

Weekly Cat Report

December 22, 2023



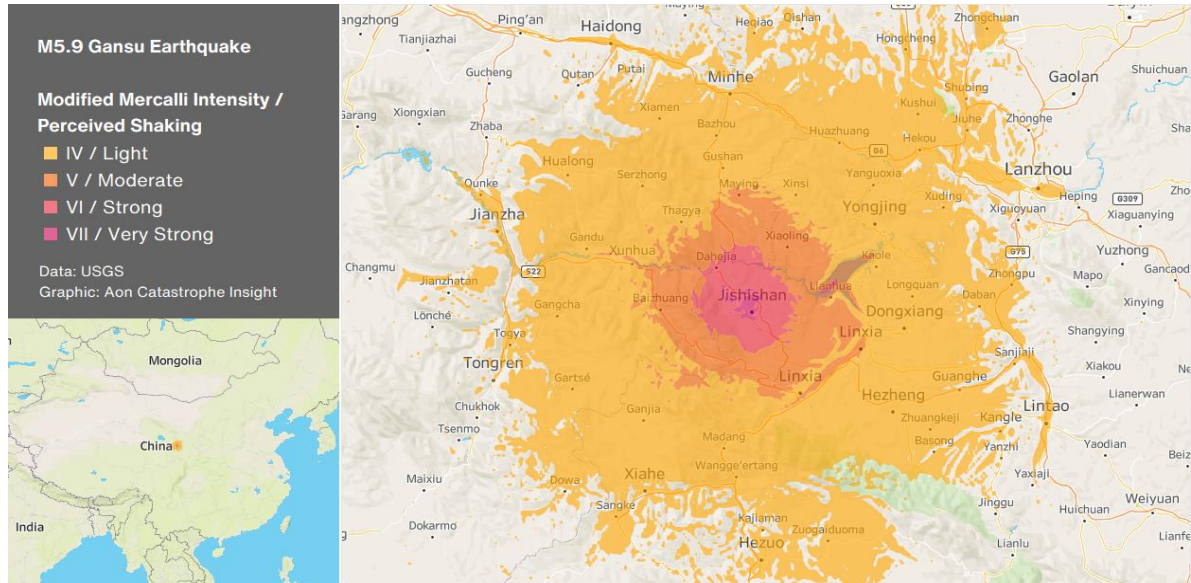
China: Earthquake

Overview

A deadly earthquake struck north-central China in the remote Gansu and Qinghai provinces on December 18. With at least 135 deaths and 980 injuries, this is the deadliest quake in China in nearly a decade. Damage assessments and relief operations are ongoing amidst freezing temperatures across the region, yet the initial information suggests more than 200,000 homes were damaged or destroyed.

Seismological Recap

At 11:59 pm local time (15:59 UTC) late on December 18, a powerful earthquake struck at a shallow depth of approximately 10 km (6.2 miles) in north-central China. The USGS measured the tremor at M5.9 while the China Earthquake Administration measured a M6.2 quake. The epicenter of the event was located about 37 km (23 miles) northwest of Linxia within the remote, mountainous Gansu province. While the quake did not occur along a plate boundary, this region of China is located on the northern fringe of the tectonically active Qinghai-Tibetan Plateau. In fact, China's most recent deadly earthquake occurred near the eastern edge of the Plateau in August 2014. At that time, a M6.1 earthquake in the Yunnan province killed over 600 people and injured over 3,000 more.



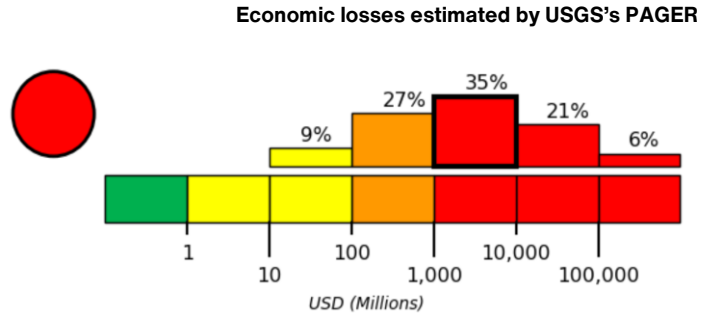
Event Details

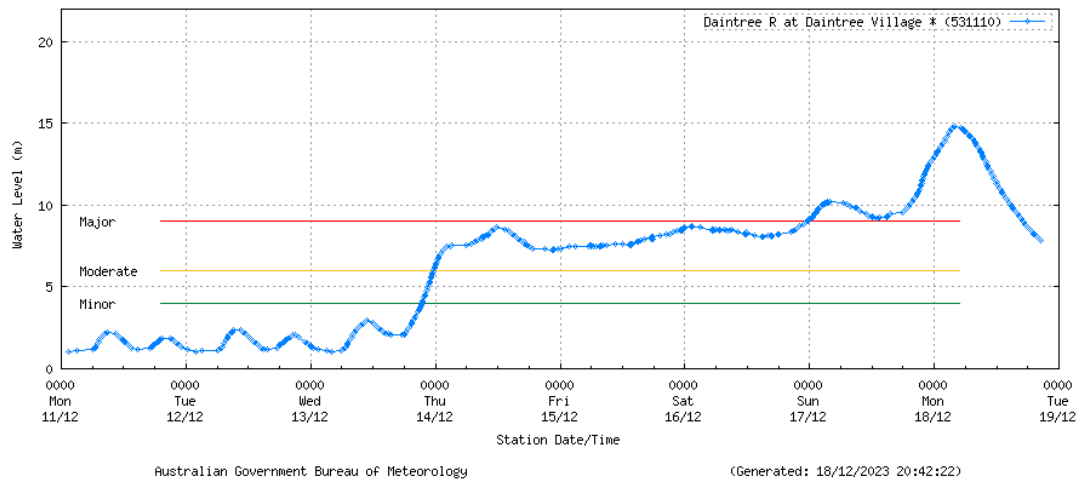
As of December 20, the earthquake has claimed 135 lives and injured 980 people within the Gansu and Qinghai provinces. Extensive damage to roads, power lines, and other infrastructural facilities was also seen across both provinces. Gansu was particularly devastated as more than 207,000 homes were damaged. More buildings were damaged in Qinghai due to several landslides. Notably, rescue efforts were hindered due to bitterly cold temperatures of nearly -20 °C (-4 °F) at the time of the event.

