Weekly Cat Report

October 15, 2021

Executive Summary
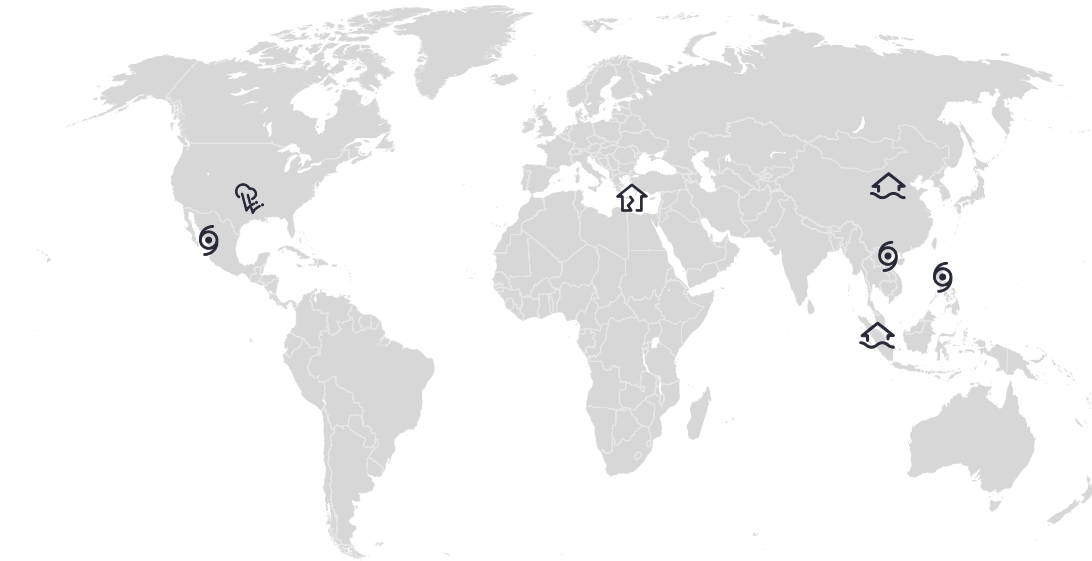
Event	Affected Region(s)	Fatalities	Economic Loss (USD)	Page
Severe Weather	United States	0	100+ million	3
Flooding	China	27+	780+ million	7
Hurricane Pamela	Mexico	0	10s of millions	9
Flooding	Indonesia	0	Unknown	11
Tropical Storm Lionrock	East Asia	6	Millions	11
Tropical Storm Kompasu	Philippines	30+	25+ million	11
Earthquake	Greece	0	Unknown	11

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

# United States: Severe Weather

Overview

An active weather pattern across the western half of the country, which included a succession of upper-level disturbances, generated multiple rounds of late season severe weather in the central United States between October 9-13. On October 10, a squall line resulted in isolated tornadoes and large hail across the Southern Plains, including significant hail damage near Norman, Oklahoma. On October 12-13, severe storms in Kansas, Oklahoma and Texas generated straight-line wind damage and multiple tornadoes. Total economic and insured losses were expected to each exceed USD100 million.

Meteorological Recap

October 9

A developing low-pressure system which ejected into the northern Plains was the main catalyst for heavy rainfall and severe weather in the Dakotas and Minnesota on October 9. The Storm Prediction Center (SPC) highlighted a region in northern South Dakota, south-eastern North Dakota, and western Minnesota for a Slight Risk (level 2 out 5) for severe weather. By the early evening hours, organizing storm clusters in the region quickly developed in the vicinity of a quasi-stationary frontal boundary and propagated eastward. A resulting squall line generated multiple reports of large hail and damaging winds, as well as isolated tornadoes as it impacted the eastern Dakotas and west-central Minnesota into the overnight hours.

