

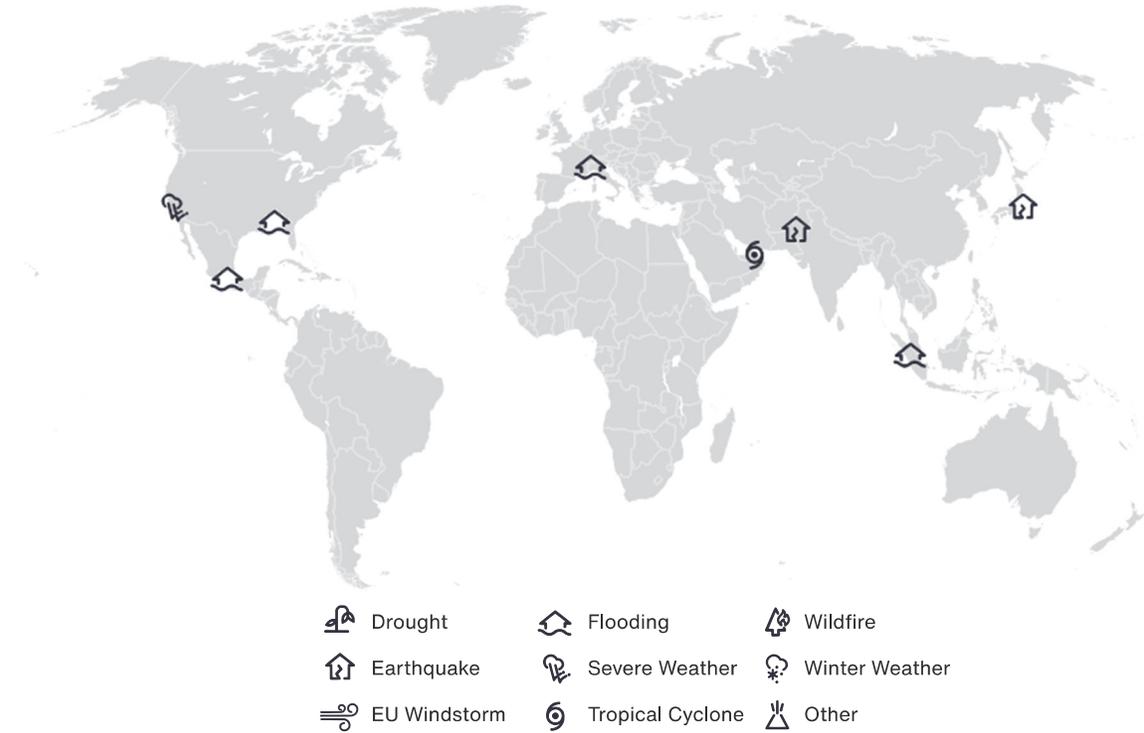
AON

Weekly Cat Report

October 8, 2021



Executive Summary



Event	Affected Region(s)	Fatalities	Economic Loss (USD)	Page
TY Gulab (Shaheen)	India, Oman, Iran	34+	100s of Millions	3
Flooding	Italy, France	0	10s of millions	6
Severe Weather	United States	0	Millions	8
Flooding	Indonesia	12+	Millions	8
Earthquake	Pakistan	23+	Unknown	8
Flooding	China	8+	50+ million	8
Flooding	Mexico	6+	Millions	8
Flooding	United States	4+	Millions	9
Earthquake	Japan	0	Millions	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.

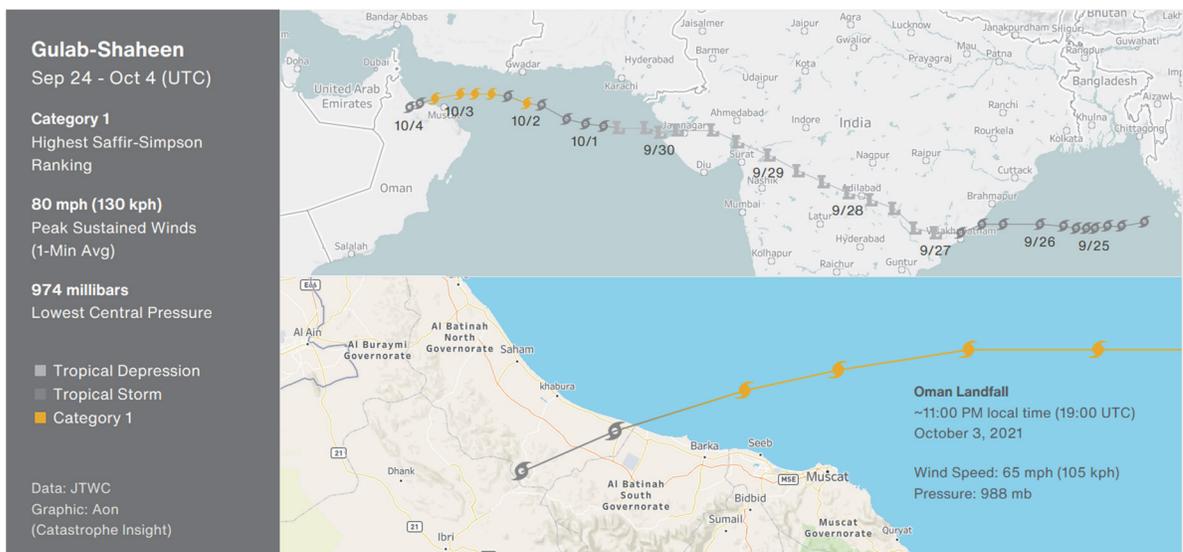
Along with this report, we continue to welcome users to access current and historical natural catastrophe data and event analysis on Impact Forecasting's Catastrophe Insight website: <http://catastropheinsight.aon.com>

Update: Cyclone Gulab (Shaheen)

Overview

Cyclone Shaheen (which developed from the remnants of Cyclone Gulab) made landfall along the northern coast of Oman on October 3, after re-forming in the Arabian Sea. This marked the first tropical cyclone in the satellite era to make landfall in this region. The storm resulted in dangerous storm surge, flooding rainfall, and hurricane-force gusts across northern Oman. Impacts included damage to homes, businesses, and infrastructure. At least 14 storm-related fatalities were reported in Oman and Iran. Prior to landfall in Oman, Tropical Storm Gulab impacted central portions of India between September 24-29. Total economic losses in Oman alone were anticipated to reach into the hundreds of millions (USD). The local insurance industry was facing a non-negligible cost of payouts.

Meteorological Recap

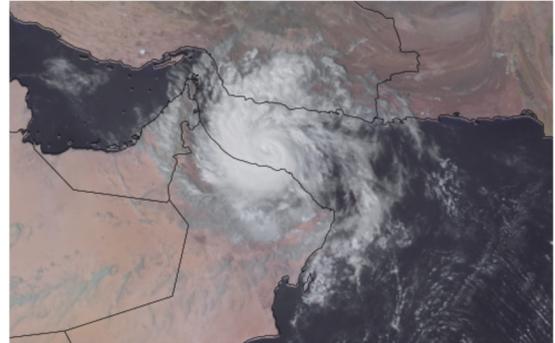


Tropical Storm Gulab, the third named storm of the 2021 North Indian Ocean season, originated in the east-central Bay of Bengal on September 24, according to data from the Joint Typhoon Warning Center (JTWC). The low-pressure system developed in a favorable environment characterized by warm sea-surface temperatures and low vertical windshear as it tracked westward toward the eastern Indian coastline. Increased convective activity and the presence of a central dense overcast prompted the India Meteorological Department (IMD) to give the storm the name Gulab on September 25. Tropical Storm Gulab made landfall along the eastern coast of Andhra Pradesh, north of Kalingapatnam, during the evening of September 26 with 1-minute average sustained wind speeds reaching 75 kph (45 mph). The storm brought gusty winds and locally heavy rainfall to portions of southern Odisha, Andhra Pradesh, Telangana, and Maharashtra through September 29.