Financial Loss

As damage assessments remain ongoing across the affected region, it is still too early to determine the total financial loss. USGS initially put a red alert for economic losses, with a high potential of losses reaching into the hundreds of millions USD or higher, using the PAGER methodology. The possible catastrophic impact of this earthquake is supported by a high number of damaged structures in the area.

Even though the insurance take-up rates are not high in the area, the event will likely generate some notable payouts. Shortly after the event, the insurance sector in Gansu reported nearly 700 filed claims with total insured losses of ¥20 million (\$2.8 million). This total is expected to further increase.





Water level of Daintree River at Daintree Village and flood stages

Source: BoM

Event Details

Warnings from the Queensland government were issued for coastal regions stretching from Wujal Wujal down to Halifax. About 300 people were rescued from **Cairns**, and around 14,000 people lost power. This is an addition to nearly 40,000 customers who experienced power outages from Jasper's initial landfall. The local airport in Cairns became submerged, leading to canceled flights on December 16-17. Local officials remain concerned that the area may lose access to drinking water due to infrastructure damage.



Source: Queensland Government

Financial Loss

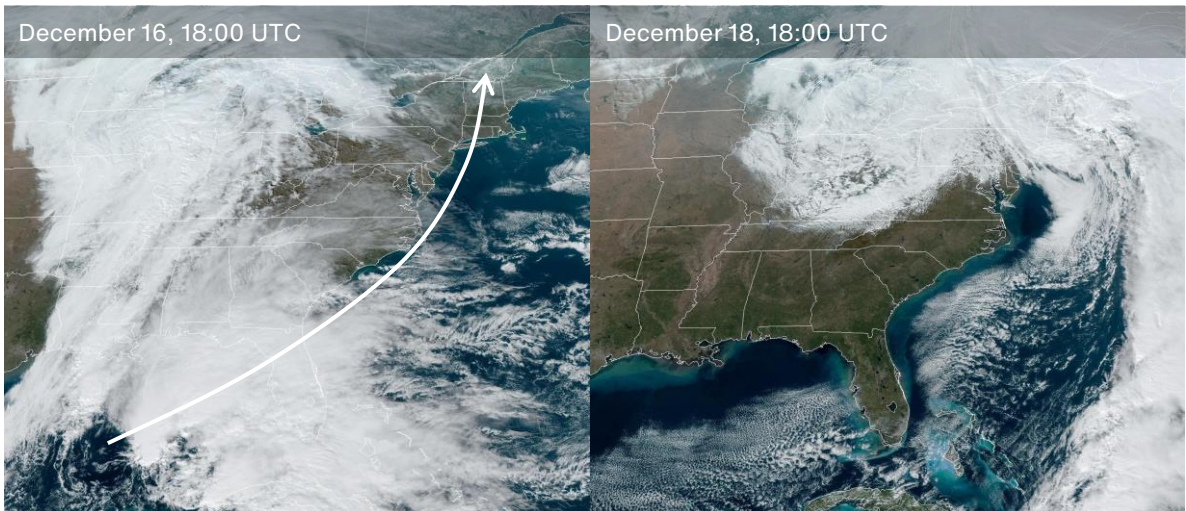
As damage assessments continue across the affected area, economic and insured losses caused by Cyclone Jasper and subsequent flooding will be likely higher than initially expected. Although the affected area was sparsely populated, material damage to properties, vehicles, infrastructure, and agriculture is significant. Current loss estimates sit in the hundreds of millions of AUD / USD. This event has been declared an insurance catastrophe by the Insurance Council of Australia as insurers have already reported thousands of claims.

United States: Flooding, SCS, Winter Weather

Overview

An intense low-pressure system brought strong winds and heavy precipitation to the eastern United States on December 16-19. Widespread power outages, downed trees, and localized flooding incidents were reported within several Atlantic coastal states. Additional winter weather impacts occurred in the eastern Great Lakes. The Carolinas and northern New England were notably devastated by significant flash flooding. Total economic and insured losses could reach into the millions of USD.

Meteorological Recap



On December 16, an area of low pressure developed over the Gulf of Mexico and quickly moved northeast into the Atlantic Ocean by the following day. While the system rapidly strengthened, several stations from northern Florida to North Carolina set new December minimum sea-level pressure records. At the same time, widespread wind gusts exceeding 60 mph (95 kph) and heavy rainfall caused coastal and inland flooding impacts to this region. South Carolina was particularly hit hard as some locations received up to 14 inches (355 mm) of rainfall on December 17 alone. Notably, heavy rain in Charleston, combined with high tide, broke the city's record for the highest non-tropical tide gauge level at 9.86 feet (3 meters).

Location, State	Storm Total Rainfall (in/mm)
McClellanville, SC	14.59
Georgetown, SC	14.42
Myrtle Beach, SC	9.45
Hemingway, SC	8.30
Savannah, GA	7.73
Gainesville, FL	7.50
Edenton, NC	7.05

By December 18-19, this strong system (commonly known as a “Nor’easter”) brought similar wind and rain impacts to the Mid-Atlantic and New England regions. As the system moved north-northeastward, many coastal communities experienced exceptional wind speeds, with gusts up to 93 mph (150 kph).

Most notably, heavy rain combined with rapid snow melt led to flash flooding incidents along several rivers from New Jersey to Maine. Communities within Vermont, New Hampshire, and Maine were especially impacted by flash flooding after receiving 4-7 inches (100-180 mm) of rain. On the backend of this system further west, parts of the eastern Great Lakes also experienced heavy lake-effect snow. Some locations within Michigan, Ohio, and Pennsylvania received 7-12 inches (180-305 mm) of snow, creating hazardous driving conditions.

Event Details



Flooding in Lewiston, Maine (left) and Charleston, South Carolina (right)

Sources: Lewiston PD (left), Charleston FD (right)

In total, 7 people were killed and dozens more injured as a result of the intense, multi-day Nor'easter. Much of New England experienced downed trees and widespread power outages, including 400,000 power outages in Maine alone. However, the most significant damage in this region came from intense flash flooding. Multiple towns in Maine such as Eustis, Lewiston, and Augusta saw extensive infrastructure and property damage, which prompted the state governor to declare a civil state of emergency. Similar flooding damage also occurred in Vermont and New Hampshire, including near the Plymouth State University campus.

