.5°F) set during the season 1988/89. SMN also noted that four hottest summers in 117-year period occurred in the last ten years.

GFS 2m T Anomaly (°C) [CFSR 1979-2000 baseline]
1-day Avg | Thu, Mar 09, 2023

ClimateReanalyzer.org
Climate Change Institute | University of Maine



Temperature Anomaly on March 9

Source: Climate Reanalyzer, University of Maine

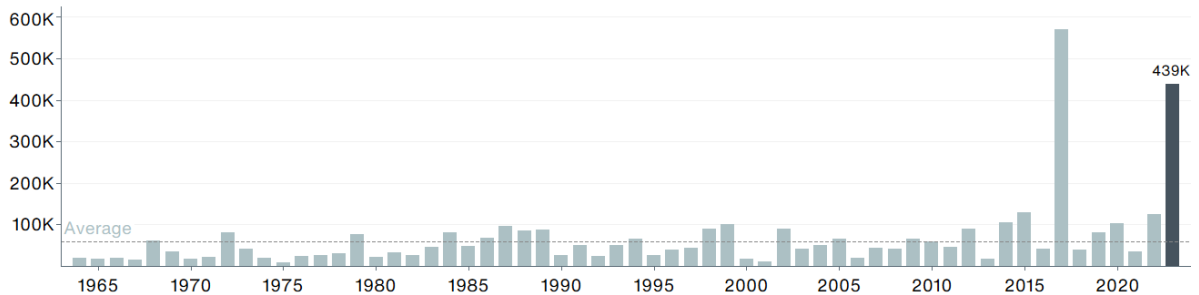
Extreme heat worsened a wildfire situation in **Chile**, where dozens of new fires were ignited. The spatial extent burned thus far in 2023 approaches the maximum of 570,000 hectares (1,400,000 acres) set in 2017.

Location	Temperature (°C)	Temperature (°F)	Previous record
Nueve de Julio	40.0	104.0	39.0°C set in 1952
El Palomar	39.5	103.1	36.0°C set in 1962
Moreno	39.2	102.6	35.5°C set in 2020
Ezeiza	39.1	102.4	37.6°C set in 1980
Morón	38.9	102.0	36.3°C set in 1967
Buenos Aires	38.0	100.4	37.9°C set in 1952, since 1906

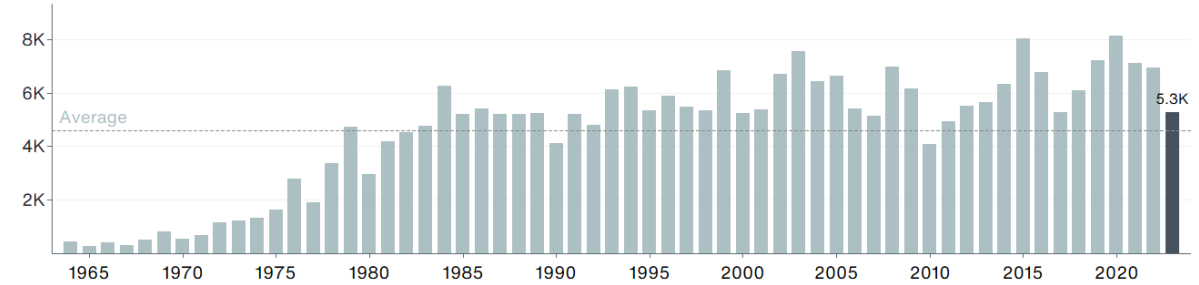
Event Details

As of March 6, active fires were reported across the **Chilean regions** of BíoBío, Ñuble, Maule, La Araucanía, Los Ríos, and Magallanes. According to the National System for Disaster Prevention (SENAPRED), no fewer than 26 people lost their lives due to fire in BíoBío (17), La Araucanía (8), and Ñuble (1). At least 2,180 others were injured in wildfire-related accidents, in total, more than 7,500 people were affected. Wildfires destroyed almost 4,000 houses across eight regions in Chile and burned almost **440,000 hectares** (1,100,000 acres) of land.

Burned Area in hectares (2023 data as of March 6)



Number of Fires (2023 data as of March 6)



Data: CONAF. Graphic: Catastrophe Insight, Aon

Further notable financial impact and influence on public health can result from the prolonged extreme heat in both countries. A total excess death rate related to the series of heatwaves can be considerable, usually reaching into hundreds or thousands of heat-related fatalities.

Financial Loss

The full scope of heatwave and wildfire impacts is likely to be realized in the coming weeks or months, depending on their duration. Full scale of the damage on property, forestry and agriculture has yet to be determined. The widespread wildfires, extreme heat, and closely related drought will likely result in complex economic consequences and a notable financial and public health impact. Total economic loss related to wildfires and drought can potentially reach into the hundreds of millions (USD).

Mozambique and Madagascar: Cyclone Freddy (Update)