The remnants of Gulab emerged over the Arabian Sea on September 29-30 as the JTWC issued a Tropical Cyclone Formation Alert (TCFA), noting that additional tropical development was expected.

During this period, intensification was aided by warm sea-surface temperature and low wind shear as the cyclone continued westward toward the Gulf of Oman. The JTWC indicated the system had re-developed into a tropical storm by 21:00 UTC on September 30 (3:00 IST on October 1), as satellite imagery depicted a consolidating system with convection wrapping into a low-level circulation. Concurrently, the IMD recognized the system and assigned it the name Shaheen, while the JTWC accepted the storm as a continuation of Gulab, referring to it as Gulab-Shaheen.

In the Gulf of Oman, Gulab-Shaheen further intensified into a marginal Category 1 equivalent storm by October 2 at 3:00 UTC (8:30 IST), with 1-minute average sustained winds reaching 120 kph (75 mph). Exhibiting slight fluctuations in intensity, the cyclone continued west-northwest under the steering influence of a sub-tropical ridge to its north. The cyclone developed a small but ragged eye feature while gradually turning southwestward toward the coast of Oman through October 3. As this occurred, the outer bands of the storm began to generate storm surge, flooding, and damaging winds along the Omani and Iranian coasts.



Gulab-Shaheen approaching Oman on October 3

Source: NOAA/RAMMB

Cyclone Gulab-Shaheen eventually made a rare landfall along the northern coast of Oman, a region unaccustomed to tropical storm impacts, on October 3 around 19:00 UTC (11:00 PM local time) near Al-Suwaiq, west of the capital of Muscat. At landfall, Gulab-Shaheen maintained strong tropical storm intensity with 1-minute averaged sustained winds of approximately 105 kph (65 mph) and locally higher gusts. On October 4, the storm rapidly weakened over the dry Arabian Desert while proceeding southwestward.

Event Details

India

Tens of thousands were evacuated from vulnerable regions of Odisha and Andhra Pradesh as the storm approached. Impacts included rough seas, uprooted trees, landslides, and flash flooding which resulted in power outages, hundreds of damaged homes, and affected a vast area of agricultural land.

In **Odisha**, The National Emergency Response Centre indicated no fewer than 512 houses were damaged to varying degrees with the most extensive impacts occurring near the Koraput and Malkangiri districts. At least 179,000 people across the state were impacted by the event. In **Andhra Pradesh**, officials reported seven deaths and no less than 156 damaged homes. At least 43,249 hectares (106,870 acres) of croplands were inundated. Multiple water rescues were performed. The most notable flooding was reported in the Srikakulam, Vizianagaram, Visakhapatnam and Kalingapatnam districts. Subsequently, several days of torrential rains enhanced by Gulab and its remnants impacted **Telangana**, **Maharashtra**, and **Gujarat**, resulting in further damage and rain-related fatalities.

Oman

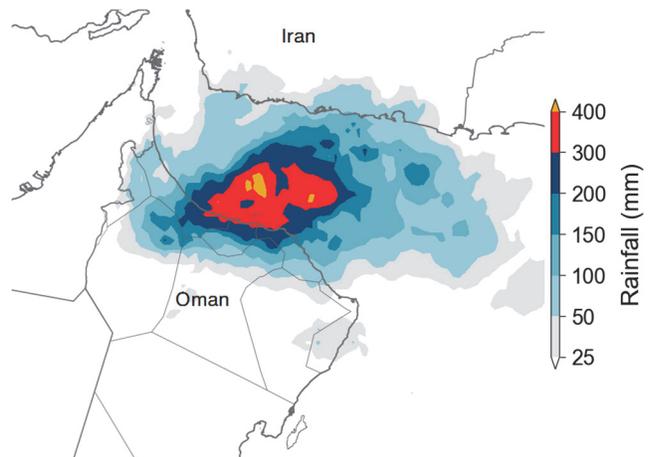


Rescue operations by the Royal Oman Air Force
Source: Oman News Agency

The unusual tropical cyclone landfall prompted the Government of Oman to declare at least a two-day national holiday to safeguard citizens from the impacts of the storm. In addition, Gulab-Shaheen prompted multiple flights to and from the capital of Muscat to be canceled or delayed, while traffic between the North and South Al Batinah Governorates was temporarily halted. Significant impacts from the cyclone included damage to homes and infrastructure, widespread flooding, landslides, and dust storms. As of this writing, at least 12 fatalities were reported in Oman.

Two-day preliminary rainfall totals in the Wilayat of Al-Khaburah reached 369 millimeters (14.5 inches), and 300 millimeters (11.8 inches) in Suwaiq. In Seeb, just west of Muscat, a rainfall total of 222 millimeters (8.7 inches) was measured. For comparison, the average rainfall for Muscat in the month of October is 0.8 millimeters (0.03 inches), while the average yearly rainfall is 89.7 millimeters (3.59 inches).

Oman Civil Defense and Ambulance Authority (CDAA) and the Royal Air Force of Oman (RAFO) performed no less than 60 rescues through October 4, predominately in North and South Batinah. No fewer than 5,000 people were relocated to emergency shelters. Officials reported electricity was cut off in the Wilayats of Barka, Musannah, and Suwaiq, while services were interrupted in surrounding communities. In portions of **Al-Dhahira, Al-Batinah North, Al-Batinah South, Muscat, and Al-Dakhilay** Governorates homes were flooded, local roadways were inundated with flood waters and debris, and numerous vehicles were damaged or became stranded.



Satellite Derived Precipitation: October 2-4 (UTC)
Source: NASA/GPM; Graphic: Aon, Catastrophe Insight

Iran

In Iran's **Sistan** and **Baluchestan** Provinces, no fewer than 122 people required hospitalization for eye, heart and lung complications after a dust storm generated by the cyclone impacted the region on October 3. As of this writing, at least two deaths in Iran have been attributed to the storm.

Financial Loss

Given the extent of damage to roads, bridges, homes, and other infrastructure in Oman alone, total economic losses were expected to reach into the hundreds of millions (USD). A non-negligible impact to the local insurance sector was also anticipated. Oman has a history of cyclones resulting in regionally high insured losses – most notably Gonu in 2007 (USD1 billion; 2021 USD).

Record-breaking rainfall observed in Italy

Overview

Record-breaking rainfall was observed in the Liguria region of northwestern Italy on October 4 in an event known as a Mediterranean episode. This event, in addition to further rainfall elsewhere, resulted in relatively minor flood-related losses in parts of Italy and France.