Additionally, parts of the southeast dealt with minor flooding damage, including several coastal communities in South Carolina between Charleston and Myrtle Beach. Downtown Charleston was especially impacted as dozens of buildings sustained flooding damage. More minor impacts were seen across the eastern Great Lakes due to winter weather. Notably, whiteout conditions in western Michigan led to two large vehicle pileups.

Financial Loss

Given the large area affected by wind and flooding damage, total economic and insured losses could reach into the millions of USD.

Iceland: Sundhnúkur Eruption

Overview

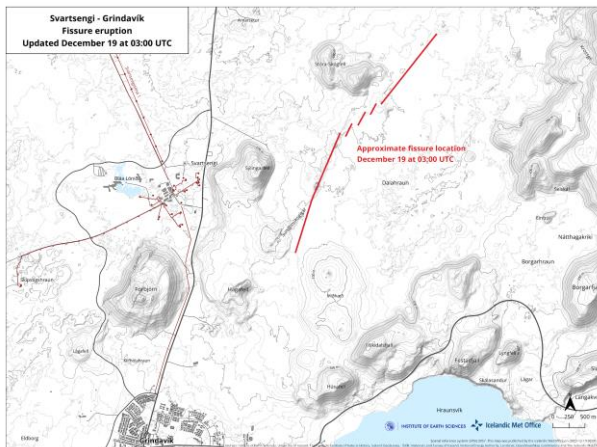
Following a magma intrusion and intense seismic and earthquake activity in recent weeks, a volcanic eruption started on the Reykjanes peninsula in the late evening of December 18. The eruption is located about 3 km (1.9 mi) north of Grindavík town, which was pre-emptively evacuated in mid-November.

Seismological Recap

The eruption began at 22:17 (local time) on December 18, following the earthquake swarm that started around 21:00. The eruptive fissure is about **4 km (2.5 mi) long**, with the northern end just east of Stóra-Skógfell and the southern end east of Sundhnúk. The distance from the southern end to the edge of Grindavík is almost 3 km (1.9 miles).

Prior to the volcanic eruption from December 18, intense seismic and earthquake activity due to a magma intrusion had occurred on the Reykjanes peninsula since October. Tens of thousands, usually weak and shallow, earthquakes have been reported since late October in the region. The strongest tremor of a magnitude of 5.2 occurred west of Grindavík on November 10 (see Weekly Cat Report released on November 17).

Although seismic activity and volcanic eruptions occur frequently across Iceland as the island is located at the boundary of the Eurasian and North American tectonic plates, the recent earthquake swarm followed by volcanic eruption was more extensive than usual. Three volcanic eruptions within various volcanic complexes have occurred in the Reykjanes peninsula since 2021.



Source: Icelandic Met Office

Event Details

The local civil protection has declared a state of emergency and pre-emptively evacuated about 3,700 residents from the town of **Grindavík** on November 10. The rupture and earthquakes caused considerable damage to properties and infrastructure in the town. The Icelandic Met Office continues to monitor the activity due to the eruption and is in direct contact with civil protection and response units in the area. The primary hazard and potential losses will be related to lava spillage and its direction. Despite current decreases in volcanic activity, it is not clear how long the eruption will last.

Natural Catastrophes: In Brief

Severe Convective Storm (Argentina)

Severe storms associated with strong winds and flooding impacted parts of the Buenos Aires province in Argentina on December 16-17. Notably, the city of Bahía Blanca was hit with winds up to 140 kph (87 mph), leading to 15 deaths and evacuations for at least 300 people. Thousands of residential properties and vehicles were damaged, along with notable damage to industrial and commercial exposure. About a million people were reportedly without power at the height of the storm. Impacts also included damage to several planes and other facilities at the city's airport. The event is likely to cause a notable economic loss, preliminarily estimated by some groups as high as ARS100 billion (\$125 million).

Tropical Storm Jelawat (Philippines)

Jelawat, named Kabayan in the Philippines, made landfall over the Davao Oriental Province on December 18. The storm generated heavy rainfall across Mindanao Island and Visayas Islands. As of December 21, the National Disaster Risk Reduction and Management Council (NDRRMC) reported more than 320,000 affected people, one injured and one missing person, along with material damage to more than 1,400 houses across six regions (Davao, Northern Mindanao, Caraga, Mimaropa, Western Visayas and Eastern Visayas)

Severe Convective Storm & Flooding (India)

At least 10 people died due to severe weather and flooding that have occurred across Tamil Nadu State in southern India since December 18. Districts of Thoothukudi, Tuticorin, Tirunelveli, Kanniyakumari, and Tenkasi were among the most hit with some material damage incurred.

Windstorm Zoltan / Pia (Western & Central Europe)

Windstorm Zoltan, alternatively named Pia by meteorological offices in Northern Europe, started to affect parts of Western and Central Europe on December 21. This storm is expected to cause notable damage across Europe in the upcoming days, particularly in the United Kingdom, Denmark, Germany, Austria, Czech Republic, and Poland. More details about this windstorm will be included in the next Weekly Report.

Severe Convective Storm (South Africa)

Strong storms affected parts of KwaZulu-Natal province in South Africa on December 18. Among the worst affected areas was Dundee City. Several hundred structures were affected, while one person was killed and six were injured.