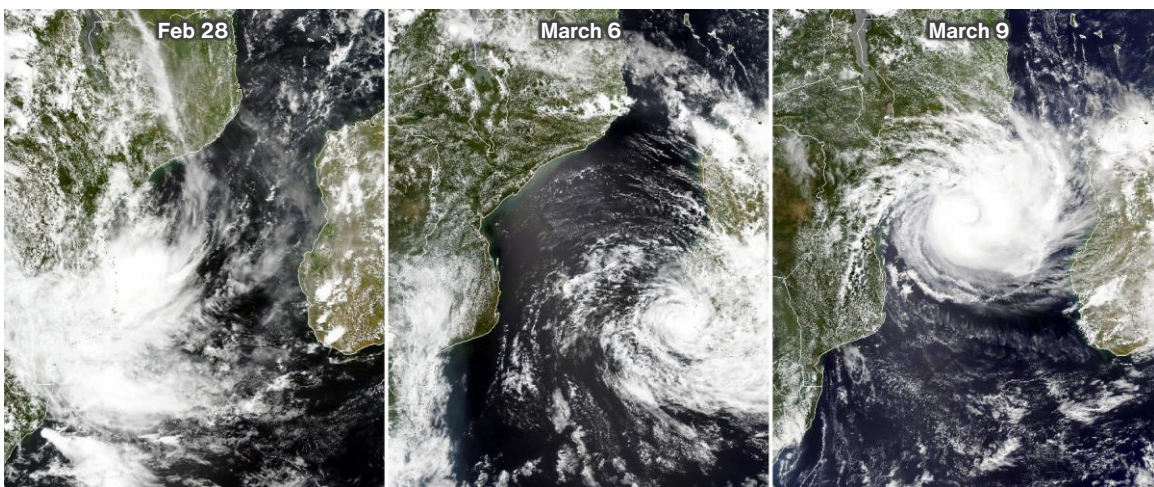
Overview

Freddy continued its remarkable journey setting multiple records, affecting Madagascar and Mozambique again as a reformed tropical cyclone. The storm continued to cause additional material damage, affected further tens of thousands of people, and claimed at least eight lives. It became the longest-lasting tropical cyclone on record globally, surpassing a previous record set in 1994.

Meteorological Recap

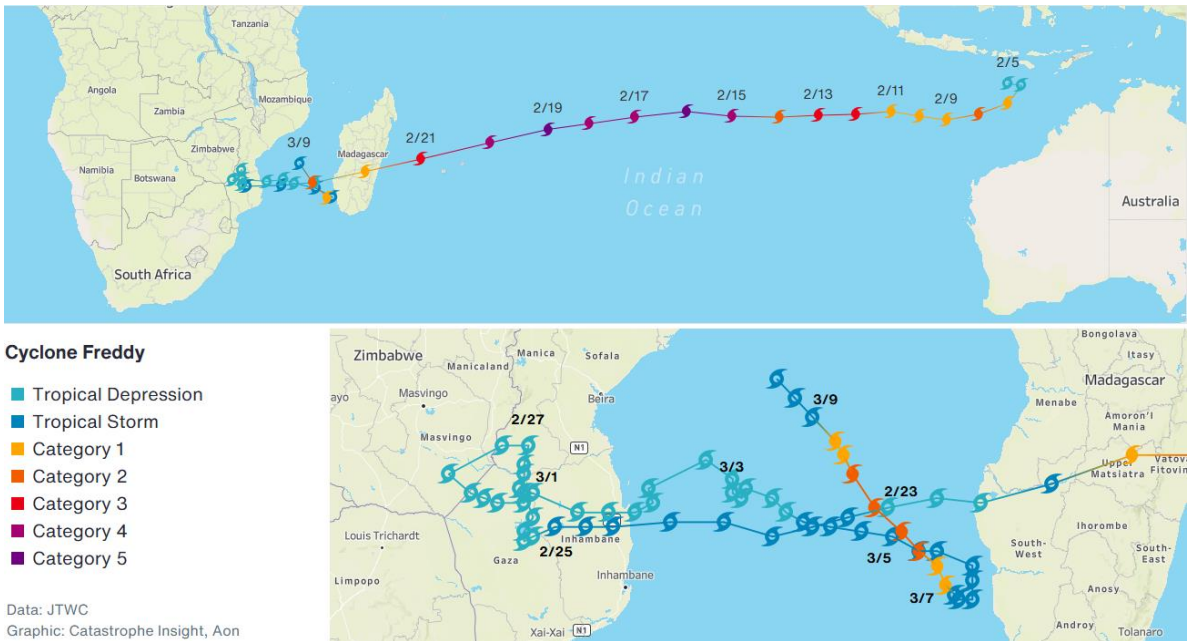
Freddy became a named storm already on February 6. It crossed the entire South Indian Ocean and made landfall in Madagascar on February 21 and in Mozambique on February 24 (see previous Weekly Cat Reports). After several days of tracking over Mozambique and Zimbabwe, storm looped back over Mozambique Channel, restrengthening over the warm seawater and then moved towards the south-western coast of Madagascar. Since March 7, Freddy moved north-westward again, approaching the coast of Mozambique and expected to make landfall on March 11 (see Graphics below). Freddy's track has been remarkable. Below are select statistics related Freddy's life cycle:

- Cyclone Freddy will likely set a new record for tropical storm longevity. The previous record was held by Hurricane / Typhoon John, which formed in Eastern Pacific and lasted for 31 days in 1994.
- With the accumulated cyclone energy (ACE) of 76.9 (as of March 9), storm has already set a new all-time record for the highest ACE of a tropical cyclone in the Southern Hemisphere.
- Freddy was the first tropical cyclone in the Southern Hemisphere to undergo six separate rounds of rapid intensification.
- Storm crossed the entire Indian Ocean, cyclones Hudah and Leone were the last ones to traverse the ocean in 2000.



Freddy on visible satellite imagery

Source: NASA



According to NOAA estimates, parts of southern Mozambique received more than 500 mm (19.7 in) of rain in the last seven days due to storm passage, southern Madagascar got more than 300 mm (11.8 in).

Event Details

As of March 8, the National Bureau of Risk and Disaster Management (BNGRC) in **Madagascar** reported eight additional fatalities, more than 5,000 evacuated people, and 1,000 destroyed buildings due to the heavy rainfall caused by the re-formed storm.

Table below summarizes Freddy's impact as of March 8.

Locality	Fatalities	People affected	Damaged homes
Madagascar	15	230,000	28,000
Mozambique	10	170,000	15,600
Mauritius	1	-	-
Zimbabwe	2	-	-

Natural Catastrophes: In Brief

Landslide (Indonesia)

Heavy rainfall triggered a massive landslide in Serasan District on the Riau Islands in north-western Indonesia, on March 6. According to the information from local disaster authorities (BNPB) as of March 9, the landslide left at least 15 people killed and 8 injured, while 35 were still missing at the time of this writing. More than 1,200 people were displaced due to landslide event.

Severe Convective Storm (Armenia)

Passage of a low-pressure system through the Caucasian region generated strong winds across Armenia gusting at more than 90 kph (56 mph), causing some wind-related damage on property and infrastructure. According to authorities and media reports, damage occurred in Yerevan Kentron, Shengavit, Davtashen, Malatia-Sebastia, Nor Nork, Erebuni, Kanaker- In Zeytun, Nork-Marash or Ajapnyak.