Meteorological Recap

Heavy rains commenced in France on October 3, in a situation known as a Cevennes episode. This is a specific type of a Mediterranean episode, a phenomenon that brings abundant moisture through storm systems to southern France, Spain or Italy, usually 3 to 6 times a year, mostly during autumn months. The sea is still warm at this time of the year and the water evaporates. If there is a low-pressure system over Western Europe, a mass of moist, warm air is pulled from the Mediterranean Sea northwards and is pushed against the mountain ranges. There it meets colder air lying north, creating instability, which is favorable for convective storm generation. Warm air rises and water vapor condenses, often creating significant rainfall. Moreover, the storms can continue to develop for hours or even days over the same location, releasing an equivalent of several months' precipitation.

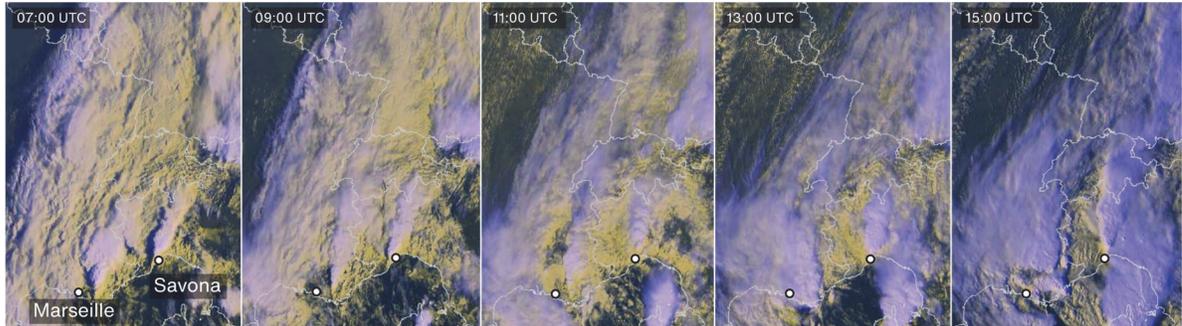
Station	Department	Rainfall (mm)
Villefort	Lozère	478
Brignoles	Var	~300
San-Giuliano	Haute Corse	252
Marseille	Bouches-du-Rhône	194
Régusse	Var	189

Significant precipitation totals nearing 500 millimeters (19.7 inches) were recorded in the Cevennes. Further significant totals came from stations in southeastern departments of Var, Bouches-du-Rhône and additionally in Corsica.

However, the most significant rainfall accumulations were recorded in northwestern Italy on October 4, as the frontal system became nearly stationary due to a robust area of high pressure located over the eastern part of the continent. Stationary thunderstorms with abundant moisture, aided by favorable orography, released exceptional amounts of rain within the 24-hour period on October 4 in the provinces of Savona and Genoa.

Highest rainfall totals for various time periods recorded in Liguria, Italy on October 4. Data: ARPAL

Period	Station	Province	Rainfall (mm)	Current Ligurian record
1 hour	Urbe Vara Superiore	Savona	178.2	181.0 – Vicomorasso (2011)
3 hours	Urbe Vara Superiore	Savona	377.8	New Record
6 hours	Montenotte Inferiore	Savona	496.0	New Record
12 hours	Rossiglione	Genoa	740.6	New Record
24 hours	Rossiglione	Genoa	883.8	948.4 – Bolzaneto (1970)



Stationary thunderstorms in Provence and Liguria on a satellite image from October 4

Data: ČHMÚ, EUMETSAT. Graphic: Aon (Catastrophe Insight)

Beside the exceptional situation in Liguria and Piemonte, additional severe weather phenomena resulted in minor damages in other Italian regions, notably in Sicilia.

Event Details

France

Minor impacts associated with inclement weather were registered in various French regions even prior to the main rainfall event in the southeast. Around 100 millimeters (3.9 inches) of rain fell in Nantes during the night to October 2; emergency services dealt with several hundred operations in Loire-Atlantique and Vendée departments due to dozens of flooded homes and power outages. Similarly, minor impacts were felt in Morbihan, Côtes-d'Armor and Finistère.

Dozens of homes were flooded in the Cevennes on October 4, notably in Chambon, and more than 3,000 homes lost power. However, most of the damage reports came from the coastal departments in the Provence-Alpes-Côte d'Azur region. Fire brigades intervened more than 1,500 times in Bouches-du-Rhône, and 230 times in Var; mainly due to flooded homes and roads.

According to the initial information, total impacts remained relatively limited in France.

Italy

Impacts in Italy were mostly associated with the exceptional rainfall that hit the Liguria region on October 4. Perhaps the most significant flooding hit the city of Savona and the adjacent region, additionally in the Bormida River basin. Floods and landslides damaged a number of houses, and other structures and affected several national roads. Further flooding occurred in Piemonte; about 80 people were evacuated in Alessandria Province due to the overflow of Bormida and Orba rivers.

Elsewhere, at least 10 people were injured as strong winds, heavy rains and a likely tornado hit central and northern Catania in Sicily, causing minor material losses, preliminarily estimated in the millions EUR. About 100 interventions were also conducted in Lazio.

Financial Loss

Despite the exceptional nature of the precipitation recorded in Liguria, damage arising from subsequent flooding was described as largely limited. Aggregated impacts from Italy and France will likely reach into the tens of millions EUR.

Natural Catastrophes: In Brief

Severe Weather (United States)

Abundant moisture streaming into California and the Southwest associated with an upper-level disturbance generated locally heavy rainfall and severe weather between October 4–5. Frequent lightning and strong winds sparked several fires, downed trees, and caused power outage across southern California on October 4. In Arizona, heavy downpours, hail, and severe winds impacted portions of Pinal and Maricopa Counties on October 5. Total economic losses were expected to reach into the millions (USD).

Flooding (Indonesia)

Torrential rainfall and subsequent landslides impacted regions of Indonesia since the end of September. On September 29, heavy rains and severe weather affected the West Sumatra Province and resulted in no less than eight deaths, damaged hundreds of homes, and inundated a vast area of cropland. Subsequently, heavy rains in South Sulawesi beginning October 3, prompted hundreds of evacuations and resulted in at least four fatalities and multiple injuries. Several villages in the province were isolated due to washed out roadways. Additional damages were noted in the East, West, and Central Kalimantan Provinces. During this period, hundreds of additional homes and several schools and public buildings were damaged to varying degrees.

Earthquake (Pakistan)

At least 23 people were killed and 300 were injured after a magnitude-5.9 tremor struck near the town of Harnai in the Baluchistan Province of central Pakistan on October 7 at 3:01 AM local time (October 6 22:01 UTC) in a shallow depth of approximately 9 kilometers (5.6 miles). Hundreds of homes reportedly collapsed. The death toll was expected to rise as officials began to access remote areas which were closest to the epicenter. Several coal miners were also reported as trapped or missing.

Flooding (China)

Torrential rains fell across swaths of northern and northwestern China from October 3-7, killing at least eight people. The hardest-hit provincial regions included Liaoning, Shaanxi, Shanxi, Henan, and Shandong. Thousands of homes were inundated, along with vast areas of agricultural land. Total combined economic losses to property and agriculture were listed by provincial emergency management offices in excess of USD50 million.

Flooding (Mexico)

A prolonged period of above average rainfall generated notable flooding in central Mexico's Querétaro state since the beginning of the month. Heavy rains on October 1 caused several area rivers to break their banks, while prompting authorities to open local flood gates. Subsequent flooding resulted in no fewer than six fatalities, while at least 3,500 homes and other structures were damaged to varying degrees. Total economic losses were expected to be in the millions (USD).