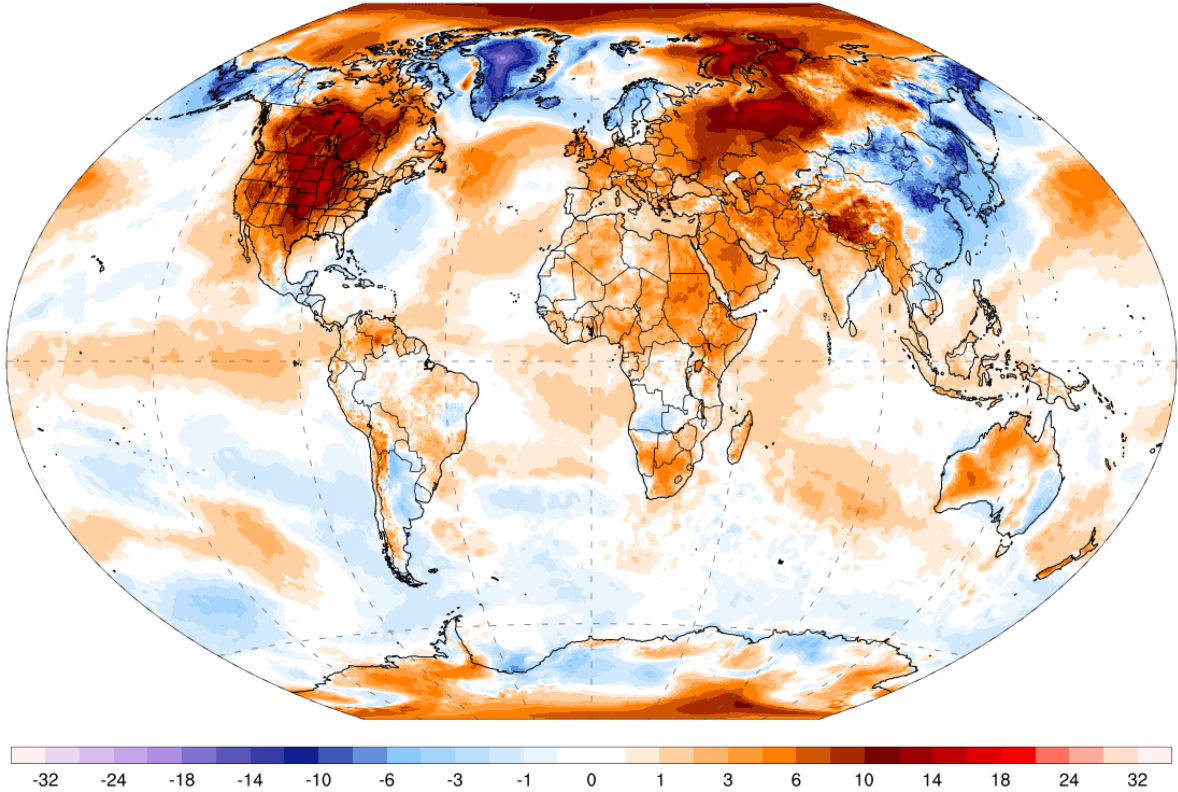
Flooding (United States)

An atmospheric river event has been affecting much of California since December 20. Heavy rainfall and localized flooding has been observed from San Francisco to Los Angeles, prompting some rescues from flooded roads. More details will be provided in the next Weekly Report as the flooding threat continues.