Flooding (Brazil)

Persistent heavy rains and floods continue to affect southern Brazil. Last time, the municipality of Bandeirantes in Paraná state declared a state of emergency due to severe flooding on March 5-6. Torrential rainfall caused rivers to overflow their banks, resulting in damage on about 250 houses, dozens of roads, and several bridges. Additional material damage was incurred in the state of Rio Grande do Sul, along with one fatality related to flooding. Economic losses from last round of flooding can reach into the millions of USD.

Flooding & Landslides (Ecuador)

At least three people were killed due to flooding and landslide events that were caused by heavy rains between March 4-7 in Ecuador. Provinces of Manabí and Guayas were the most affected by this rainy episode, with reports of dozens destroyed homes and notable damage on infrastructure. Local risk management authorities (SGR) reported that no fewer than 17 persons have died, almost 6,000 people have been affected, and around 1,500 homes have been damaged since the start of the year due to flooding.

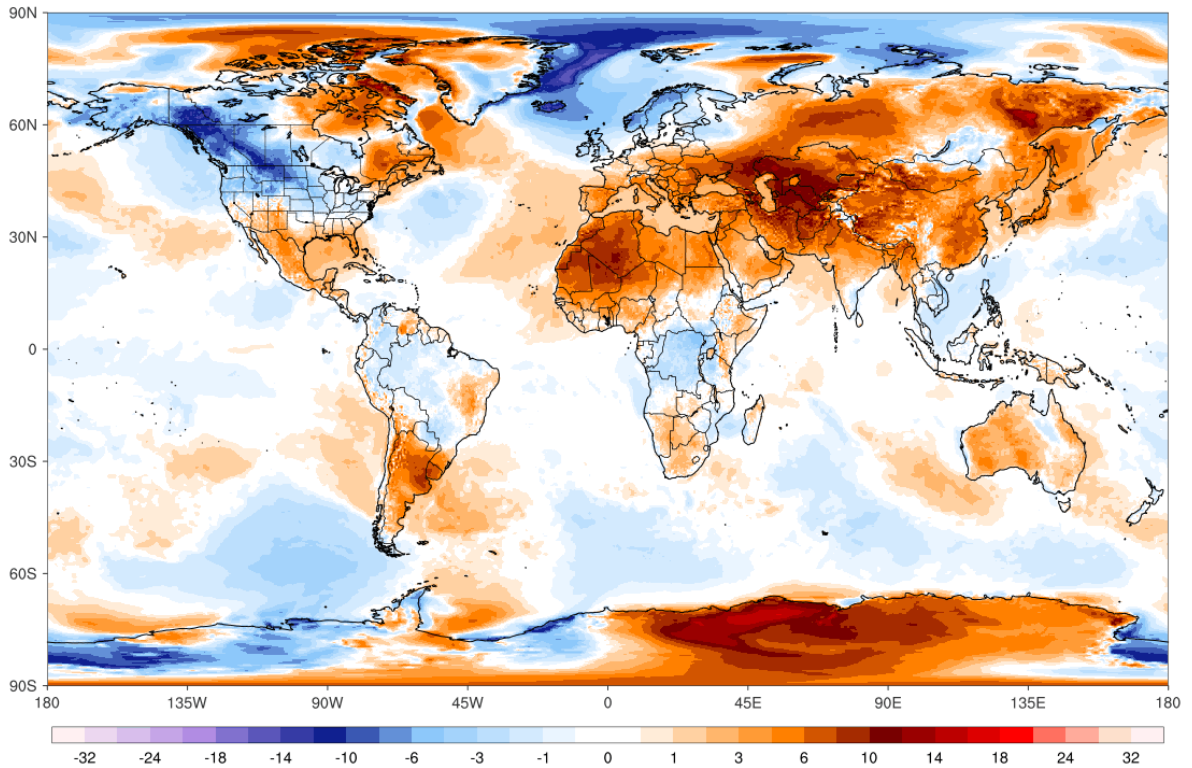
Severe Convective Storm (Indonesia)

Heavy rainfall, thunderstorm activity, and tornadic winds have affected Sulawesi Island, Indonesia, since March 5. Severe weather hazards claimed at least one fatality, three injured people, and around 130 damaged houses across the Konawe Regency, more than 500 houses were affected across the Southeast Sulawesi and Central Sulawesi provinces, mainly due to flooding.