October 10-11
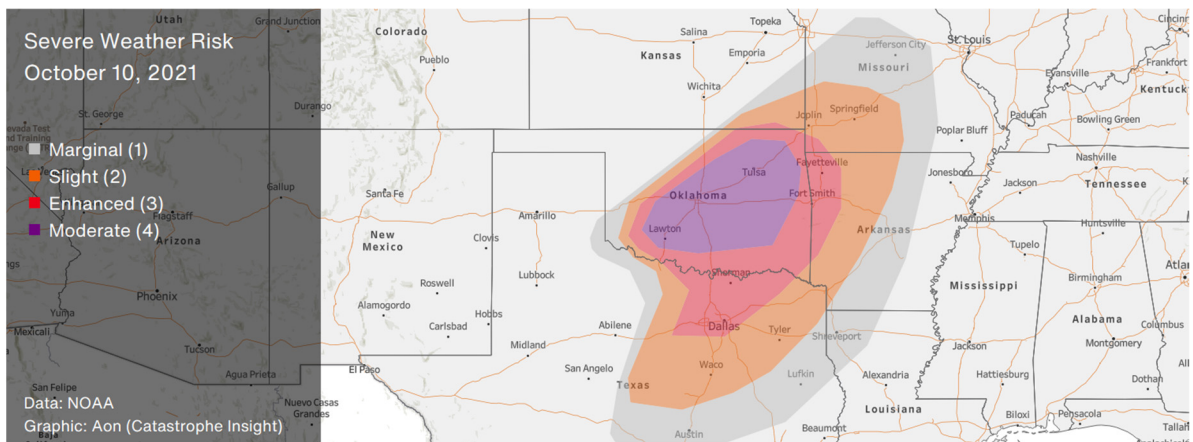
While the disturbance responsible for the previous days severe weather in the Northern Plains progressed in Canada, a second upper-level trough pivoted eastward toward the southern High Plains on October 10. At the surface, a well-defined cold front and dryline (a boundary which separates a moist air mass from a dry air mass) associated with a deepening low-pressure center developed across the Southern Plains. These conditions prompted the SPC to issue a Moderate Risk (level 4 out 5) for severe

weather across central and eastern Oklahoma – including the Greater Oklahoma City region, surrounded by a broader region of Slight Risk (level 2 out 5) and higher spanning from southwest Missouri into central Texas. Throughout the day, increasing instability was aided by surface heating and mid-level cooling, and further enhanced by increasing moisture, sufficient wind shear, and steep mid-level lapse rates (changes in temperature with height).

In the evening hours, thunderstorms developed along the surging cold front and dry line across central Texas and Oklahoma. A squall line with embedded strong updrafts subsequently tracked across Oklahoma and central Texas into the overnight hours, generating damaging winds, large hail (greater than or equal to 2.0 inches, 5.1 centimeters), flash-flooding, and tornadoes. Areas near Oklahoma City (Oklahoma) and Dallas-Fort Worth (Texas) were affected.

As the surface low pivoted north-eastward on October 11, the threat for severe storms continued into the Midwest and Great Lakes – particularly in parts of Illinois, Indiana, Wisconsin, and Michigan where a Slight Risk (level 2 out 5) for severe weather was forecast. Synoptic scale windshear associated with the disturbance enhanced the risk for tornadoes, while a band of convection moved through northeast Illinois and northwest Indiana into the evening hours.
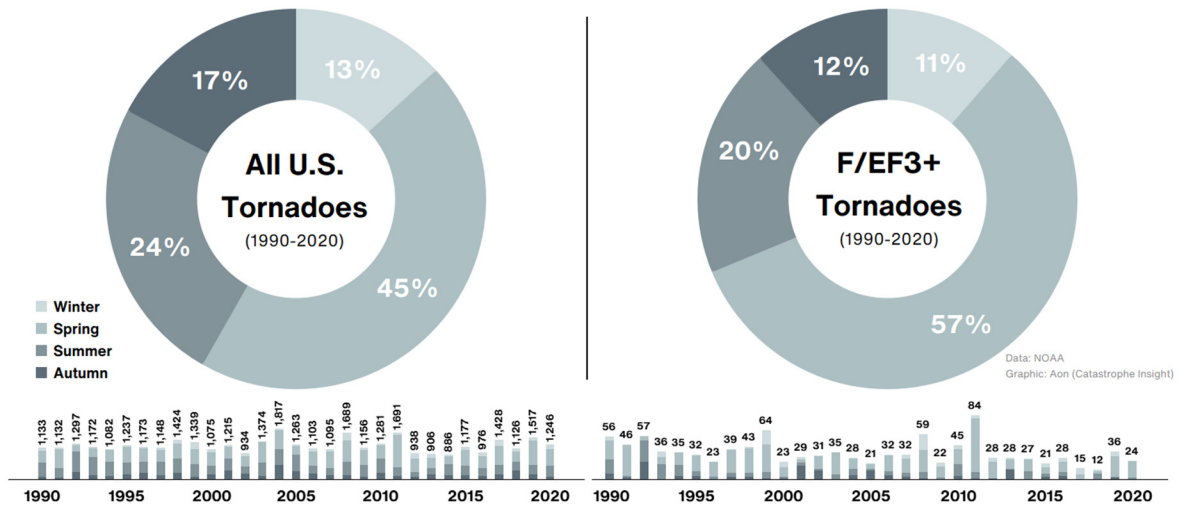
October 12-13