Global Temperature Anomaly Forecast

GFS 2m T Anomaly (°C) [CFSR 1979-2000 baseline]
Days 1-3 Avg | Thu, Dec 21, 2023

ClimateReanalyzer.org
Climate Change Institute | University of Maine

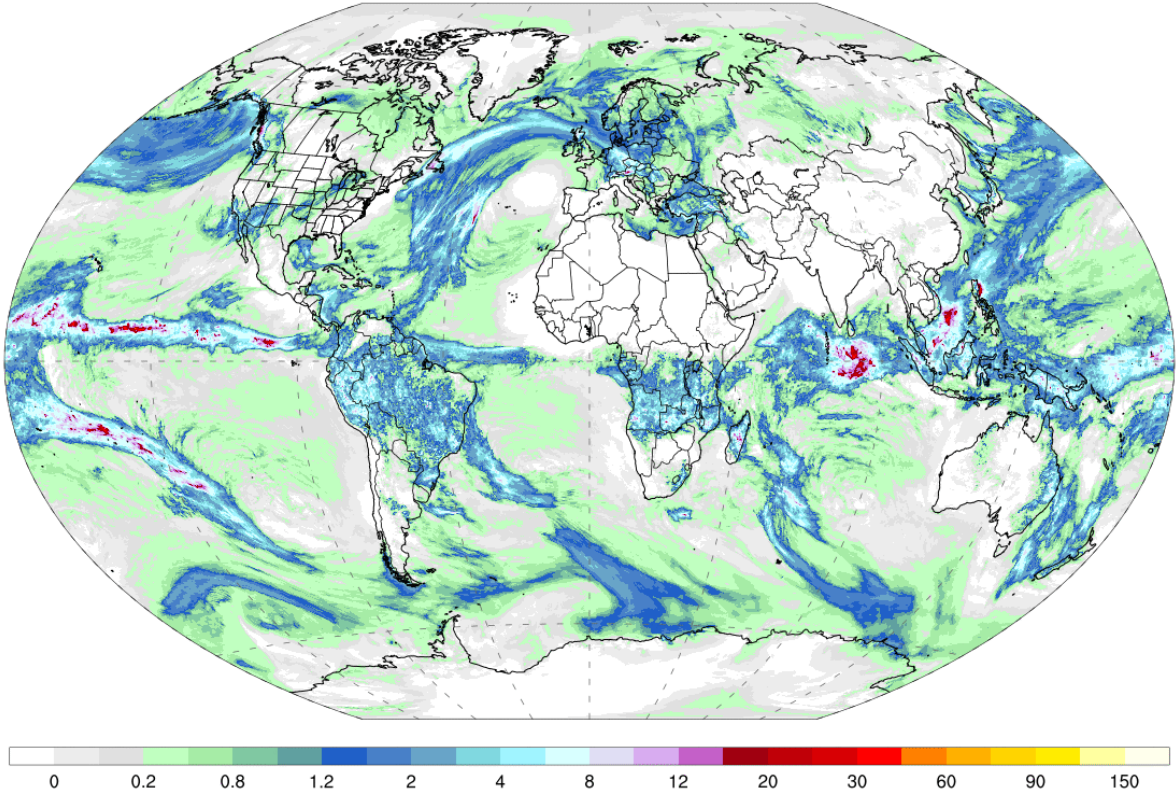


Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

Global Precipitation Forecast

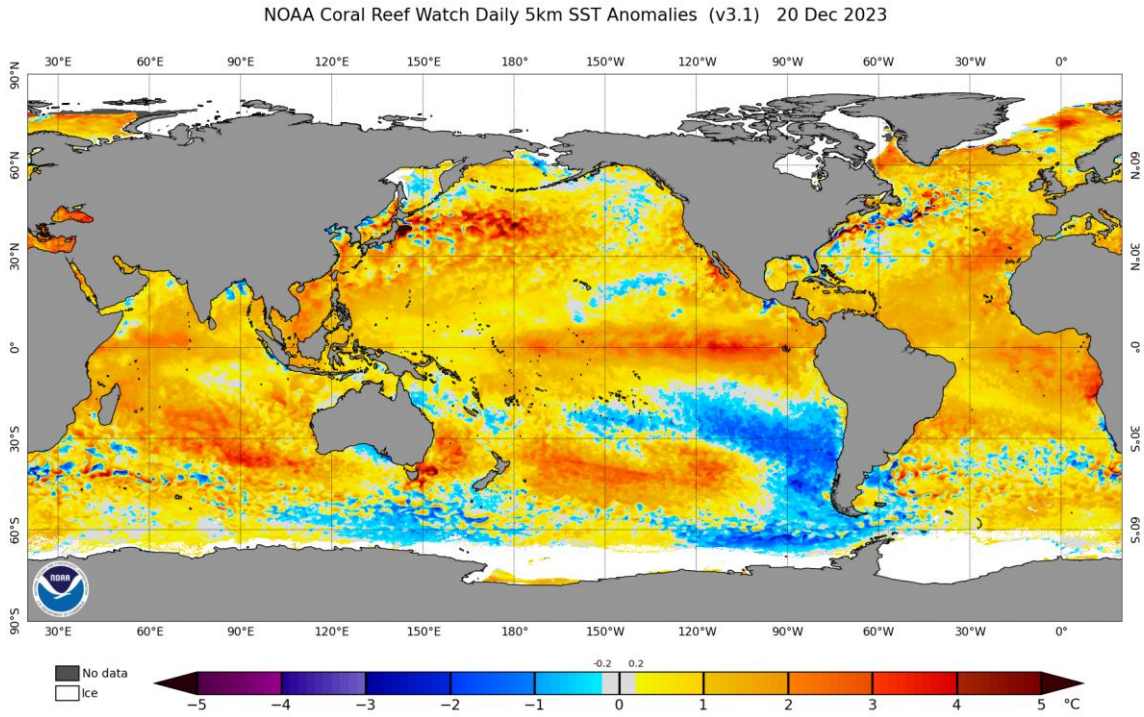
GFS Accumulated Precipitation (cm)
Days 1-3 Total | Thu, Dec 21, 2023

ClimateReanalyzer.org
Climate Change Institute | University of Maine

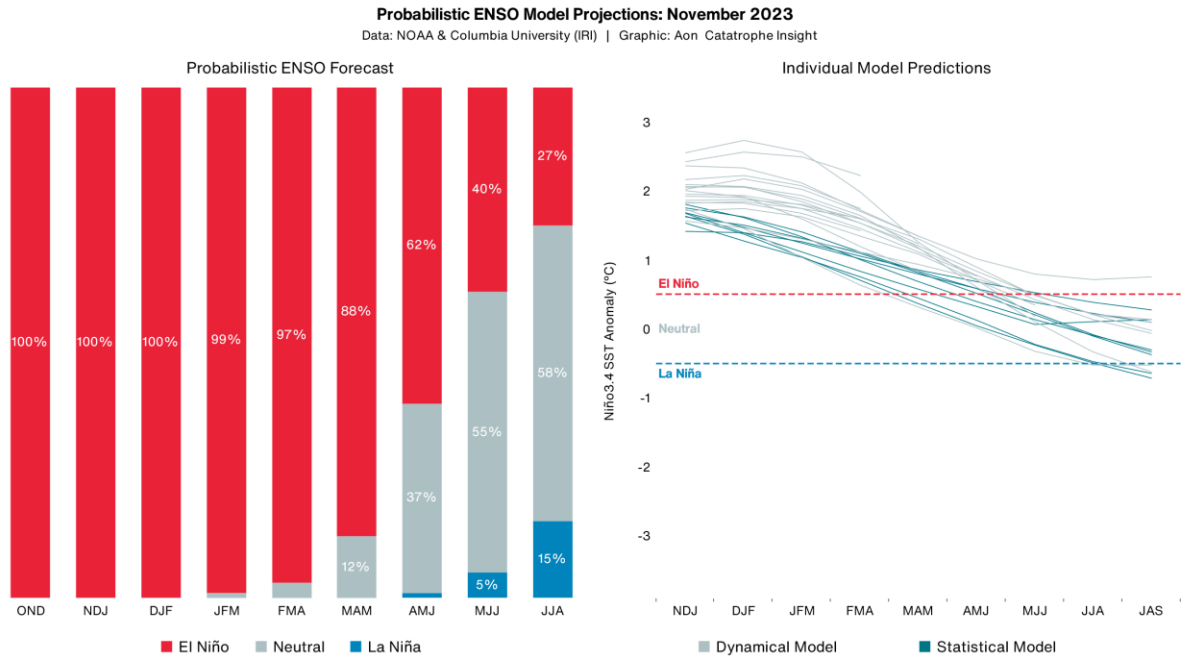


Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

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



El Niño-Southern Oscillation (ENSO)