Global Temperature Anomaly Forecast

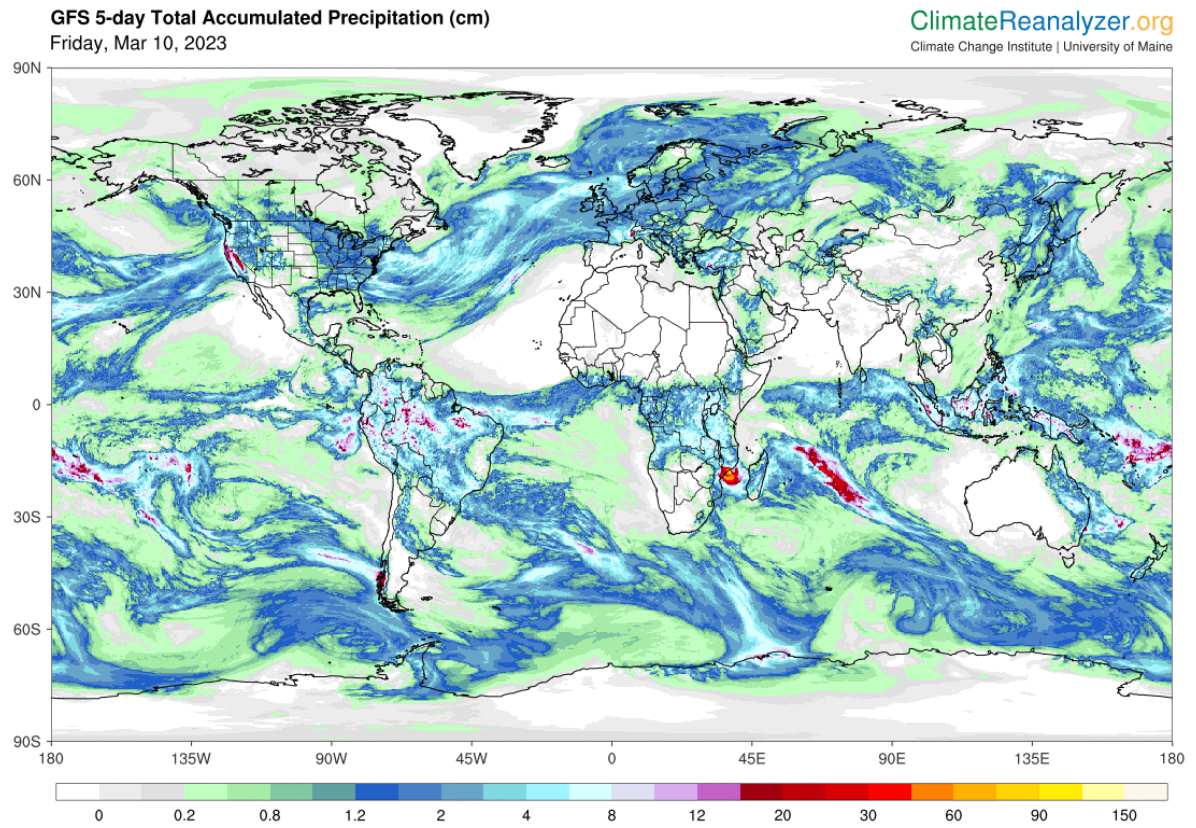
GFS/CFSR 5-day Avg 2m T Anomaly (°C) [1979-2000 base]
Friday, Mar 10, 2023

ClimateReanalyzer.org
Climate Change Institute | University of Maine



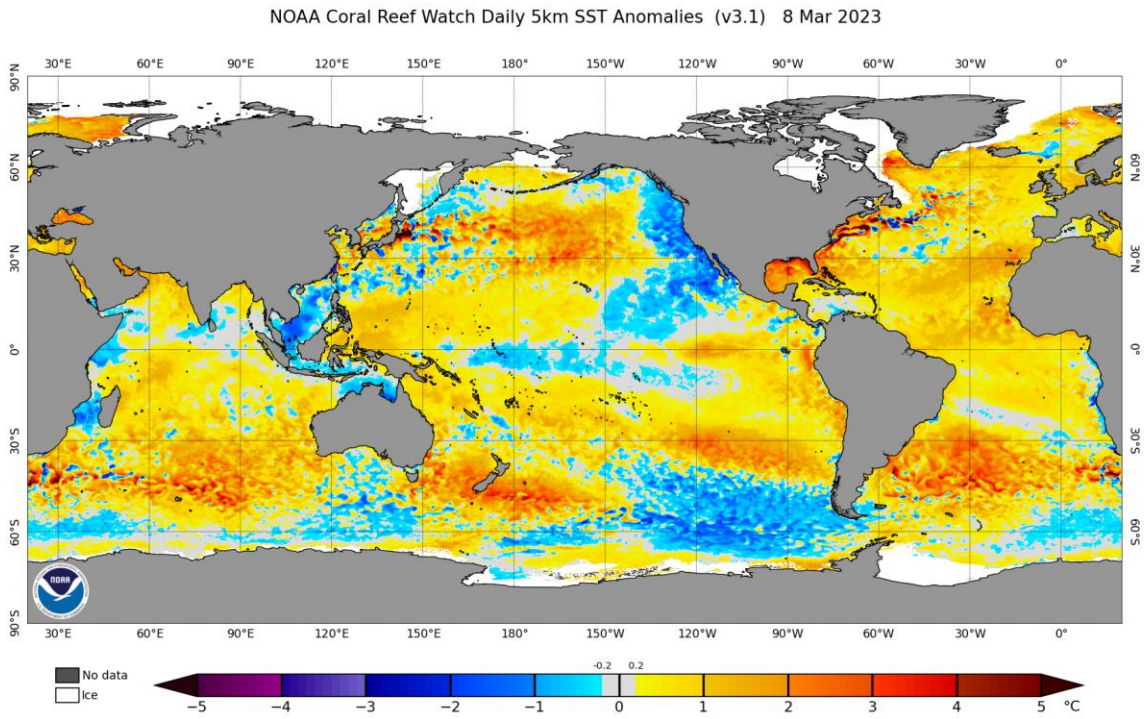
Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

Global Precipitation Forecast



Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

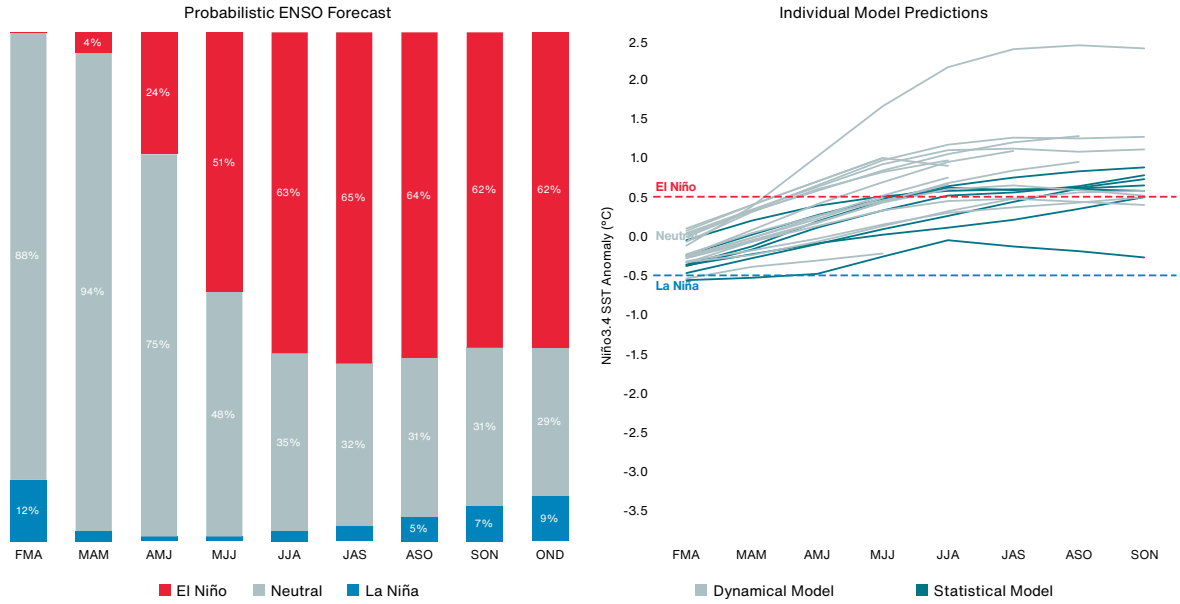
Weekly Sea Surface Temperature (SST) Maps (°C)