A more expansive upper-level disturbance, which generated heavy snowfall in the Rockies and strong winds across the Southwest, emerged over the Plains on October 12. At the surface, a low-pressure system deepened while tracking across the High Plains. South of the low, forcing for severe storms was enhanced in the vicinity of a well-defined eastward pushing cold front.
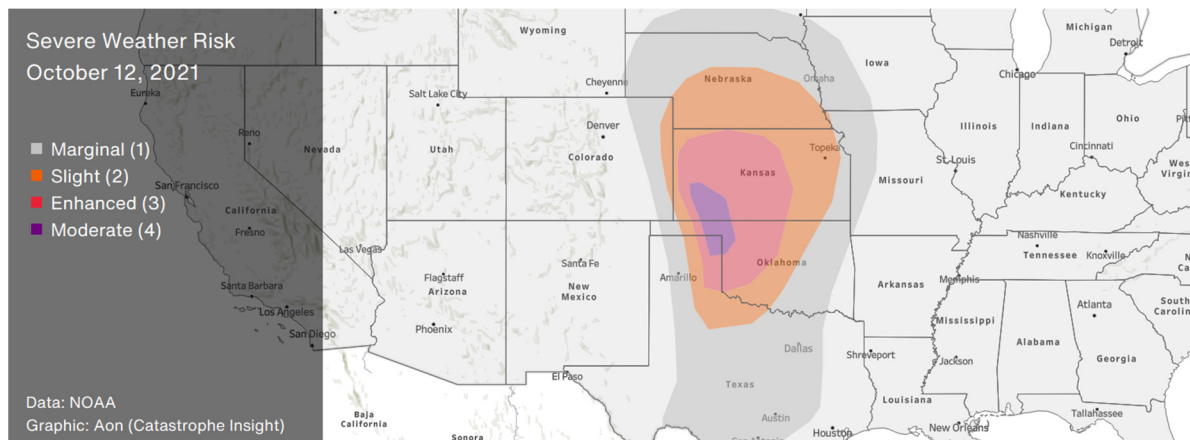
These conditions prompted the SPC to highlight a region in western Kansas and Oklahoma and the north-eastern Texas Panhandle for a Moderate Risk (level 4 out 5) for severe weather on October 12, surrounded by a broader region of Slight Risk (level 2 out 5) or higher spanning from central Nebraska southward into the Red River Valley. Storm development was fueled by favorable upper-level support, strong vertical wind shear, and abundant low-level moisture. Several discrete and supercells impacted western Oklahoma and northern Texas during the evening hours, while a main line of storms traversed portions of Kansas, Oklahoma, and Texas overnight. These storms produced several confirmed tornadoes and widespread reports of damaging straight-line winds.

Miscellaneous

October tornado touchdowns are not highly anomalous in the United States. Meteorological autumn (September, October, November) has accounted for 17 percent of tornadoes dating to 1990. Tornadoes often have a "second season" during the autumn months as it acts as a transition period between summer warmth and cooler late-season temperatures that can spawn severe thunderstorm activity.