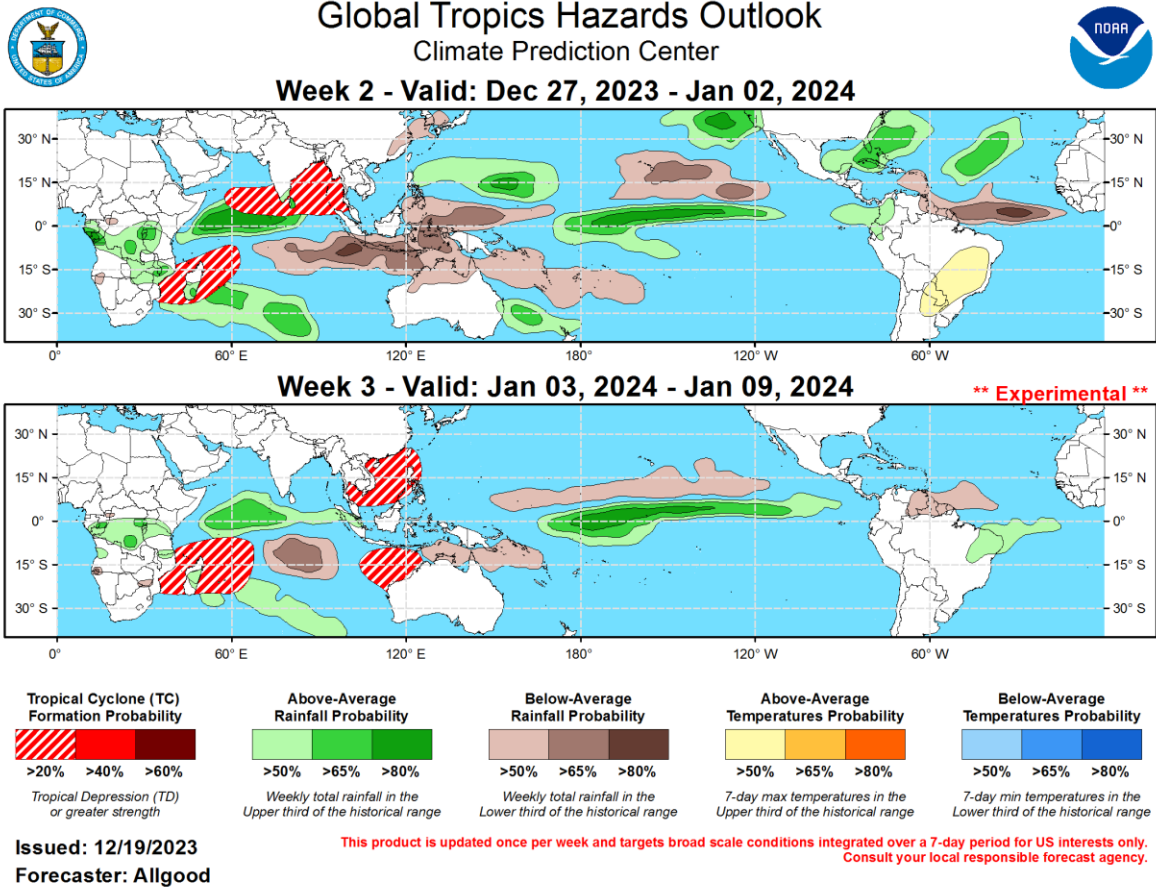
El Niño: Warm phase of an ENSO cycle. Sea surface temperatures of +0.5°C occur across the east-central equatorial Pacific.

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.

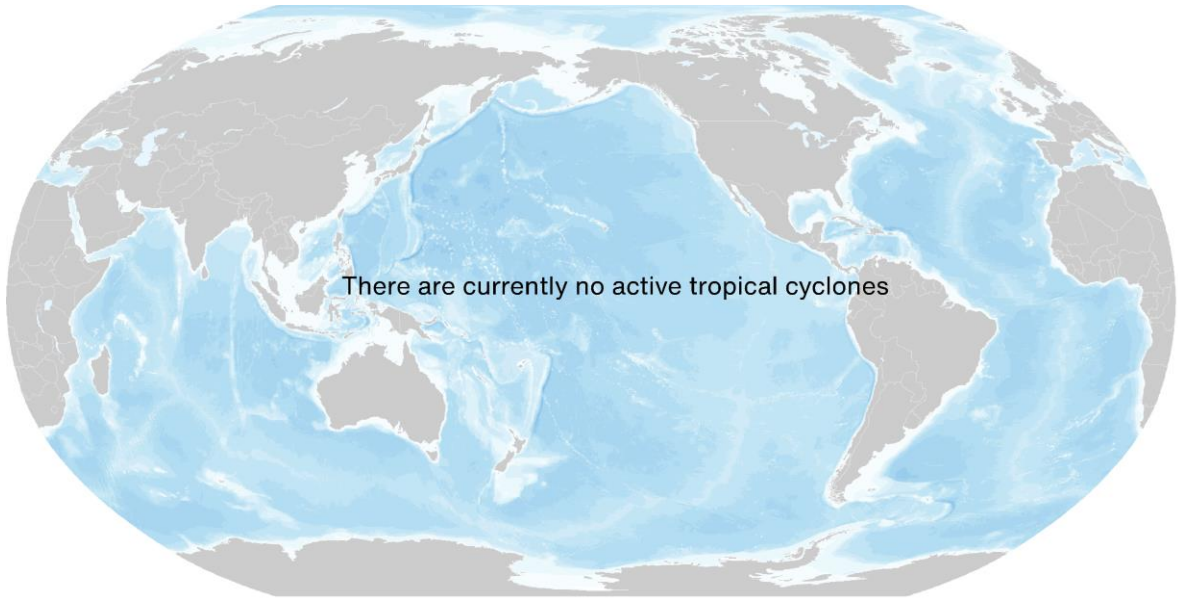
El Niño (La Niña) is a phenomenon in the equatorial Pacific Ocean characterized by a five consecutive 3-month running mean of sea surface temperature (SST) anomalies in the Niño 3.4 region that is above the threshold of +0.5°C (-0.5°C). This is known as the Oceanic Niño Index (ONI).