El Niño-Southern Oscillation (ENSO)

Probabilistic ENSO Model Projections: February 2023

Data: NOAA & Columbia University (IRI) | Graphic: Catastrophe Insight, Aon



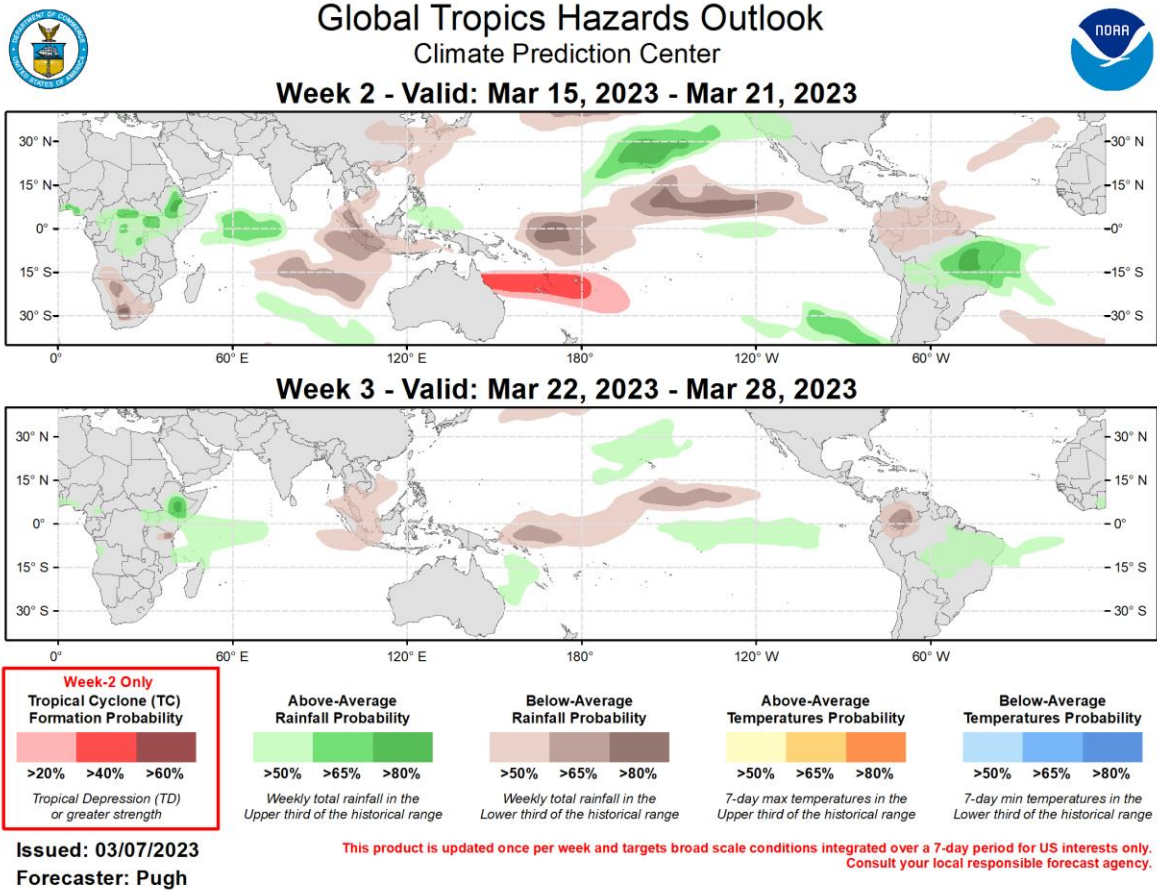
El Niño: Warm phase of an ENSO cycle. Sea surface temperatures of +0.5°C occur across the east-central equatorial Pacific.

La Niña: Cool phase of an ENSO cycle. Sea surface temperatures of -0.5°C occur across the east-central equatorial Pacific.

Neutral: A period when neither El Niño nor La Niña conditions are present.