Event Details

October 10-11

 In **Oklahoma**, damaging hailstones approaching 3.0 inches (7.1 centimeters), larger than a tennis ball, pelted regions in Cleveland County (near Norman) on October 10, while 2.0-inch (5.1-centimeters) hail were reported in Kiowa and Osage Counties. In Cleveland County, notable hail damage to vehicles, homes, and businesses were incurred and included impacts to siding and facades, broken glass/windows, and busted windshields. In late April 2021, similar regions (near Norman) were impacted by a separate significant hailstorm.
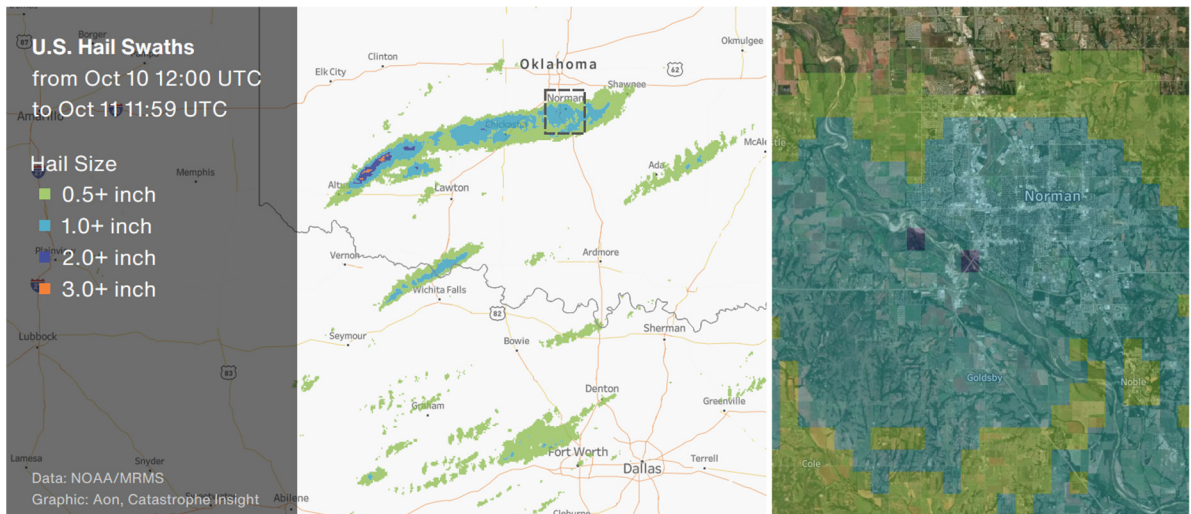
A straight-line wind gust of 79 mph (127 kph) was recorded in Jackson County and a gust of 82 mph (132 kph) was measured in Grady County. According to Oklahoma Gas and Electric (OG&E), no fewer than 11,000 power outages were reported. Several tornadoes touched down across central and eastern Oklahoma, including an EF-1 tornado in Wagoner County which damaged numerous homes, businesses, and a high school near Coweta.

In **Texas**, at least 13,000 customers lost electricity on October 10. A 70 mph (112 kph) wind gust was reported at the Dallas-Fort International Airport. Across the region, strong winds resulted in downed trees, fallen power lines, and property damages.

Tornado damage near Coweta, Oklahoma
Source: NWS-Tulsa

Locally heavy rainfall and non-tornadic winds - with gusts reaching and topping 60 to 70 mph (96 to 112 kph), were observed in north-eastern **Illinois** and north-western **Indiana** on October 11 and resulted in tree and structural damage. In Indiana, a wind gust of 75 mph (120 kph) was measured in Starke County. An EF-2 tornado with maximum wind speeds approaching 115 mph (185 kph) touched down in Wrights, Illinois and destroyed at least four farm buildings.

October 12-13

In **Oklahoma**, a non-tornadic wind gust of 79 mph (127 kph) was recorded in Woods County near Freedom. Downed trees and utility lines and property damages occurred across western and central Oklahoma – including the Greater Oklahoma City region. In Custer County, significant impacts at the Clinton Regional Airport, which included severe damage to several airport building and a destroyed hangar, were generated by an EF-1 tornado. Another EF-1 tornado severely damaged recently built homes in the Canadian County suburb of Mustang early in the morning on October 13, southwest of Oklahoma City.

In **Kansas**, wind gusts of 75 mph (120 kph) were measured in Kiowa and Pratt Counties. Storms in western Kansas resulted in power outages, toppled trees, and blocked or closed roadways. A brief EF-0 tornado in Wallace County caused damages near the Sharon Spring Golf Course.