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

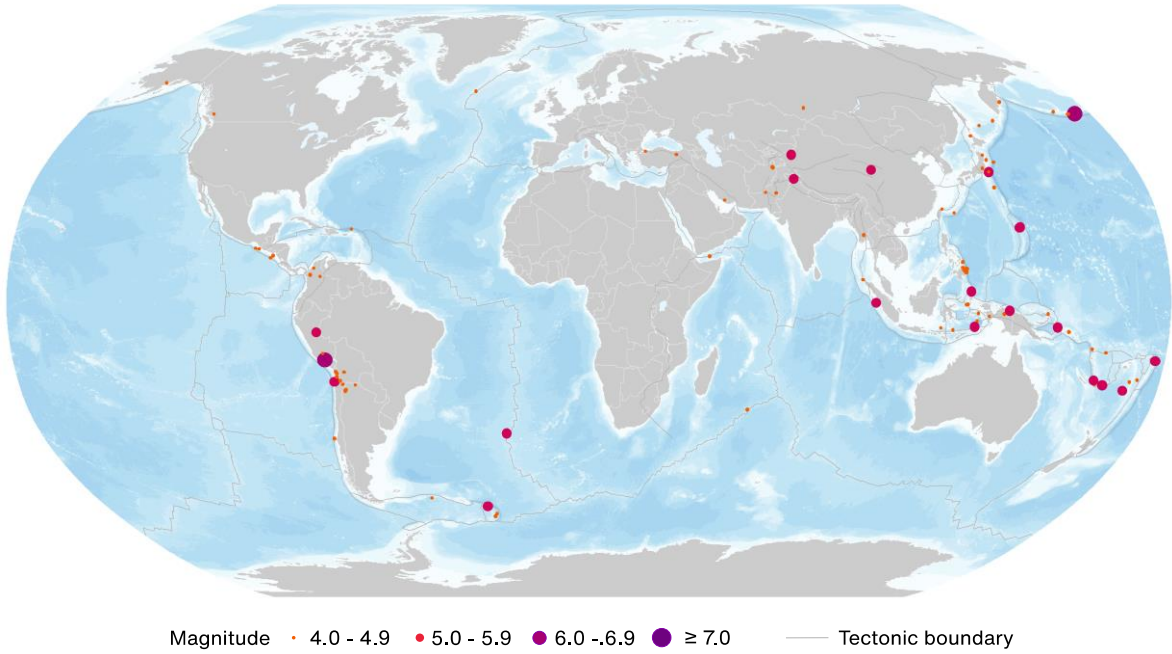
Name	Location	Winds	Center

* 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)

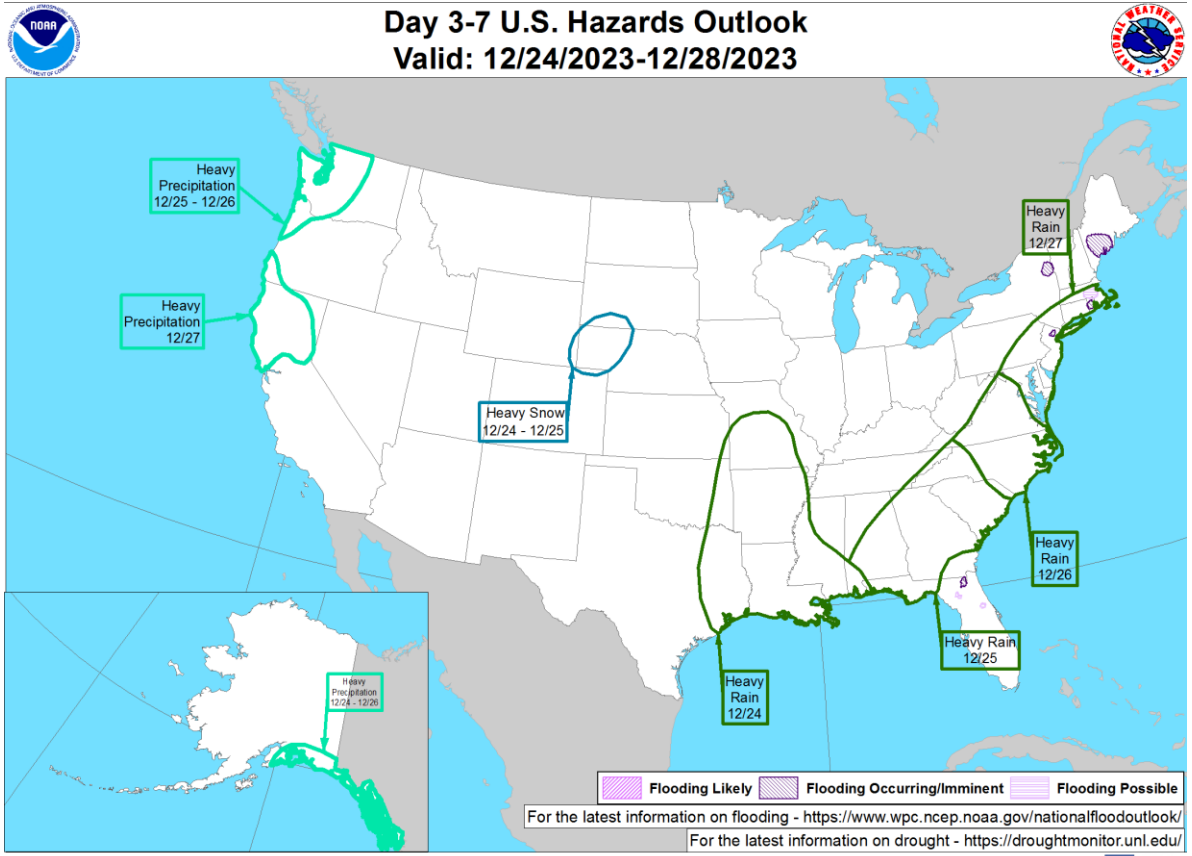
Global Earthquake Activity ($\geq M4.0$): December 15-21



Date (UTC)	Location	Mag	Epicenter
12/20/2023	15.96S, 72.60W	6.2	11 km (7 miles) SSE of Iray, Peru
12/21/2023	51.33N, 175.36W	6.1	10 km (6 miles) SE of Adak, Alaska