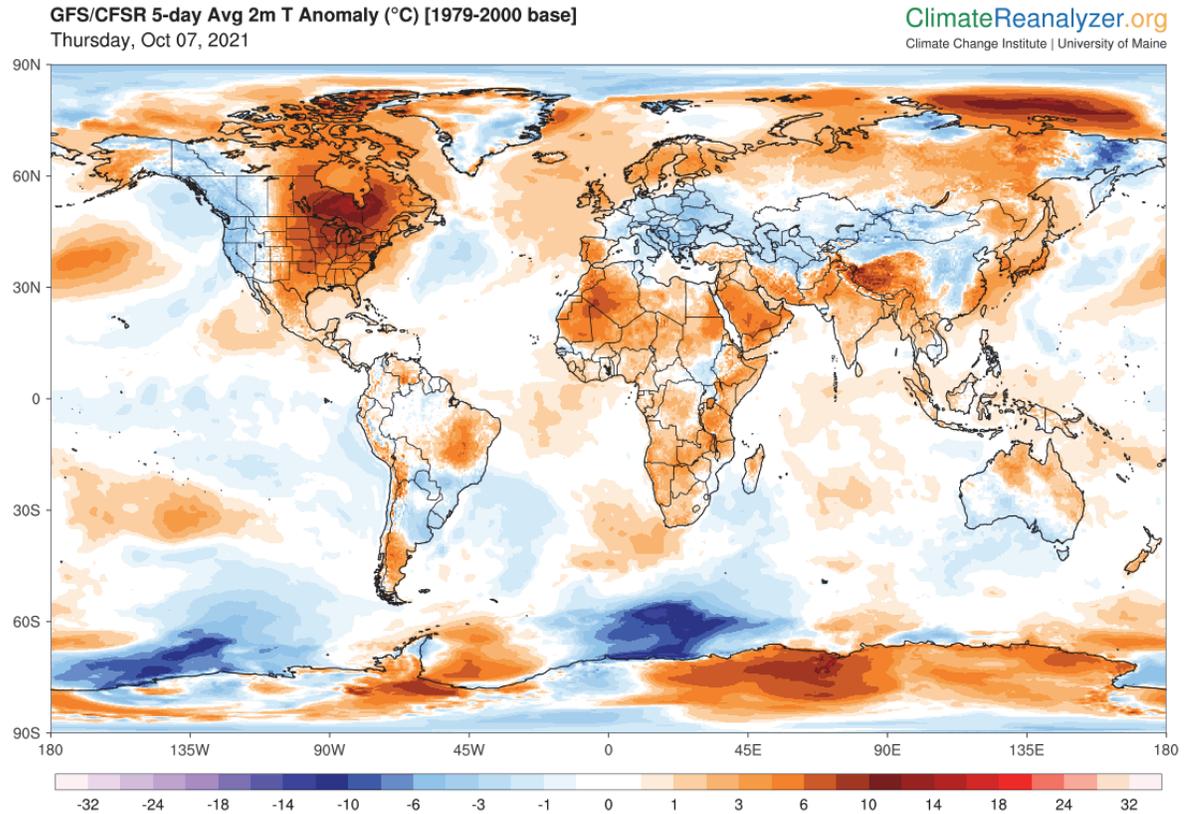
Flooding (United States)

Flood and flash-flood watches and warnings, resulting from a slow moving upper-level low and stalled frontal boundary across the Lower Mississippi Valley, spanned parts of Mississippi, Alabama, Tennessee, and the Florida Panhandle between October 5-7. A particularly bad situation unfolded in central Alabama on October 6, as incessant rainfall prompted the National Weather Service (NWS) to issue a Flash Flood Emergency in Shelby and Jefferson Counties – which included the City of Birmingham. Radar estimated rainfall totals in this region reached and exceeded 6 to 10 inches (150 to 250 millimeters). Floodwaters entered numerous residences and buildings, while inundating multiple roadways and prompting dozens of water rescues. At least four deaths in the state were reported. Total economic losses were expected to be in the millions (USD).

Earthquake (Japan)

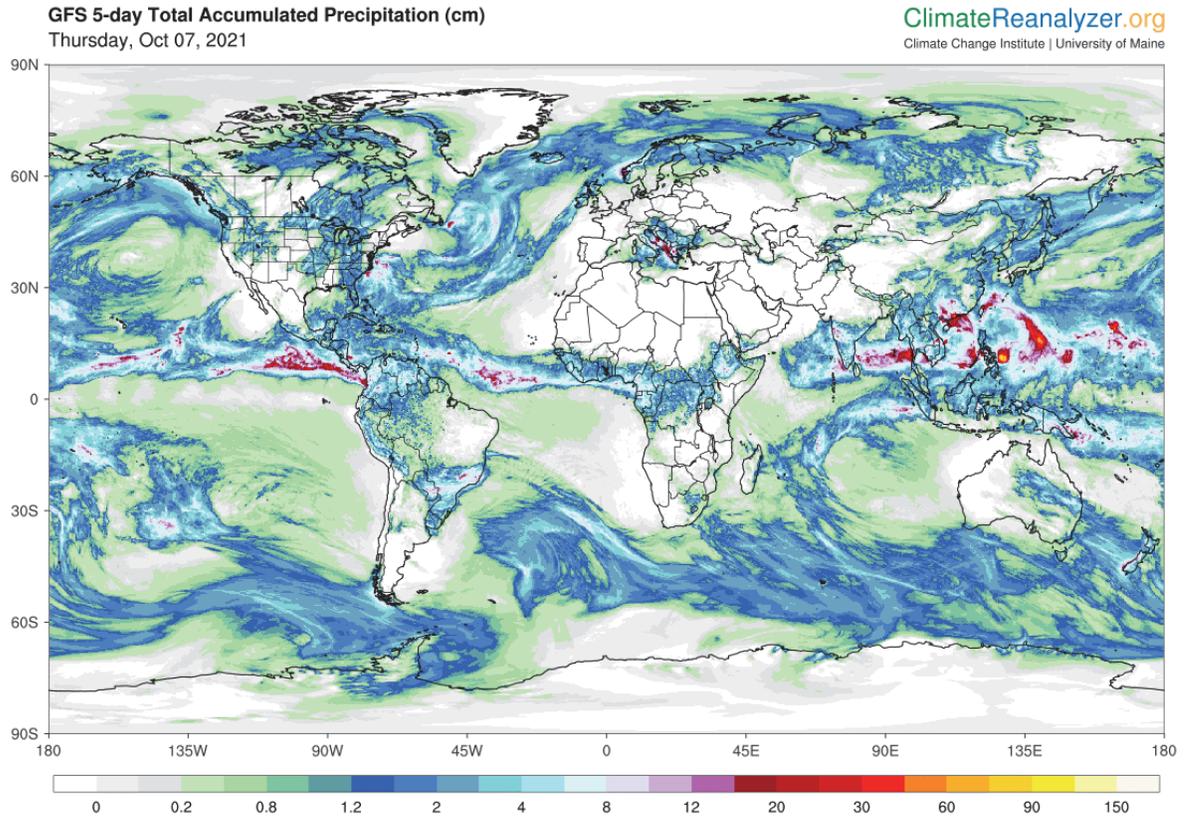
According to the United States Geological Survey (USGS), a magnitude-5.9 earthquake struck near the coast of Honshu in Japan's Chiba Prefecture, east of Tokyo, on October 7 at 10:41 PM local time (13:41 UTC) at a depth of 62 kilometers (38 miles). Shaking was felt widely throughout the capital of Tokyo, where several train lines and flights were suspended or delayed. Initial reports indicated only minor property and structural damages were incurred. As of this writing, damage assessments remained ongoing.