Financial Loss

The latest stretch of late season severe weather across the central United States between October 9-13 was anticipated to result in economic and insured losses each exceeding USD100 million.

The United States is currently on pace to surpass the USD20 billion insured loss threshold once again from the peril for the third consecutive year – and fourth time in five years. The elevated level of losses has occurred despite a below average year in terms of the number of tornadoes, hail, and straight-line wind reports into NOAA's Storm Prediction Center. This further highlights the reality that the location and intensity of where storm clusters track is the primary driver of SCS-related costs.
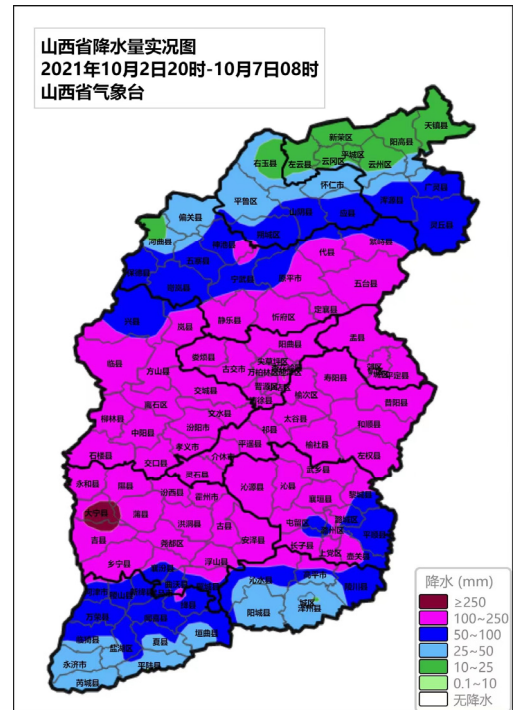
China: Flooding

Overview

Several days of heavy rainfall and convective storms generated significant flooding across northern China's Shanxi Province as well as neighboring Shaanxi and Hebei Provinces throughout first week of October. In Shanxi Province, provincial averaged rainfall between October 2-7 exceeded three time the normal monthly precipitation for October. Tens of thousands of homes and multiple cultural sites were damaged or destroyed, along with a vast area of agricultural land. At least 27 fatalities were reported. Total economic losses in Shanxi alone were expected to exceed CNY5.0 billion (USD780 million).

Meteorological Recap

Days of heavy rainfall and severe weather resulted in notable flooding across portions of Northern China between October 2-7, particularly in the Shanxi Province. The torrential rains were enhanced by southerly flow around an expansive subtropical high coupled with a favorable jet stream pattern which transported abundant moisture from the South China Sea and Bay of Bengal toward the region. According to the Shanxi Meteorological Bureau, the average precipitation in the province between October 2-7 was 119.5 millimeters (4.7 inches) – greater than three times the normal average rainfall for the entire month of October. During the same period, the average precipitation in Taiyuan City was 185.6 millimeters (7.3 inches). No fewer than 18 counties in the province recorded precipitation totals exceeding 200 millimeters (8 inches), while the maximum accumulated precipitation reached 285.2 millimeters (7.3 inches). No less than 59 national meteorological stations in the region set new daily precipitation records during the event.


Rainfall in China's Shanxi Province (Oct 2-7)
Source: Shanxi Meteorological Bureau

Event Details

Since October 2, flooding and subsequent landslides in the **Shanxi Province** affected nearly 1.76 million people, while at least 120,000 individuals were temporarily evacuated. As of this writing, 15 fatalities related to flooding and subsequent landslides have been reported. According to provincial officials, at least 238,460 hectares (589,250 acres) of cropland were inundated, while no less than 37,700 homes were damaged or destroyed. Media reports indicated that at least 1,000 cultural sites and buildings, including the UNESCO World Heritage site of Pingyao, were impacted to varying degrees by the extreme rainfall - in several instances structural damage was noted.