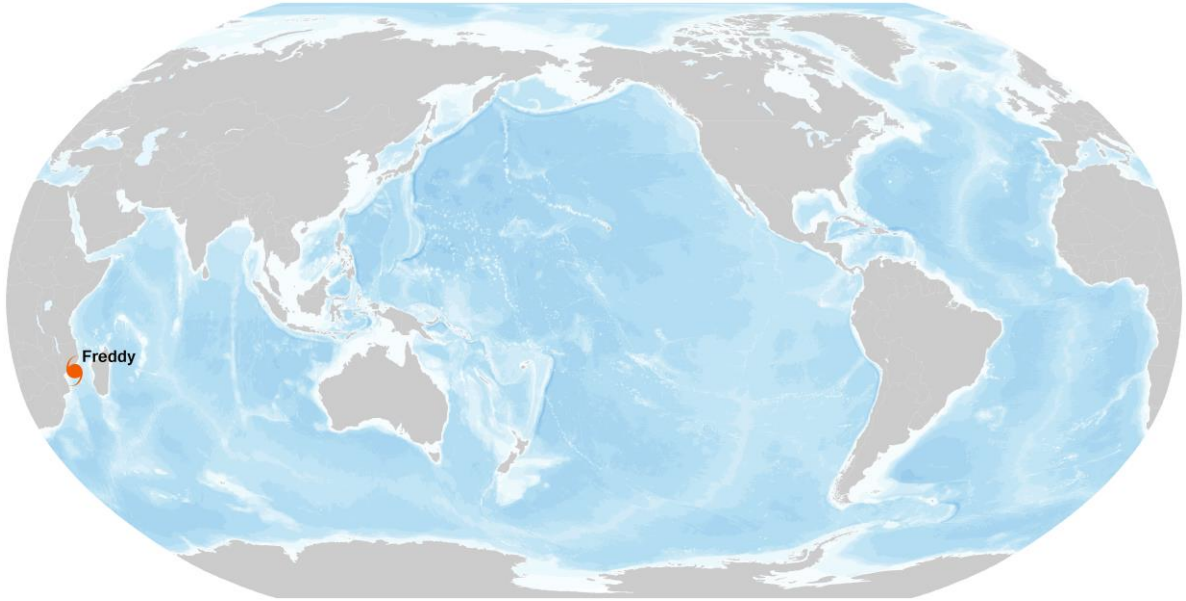
El Niño (La Niña) is a phenomenon in the equatorial Pacific Ocean characterized by a five consecutive 3-month running mean of sea surface temperature (SST) anomalies in the Niño 3.4 region that is above the threshold of +0.5°C (-0.5°C). This is known as the Oceanic Niño Index (ONI).

Global Tropics Outlook



Source: Climate Prediction Center (NOAA)

Current Tropical Cyclone Activity



● Tropical Depression
 ● Tropical Storm
 ● Category 1
 ● Category 2
 ● Category 3
 ● Category 4
 ● Category 5

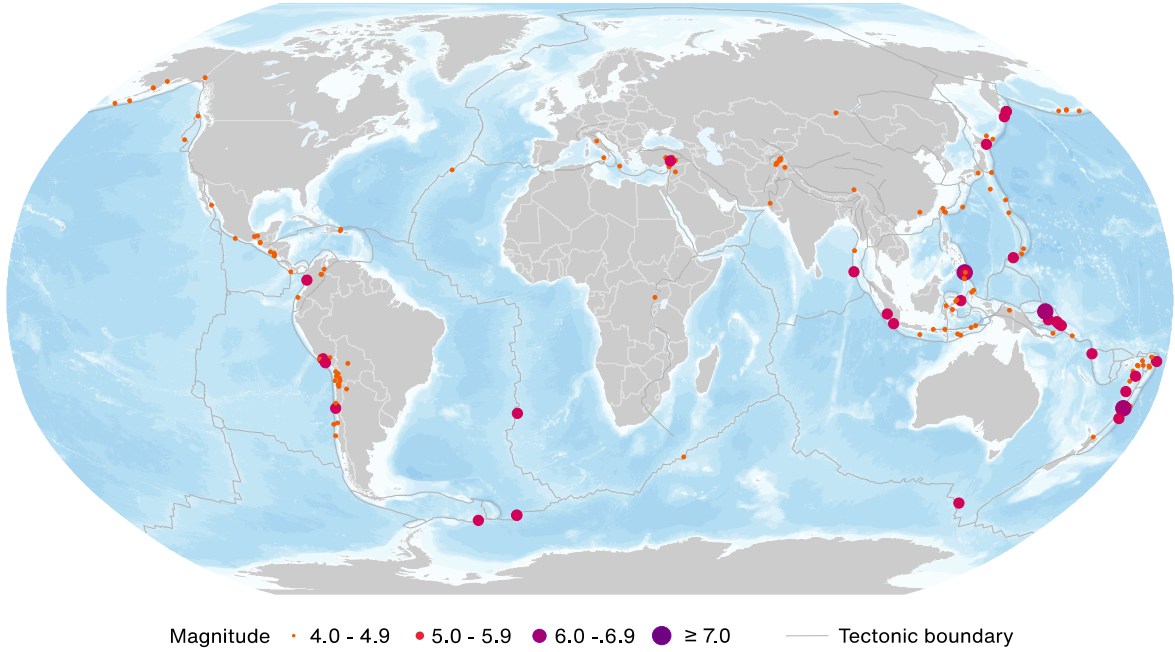
Storm Name	Location	Winds	Location from Nearest Land Area
CY Freddy	18.8S, 38.5E	80	125 miles (200 km) SE from Quelimane, Mozambique

* TD: Tropical Depression, TS: Tropical Storm, HU: Hurricane, TY: Typhoon, CY: Cyclone

** N: North, S: South, E: East, W: West, NW: Northwest, NE: Northeast, SE: Southeast, SW: Southwest

Source: National Hurricane Center, Joint Typhoon Warning Center, Central Pacific Hurricane Center (NOAA)