Source: United States Geological Survey

U.S. Hazard Outlook

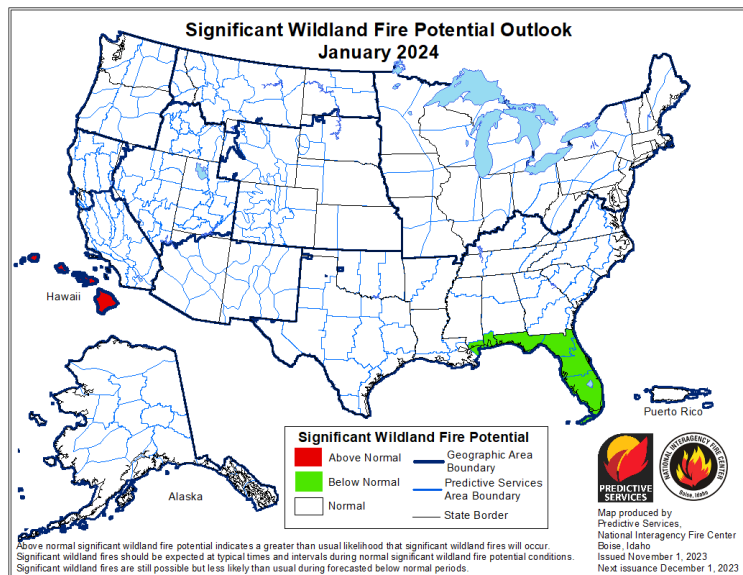
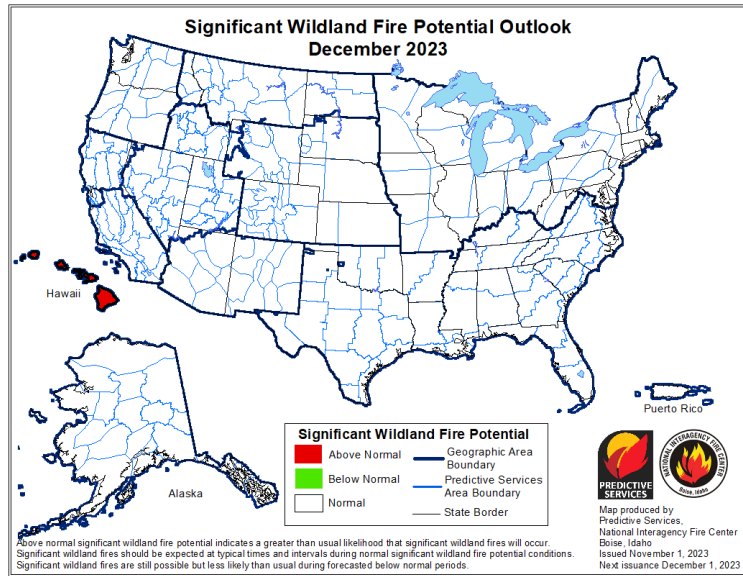


Weather Prediction Center
Made: 12/21/2023 02:37 PM EST

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www.wpc.ncep.noaa.gov

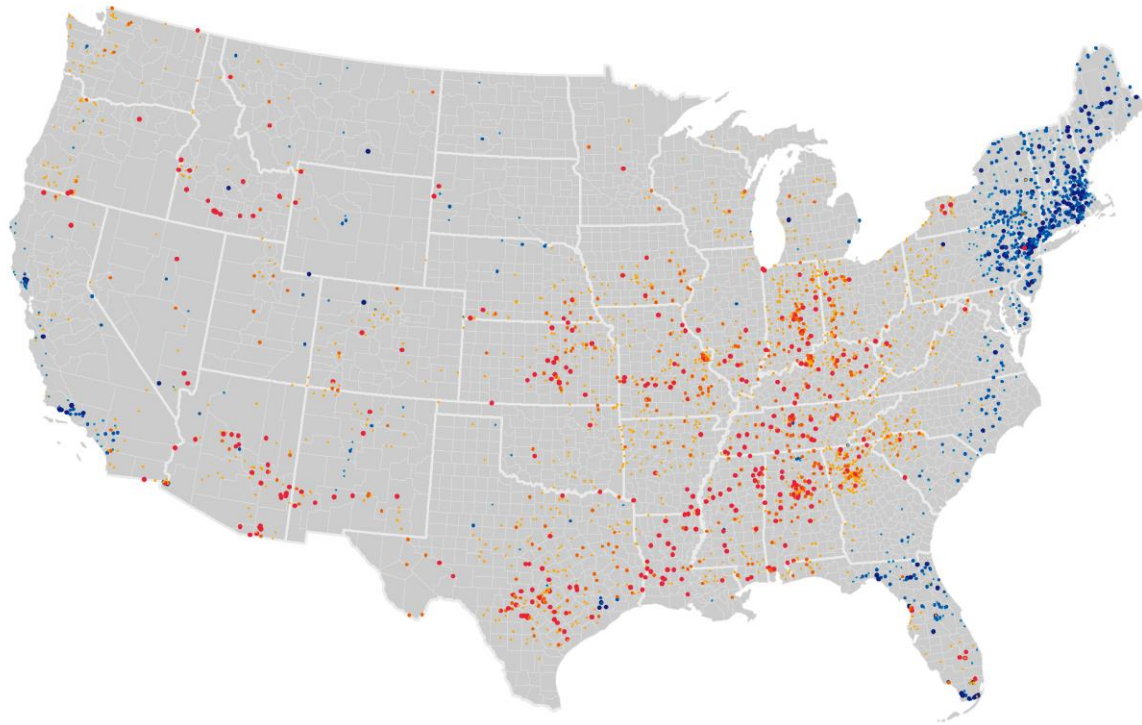
Source: Climate Prediction Center (NOAA)

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

China: Earthquake

USGS

China Earthquake Administration

An earthquake in northwestern China kills at least 131 people and is the deadliest in 9 years, *Ap News*

In Bitter Cold, Rescuers Struggle to Help Quake Survivors in China, *The New York Times*

A dozen still missing after China's earthquake, *Reuters*

ReliefWeb

Australia: Cyclone Jasper & Flooding

Australian Bureau of Meteorology (BoM)

Insurance Council of Australia (ICA)

Families stranded on rooftops as heavy rains batter northern Australia and crocodiles stalk floodwaters,

CNN

Queensland floods: Towns isolated as supplies dwindle and rain eases, *BBC*

United States: Flooding, SCS, Winter Weather

National Weather Service (NWS)

Weather Prediction Center (WPC)

Drone video shows devastating floods in Northeast after deadly storm walloped East Coast, *Fox Weather*

Christmas is in jeopardy for some New Englanders after storms and flooding knocked out power, *AP News*

Crash of up to 40 cars shuts Telegraph for hours in Redford Township, *The Detroit News*

Thousands of homes and businesses without power as cold weather and 'significant' storm damage torment Maine, *CNN*

Iceland: Volcanic Eruption

Icelandic Met Office

Public Safety Department of the National Police

Natural Catastrophes: In Brief

NDRRMC

California hammered with rain and flooding ahead of holiday weekend: Latest, *ABC News*

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