Additional impacts included widespread power outages, washed out roadways, collapsed bridges, and public transportation disruptions.
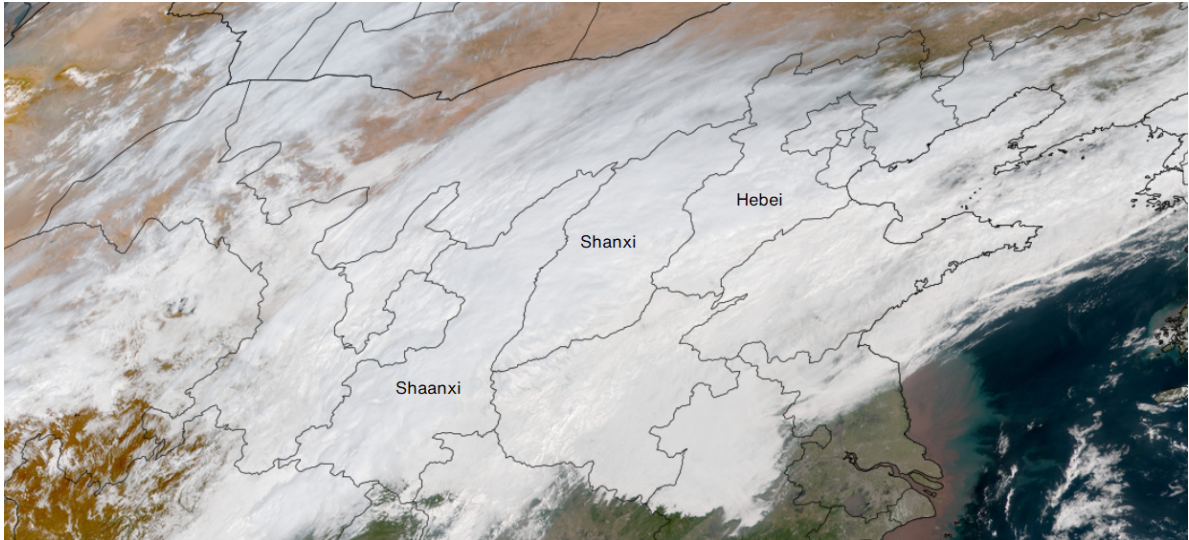
Visible satellite image over northern China on October 5 (2:00 UTC)
Source: NOAA/RAMMB

On October 7, a 20-meter (65-foot) long section of embankment along the Fenhe River (a tributary of the Yellow River) was breached in Xinjiang County forcing the evacuation of at least 17,000 people near Yuncheng City. This section of the Fenhe River reached its highest measured crest in at least 40 years.

Furthermore, the flooding impacted coal producing and mining operations as the local government suspend output in at least 60 coal mines, 372 non-coal mines, and 14 chemical factories. Shanxi is historically among the top coal producing provinces in China.

The neighbouring province of **Shaanxi** was also severely affected, with 12 fatalities reported

Financial Loss

As of this writing, preliminary reports by provincial government officials estimated that direct economic losses in Shanxi alone were expected to reach 5.03 billion yuan (about 780 million U.S. dollars). As of October 8, the Insurance Industry Association of the Shanxi Province reported nearly 3,500 filed property or vehicle claims, totaling CNY64 million (USD10 million) in losses. However, these totals were expected to increase further.

Mexico: Hurricane Pamela

Overview

Hurricane Pamela made landfall in Mexico's state of Sinaloa on October 13 as a 75 mph (120 kph) Category 1 storm. The system brought high winds and storm surge near the landfall spot, just north of the city of Mazatlán, before quickly losing its tropical characteristics while tracking inland. However, abundant remnant moisture would later interact with a frontal boundary and bring torrential rainfall and flooding across much of the U.S. state of Texas on October 13-14. Total economic losses were expected to reach into the millions (USD).
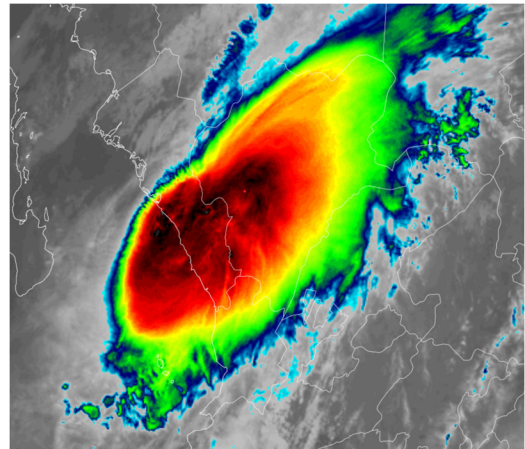
Meteorological Recap