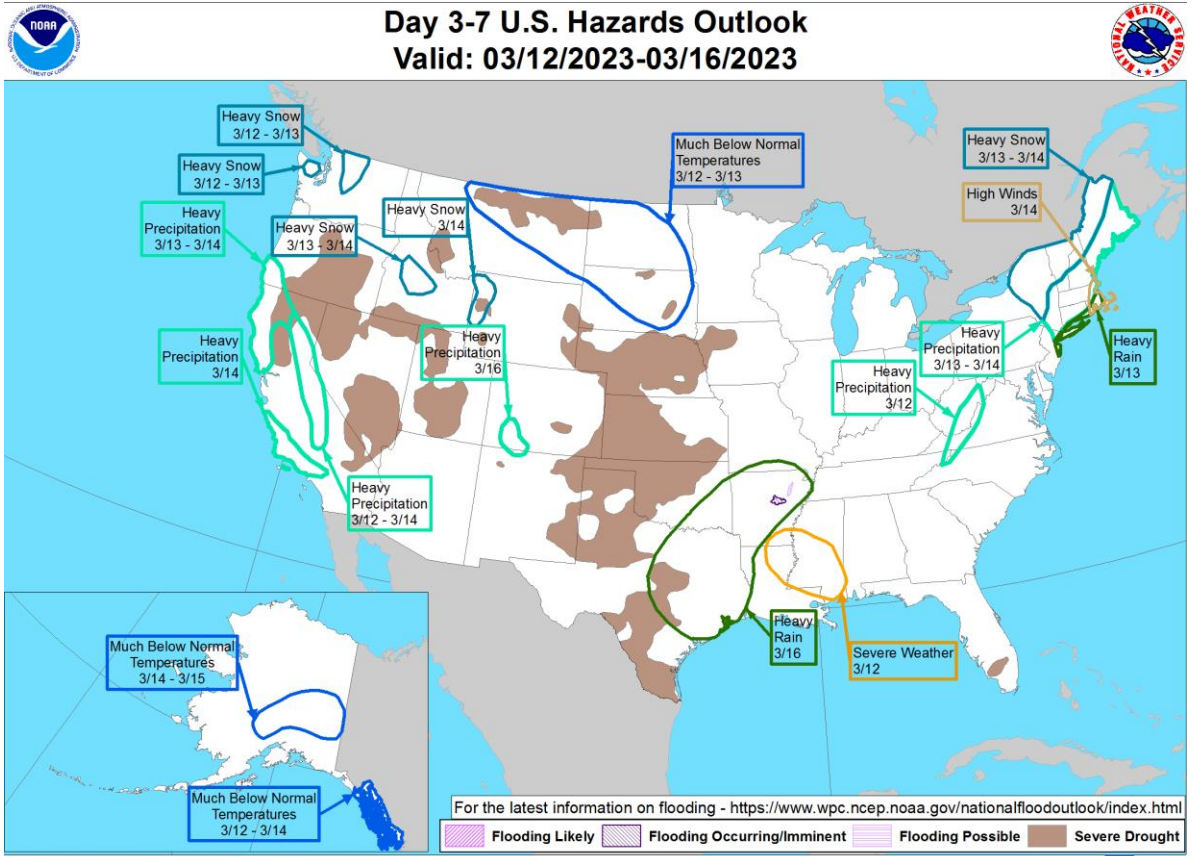
Global Earthquake Activity ($\geq M4.0$): Mar 3-Mar 9



Date (UTC)	Location	Magnitude	Epicenter
3/4/2023	29.47S, 178.79W	6.9	Kermadec Islands, New Zealand
3/7/2023	7.47N, 126.03E	6.0	4 km (2 mi) SE of San Mariano, Philippines
3/7/2023	3.21S, 150.65E	6.0	72 km (45 mi) SSW of Kavieng, Papua New Guinea

Source: United States Geological Survey

U.S. Hazard Outlook



Weather Prediction Center

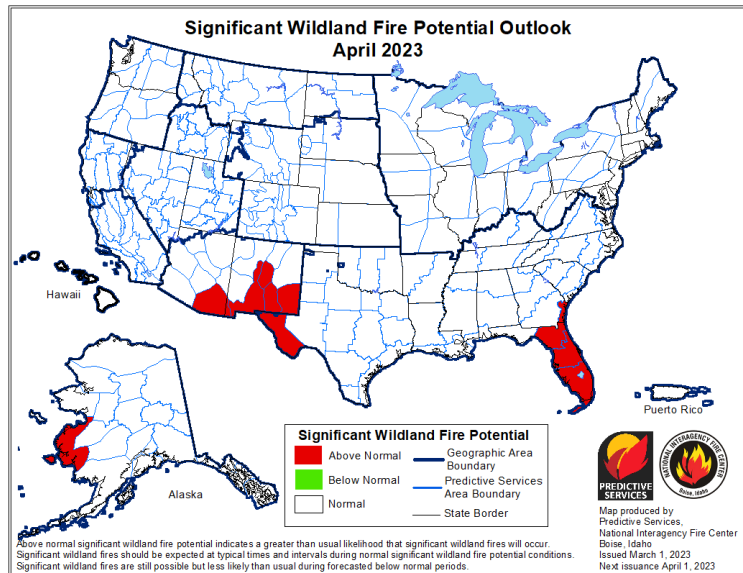
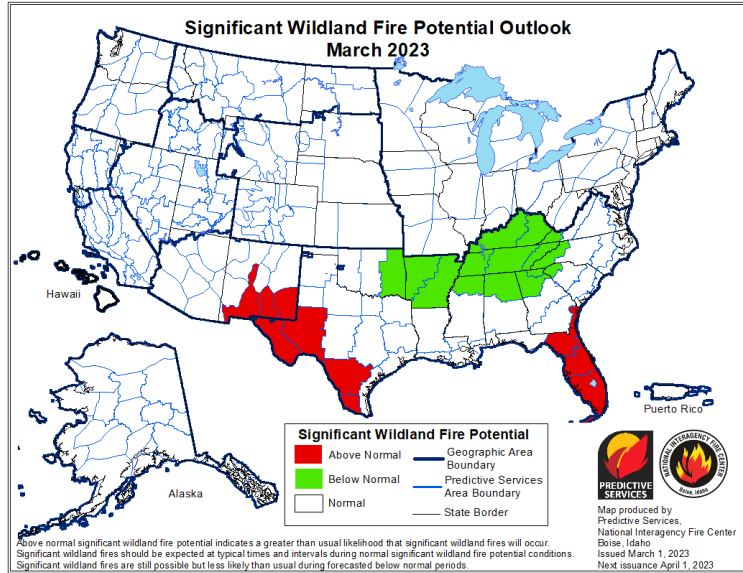
Made: 03/09/2023 3PM EST

Source: Climate Prediction Center (NOAA)

Follow us: 