Global Temperature Anomaly Forecast



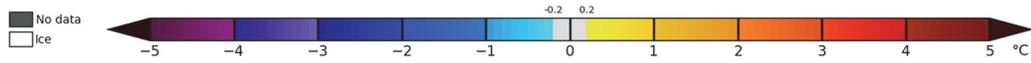
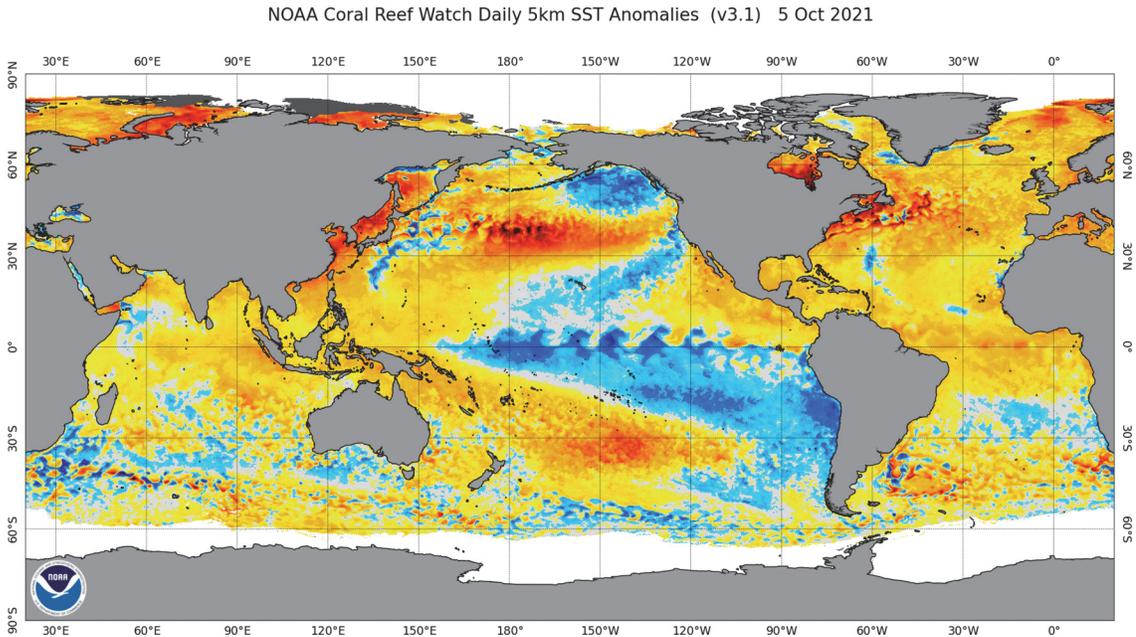
Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

Global Precipitation Anomaly Forecast

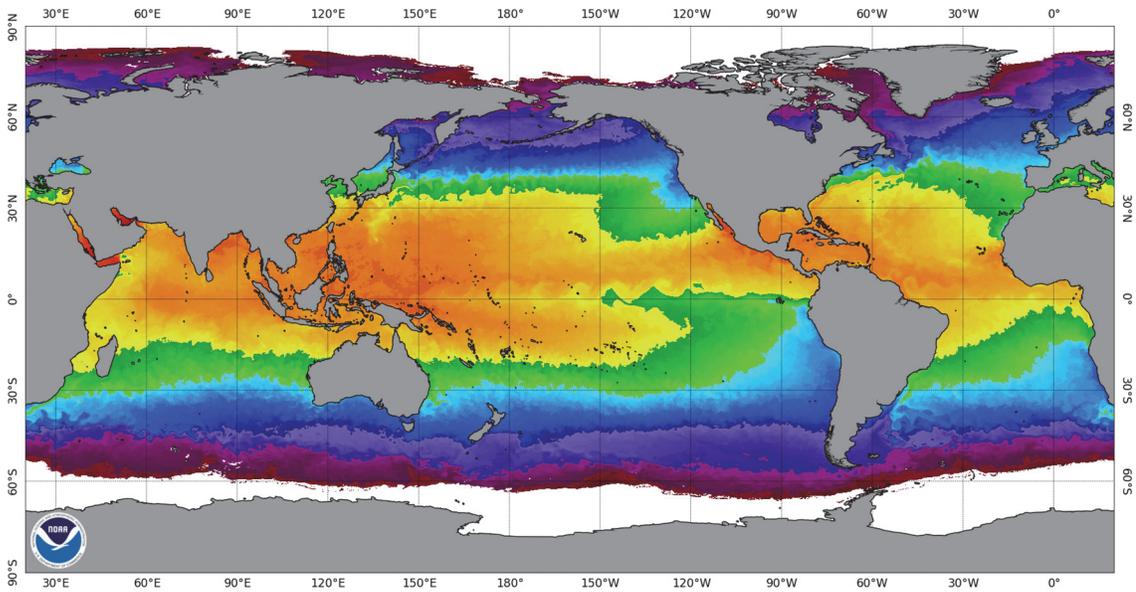


Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

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



NOAA Coral Reef Watch Daily 5km Sea Surface Temperatures (v3.1) 5 Oct 2021



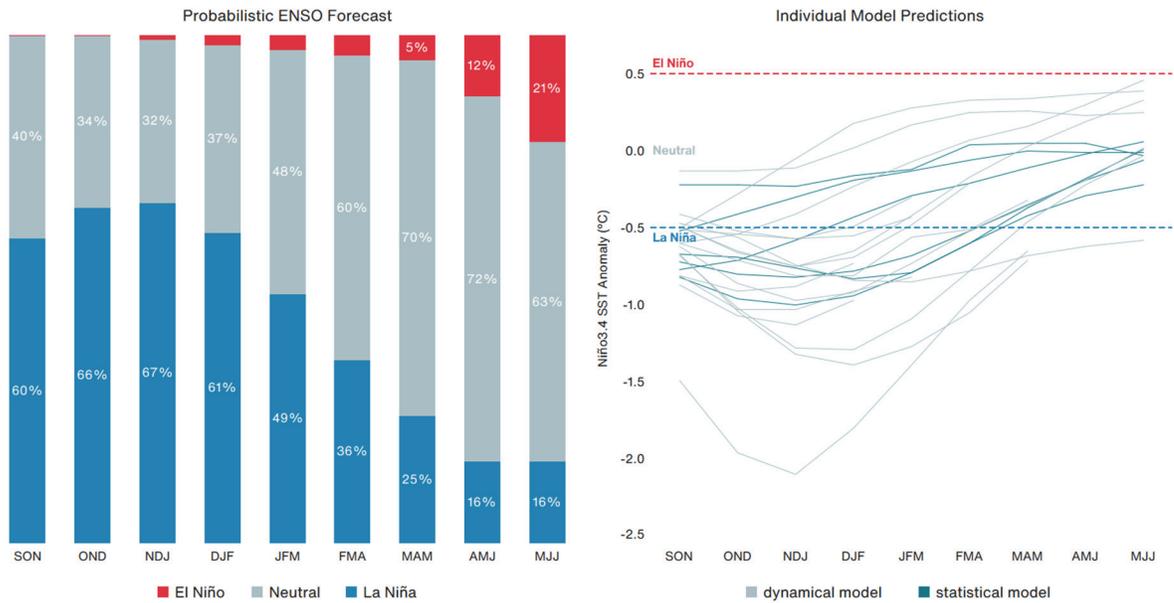
El Niño-Southern Oscillation (ENSO)

Overview

ENSO-neutral conditions are currently present, though NOAA has issued a La Niña Watch. NOAA notes a ~60 percent chance that neutral conditions will persist through the Northern Hemisphere summer and into September. There is a ~70 percent chance of La Niña emerging in September and lasting into early 2022.

Probabilistic ENSO Model Projections: September 2021

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



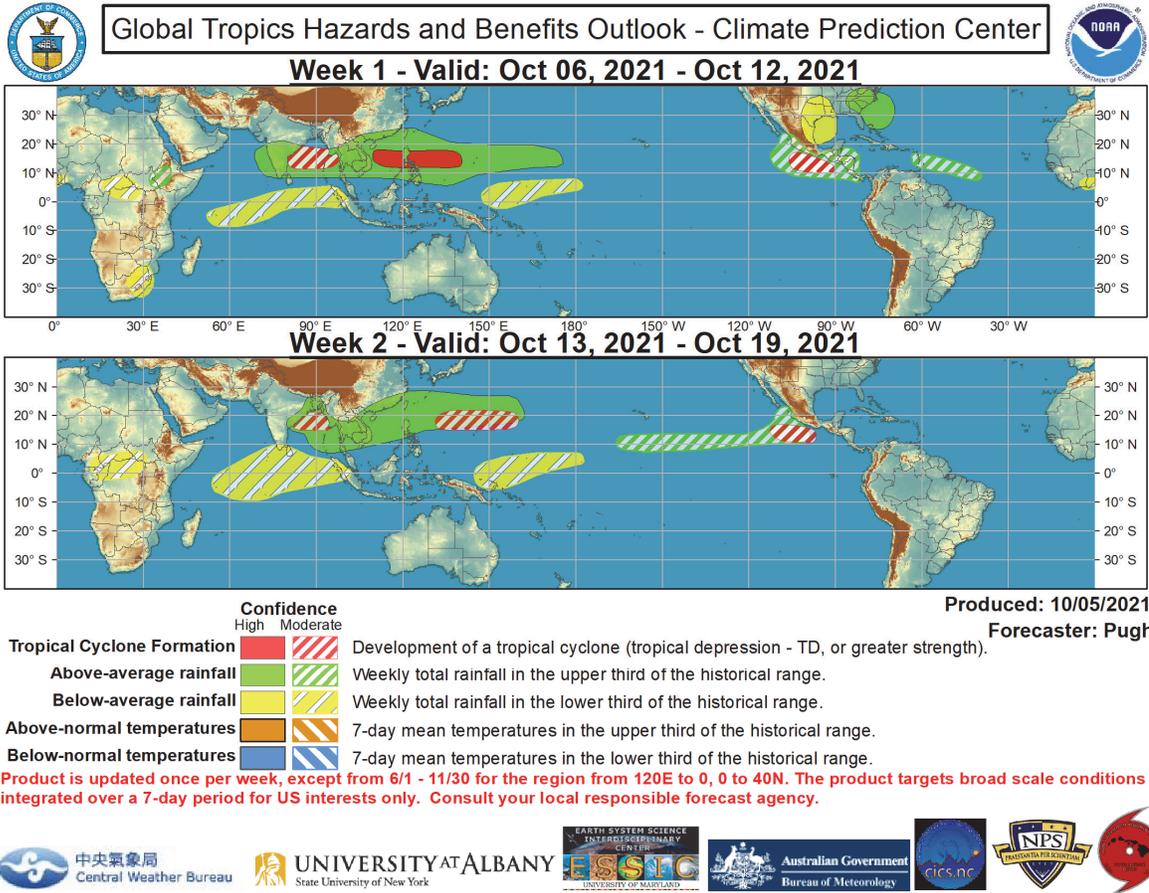
El Niño: Warm phase of an ENSO cycle. Sea surface temperatures of +0.5°C occur across the east-central equatorial Pacific.

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.

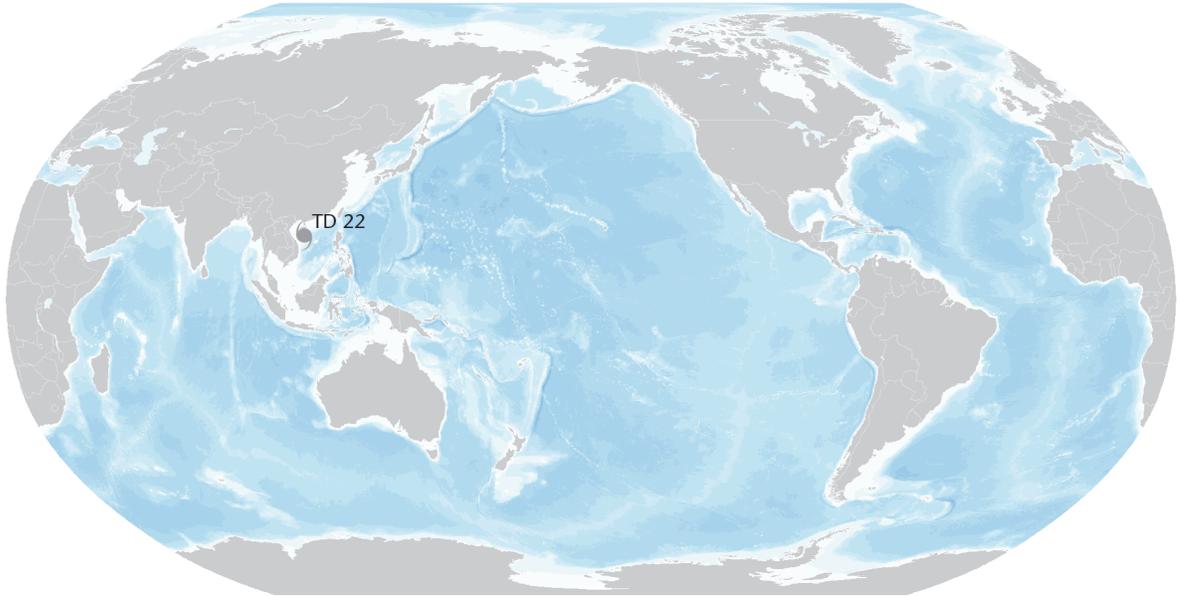
El Niño (La Niña) is a phenomenon in the equatorial Pacific Ocean characterized by a five consecutive 3-month running mean of sea surface temperature (SST) anomalies in the Niño 3.4 region that is above the threshold of +0.5°C (-0.5°C). This is known as the Oceanic Niño Index (ONI).