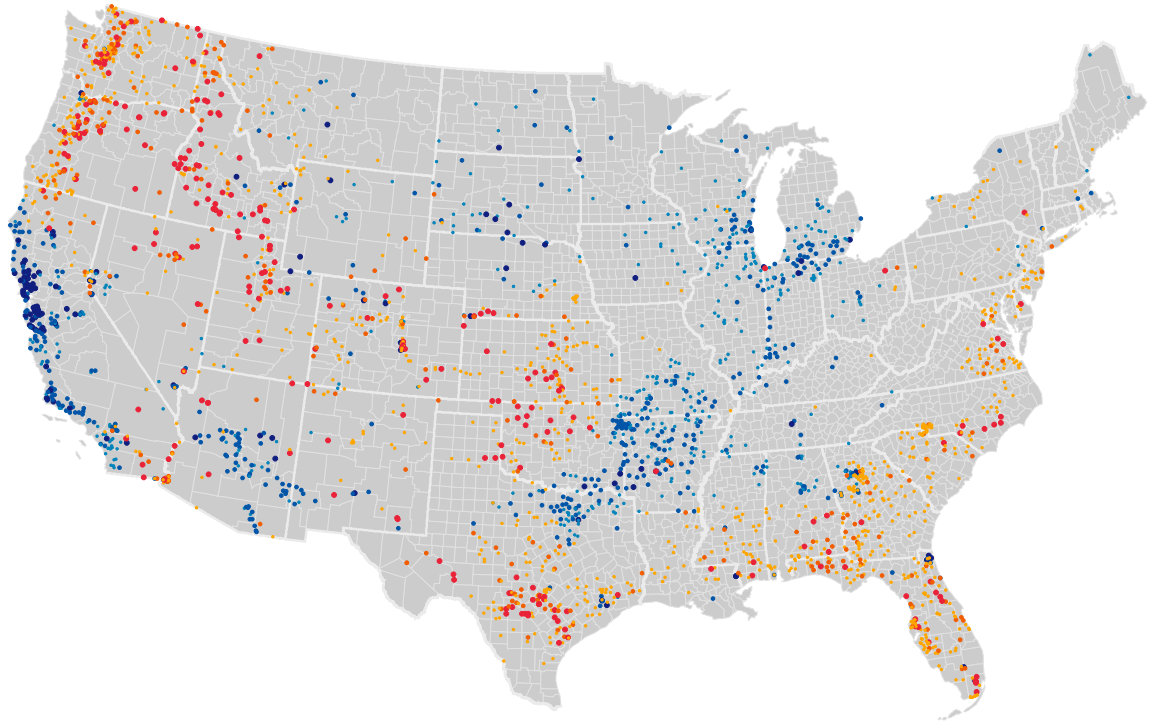
www.wpc.ncep.noaa.gov

U.S. Wildfire: Significant Fire Risk Outlook & Activity



Source: NIFC

U.S. Current Riverine Flood Risk



- | | | | |
|----------------------------|---------------------------|-------------------------|--------------------|
| High Flows
(Percentile) | • ≥ 99 / Above floodstage | Hydrological
Drought | • Severe Drought |
| | • 95 - 99 | | • Moderate Drought |
| | • 90 - 95 | | • Below Normal |

A ≥99th percentile indicates that estimated streamflow is greater than the 99th percentile for all days of the year. This methodology also applies for the other two categories. A stream in a state of severe drought has 7-day average streamflow of less than or equal to the 5th percentile for this day of the year. Moderate drought indicates that estimated 7-day streamflow is between the 6th and 9th percentile for this day of the year and 'below normal' state is between 10th and 24th percentile.

Source: United States Geological Survey

Source Information

United States: Severe Convective Storm

NWS Storm Prediction Centre

At least 13 people are dead as severe storms bring tornadoes and flooding to South, now sweeps across Northeast, *CNN*

Chile and Argentina: Wildfires & Heatwave (Update)

The National Forestry Corporation (CONAF)

The National System for Disaster Prevention (SENAPRED)

The Argentina's Meteorological Service (SMN)

Argentina melts in late-summer heat wave as records tumble, *Reuters*

Mozambique and Madagascar: Cyclone Freddy (Update)

The Madagascar's National Bureau of Risk and Disaster Management (BNGRC)

The Mozambique's National Disaster Management Agency (INGD)

The World Meteorological Organization (WMO)

Colorado State University

NOAA

Deadly cyclone Freddy has become Earth's longest-lived tropical storm, *The Washington Post*

Natural Catastrophes: In Brief

The Indonesian Disaster Agency (BNPB)

Ecuadorian Secretariat for Risk Management (SGR)

Hundreds Displaced by Floods in Northern Paraná, Floodlist

The strong wind broke trees and damaged roofs. Times.am

Contacts

Michal Lörinc

Head of Catastrophe Insight

michal.lorinc@aon.com

Ondřej Hotový

Catastrophe Analyst

ondrej.hotovy@aon.com

About Aon

Aon plc (NYSE:AON) is a leading global professional services firm providing a broad range of risk, retirement and health solutions. Our 50,000 colleagues in 120 countries empower results for clients by using proprietary data and analytics to deliver insights that reduce volatility and improve performance.

© Aon plc 2021. All rights reserved.

The information contained herein and the statements expressed are of a general nature and are not intended to address the circumstances of any particular individual or entity. Although we endeavor to provide accurate and timely information and use sources we consider reliable, there can be no guarantee that such information is accurate as of the date it is received or that it will continue to be accurate in the future. No one should act on such information without appropriate professional advice after a thorough examination of the particular situation.

Copyright © by Impact Forecasting®

No claim to original government works. The text and graphics of this publication are provided for informational purposes only.

While Impact Forecasting® has tried to provide accurate and timely information, inadvertent technical inaccuracies and typographical errors may exist, and Impact Forecasting® does not warrant that the information is accurate, complete or current. The data presented at this site is intended to convey only general information on current natural perils and must not be used to make

life-or-death decisions or decisions relating to the protection of property, as the data may not be accurate. Please listen to official information sources for current storm information. This data has no official status and should not be used for emergency response decision-making under any circumstances.

Cat Alerts use publicly available data from the internet and other sources. Impact Forecasting® summarizes this publicly available information for the convenience of those individuals who have contacted Impact Forecasting® and expressed an interest in natural catastrophes of various types. To find out more about Impact Forecasting or to sign up for the Cat Reports, visit Impact Forecasting's webpage at impactforecasting.com.

Copyright © by Aon plc. All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise. Impact Forecasting® is a wholly owned subsidiary of Aon plc.