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

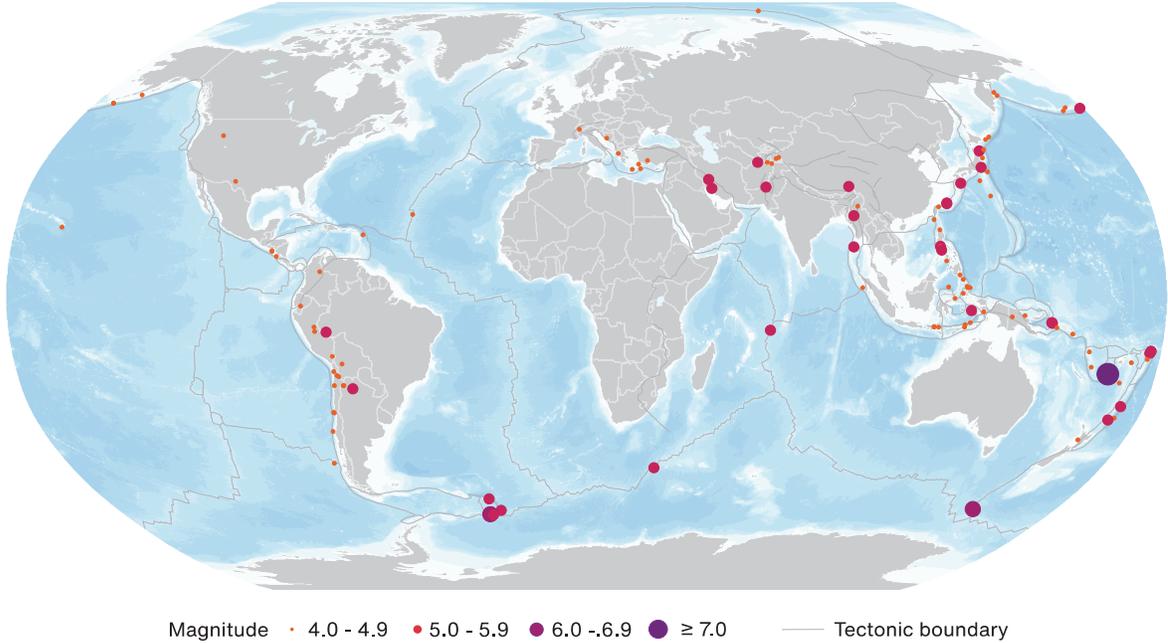
Storm Name	Location	Winds	Location from Nearest Land Area
TD 22	17.4°N, 110.7°E	35 mph	185 miles (295 kilometers) S from Haikou, China

* 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 ($\geq M4.0$): September 24-30

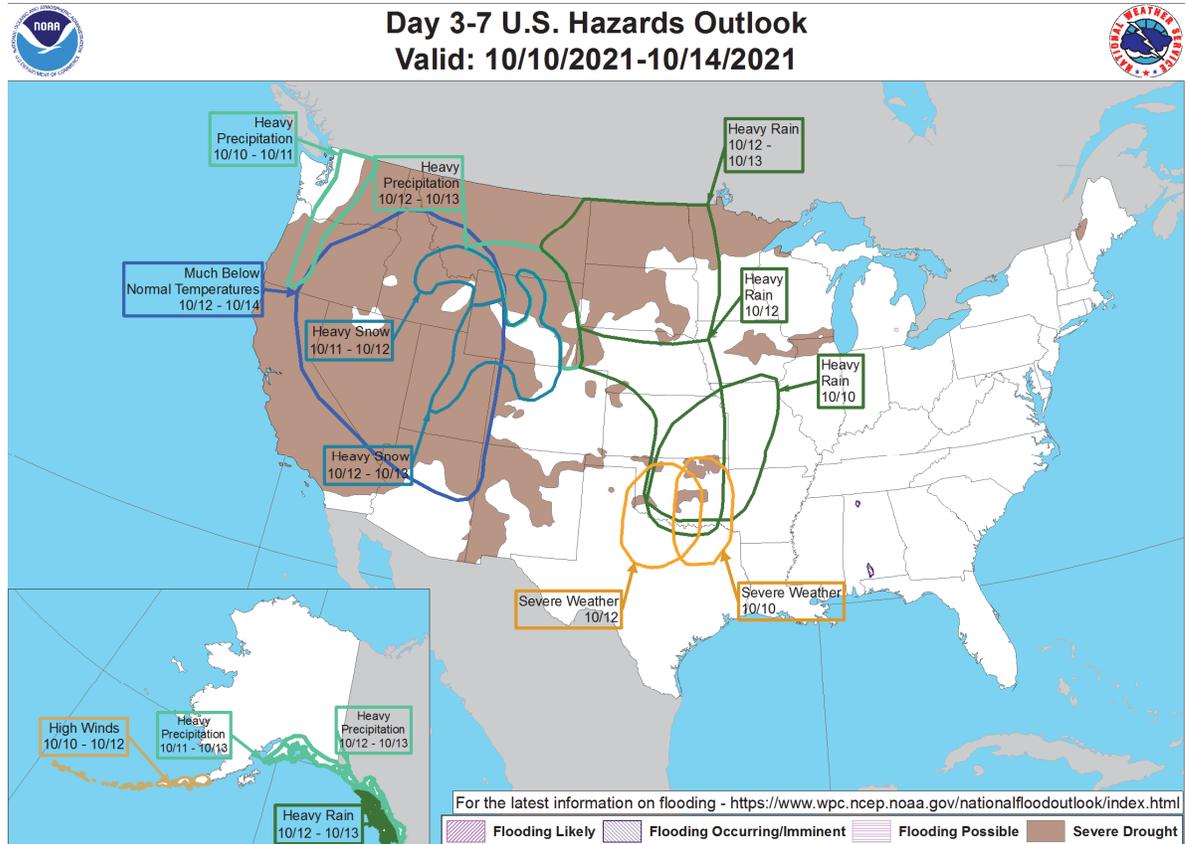


Date (UTC)	Location	Magnitude	Epicenter
10/2/2021	21.10°S, 174.89°E	7.3	Vanuatu region
10/4/2021	60.40°S, 27.60°W	6.3	South Sandwich Islands region
10/7/2021	58.78°S, 158.45°E	6.1	Macquarie Island region

Source: United States Geological Survey

U.S. Hazard Outlook

Potential Threats



Weather Prediction Center

Made: 10/07/2021 3PM EDT

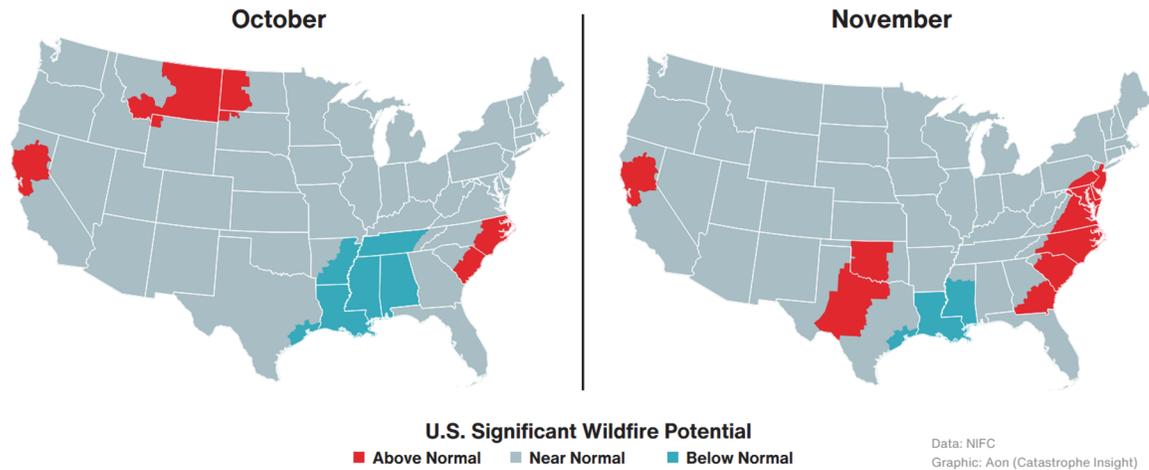
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- An active weather pattern in the medium range will begin with severe weather and heavy rainfall in the Central and Southern Plains on October 11, associated with a shortwave disturbance and frontal system. Concurrently, an atmospheric river will bring mixed precipitation to the Cascades.
- A strong upper-level trough and frontal system will produce accumulating snowfall across higher elevations in the Rockies, transitioning to mixed precipitation and heavy rainfall toward the Northern Plains between October 11-13. Ahead of the disturbance, moist southerly flow will promote severe weather and heavy rainfall in the Central and Southern Plains on October 12.
- In the wake of the cold front, much below normal temperatures are expected across the Great Basin, Intermountain West, and Rockies between October 12-14.

Source: Weather Prediction Center (NOAA)

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



Annual YTD Wildfire Comparison: October 7

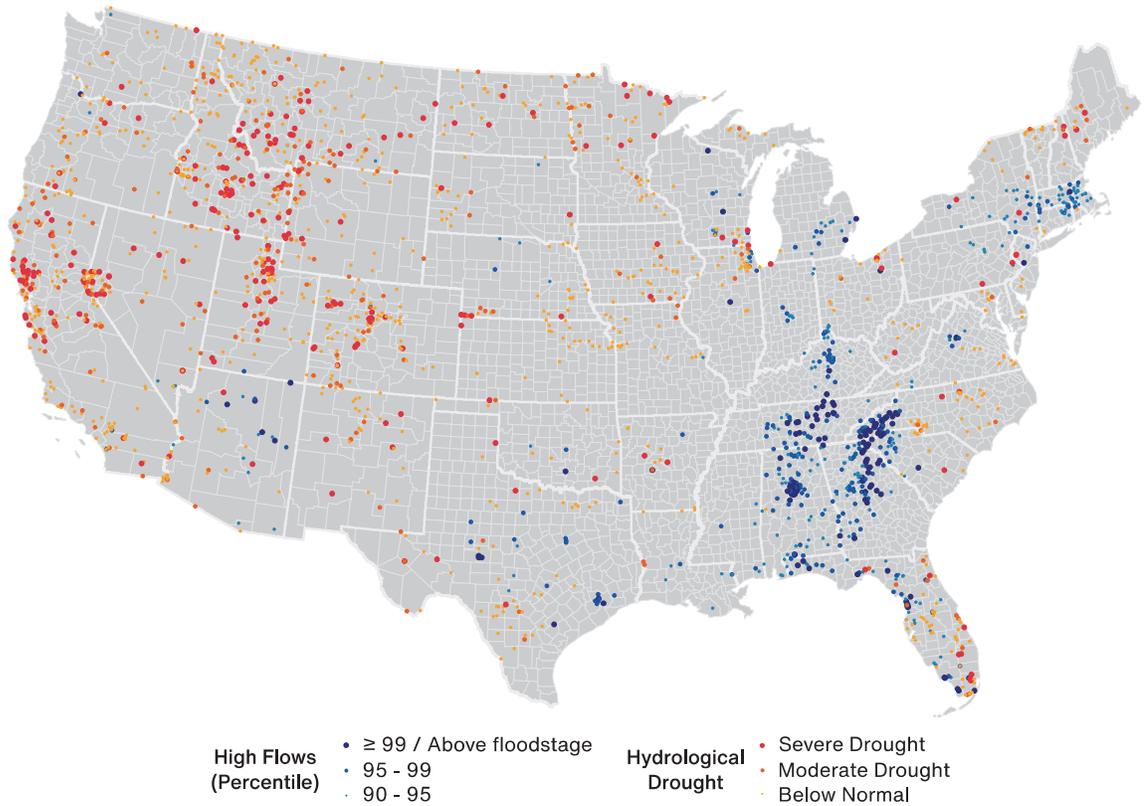
Year	Number of Fires	Acres Burned	Acres Burned Per Fire
2017	46,618	4,819,049	103.37
2018	50,441	8,472,650	167.97
2019	47,853	7,741,075	161.77
2020	41,587	4,391,192	105.59
2021	46,886	6,420,898	136.95
10-Year Average (2011-2020)	47,434	6,671,886	138.33

Top 5 Most Acres Burned by State: October 7

State	Number of Fires	Acres Burned	Acres Burned Per Fire
California	8,256	2,326,922	281.85
Montana	2,370	713,463	301.04
Oregon	1,576	672,329	426.60
Arizona	1,650	529,438	320.87
Idaho	1,281	445,500	347.78

Source: National Interagency Fire Center

U.S. Current Riverine Flood Risk



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.

Top 5 Rivers / Creeks: Highest Percentile for Water Height

Location	Current Stage (ft)	Percentile
Housatonic River at Falls Village, Connecticut	6.08	99.09
Housatonic River near Great Barrington, Massachusetts	5.40	99.07
Buffalo River near Flat Woods, Tennessee	8.21	99.02
Flint River near Carsonville, Georgia	15.03	99.01
Black Warrior River at Northport, Alabama	127.73	99.01

Source: United States Geological Survey

Source Information

Update: Cyclone Gulab-Shaheen

Joint Typhoon Warning Center (JTWC)

Oman braces for historic landfall from Tropical Cyclone Shaheen, The Washington Post

Cyclone Shaheen hits Oman with ferocious winds, killing four, Reuters

Shaheen headed for historic landfall in Oman, Yale Climate Connections

Shaheen leaves 11 dead, Muscat Daily

Oman – Cyclone Shaheen Triggers Deadly Floods and Landslides, Floodlist

Cyclone Shaheen death toll rises to 14, The National

Record-breaking rainfall observed in Italy

ARPA Liguria

ARPA Piemonte

Meteofrance

Natural Catastrophes: In Brief

U.S. National Weather Service

4,000 lightning strikes recorded during SoCal storm, KTLA5

Indonesia – Floods and Landslides Leave 4 Dead in South Sulawesi, Floodlist

Indonesia – Heavy Rain Triggers Floods and Deadly Landslides in West Sumatra, Floodlist

Pakistan quake kills at least 20, injures hundreds. Reuters

There are 5 people killed by floods in Querétaro, Excelsior

Mexico – Severe Floods Hit Querétaro for Second Time in 2 Weeks, Floodlist

Alabama swamped, 4 killed in floods from slow-moving front, Associated Press

China's Xinhua News Agency

United States Geological Survey (USGS)

Magnitude 6.1 quake jolts Tokyo area; no risk of a tsunami, The Japan Times

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