On October 6, the National Hurricane Center (NHC) began monitoring a westward moving tropical wave in the southwestern Caribbean for future development in the Eastern Pacific. After producing disorganized showers and storms across central America, the wave emerged over the Eastern Pacific on October 7, where gradual organization occurred. Exhibiting a closed surface vortex, the system was officially recognized as Tropical Depression Sixteen-E on October 10, several hundred miles (kilometers) south of the southwestern Mexican coast. Warm sea surface temperatures, low to moderate wind shear, and abundant mid-level moisture allowed the depression to strengthen into Tropical Storm Pamela by 4:00 PM CDT (21:00 UTC) on October 10 - with maximum sustained winds of 45 mph (75 kph).

On October 11, Tropical Storm Pamela continued to intensify while steered west northwestward along the southern periphery of a mid-level ridge to its north. Pamela reached hurricane strength by 3:00 AM MDT (9:00 UTC) on October 12, with maximum sustained winds of 75 mph (120 kph) - equivalent to a Category 1 storm on the Saffir-Simpson Hurricane Wind Scale (SSHWS).

On October 12, Pamela was downgraded to a tropical storm due to dry air intrusion and increasing wind shear. During this time, the cyclone also began turning north-northeast around the western periphery of the ridge. As landfall became imminent, Hurricane Warnings were posted along the Mexican coast from Bahia Tempehuaya to Escuinapa. On October 13, Pamela made landfall as a marginal Category 1 hurricane at 6:00 AM MDT (12:00 UTC) near Estacion Dimas (north of Mazatlán) in the Mexican state of Sinaloa with maximum sustained winds of 75 mph (120 kph) and a minimum central pressure of 987 millibars.

Once inland, Pamela rapidly weakened over the rough terrain of Mexico, while tropical moisture from the system interacted with a frontal boundary across the

Hurricane Pamela landfall in Mexico on Oct 13
Source: NOAA/RAMMB

southern United States. This resulted in a corridor of locally heavy rainfall and flash-flooding across regions in northern Mexico and the U.S. state of Texas through October 14.

Event Details

Mexico's Federal Electricity Commission (CFE) reported no fewer than 213,000 customers in the states of Nayarit, Sinaloa, Durango, and Coahuila lost electricity services due to the hurricane. At least 179,000 of which were in Sinaloa.

In **Sinaloa**, Hurricane Pamela generated dangerous storm surge along the coast, along with tropical storm force and higher wind gusts amid torrential rainfall and subsequent landslides. Authorities reported dozens of water rescues, while State Civil Protection officials evacuated hundreds of residents from flood prone regions. Impacts included washed out roadways, downed trees and power lines, and damage to homes and businesses. Notable damage and flooding were incurred in the City of Mazatlán.

Flooding from Pamela in Nayarit
Source: Government of the State of Nayarit

In **Nayarit**, rising water levels along the banks of several rivers including the Acaponeta River prompted additional water rescues while evacuations were ordered in several municipalities. Reports indicated homes were flooded and vehicles swept from streets – particularly in the communities of Acaponeta, Tecuala, and Tuxpan.

Financial Loss

While less than initially feared, total damage associated with Hurricane Pamela's landfall in western Mexico and subsequent inland flooding were expected to result in an economic toll minimally reaching into the tens of millions (USD). Pamela brought additional precipitation to a part of central and northern Mexico which has seen a dramatic recovery from the extreme drought conditions experienced during 2020 and the first half of 2021.

Natural Catastrophes: In Brief

Flooding (Indonesia)

Tidal flooding impacted Medan City and the adjacent coastal region located in North Sumatra, Indonesia on October 6. According to the Indonesian National Board for Disaster Management, high tides resulted in an inundation of about 15,000 homes in Medan and in the villages of Belawan 1, Belawan 2, Sincanang, Bahari, Bahagia, Bagan Deli, and Labuan Deli. Additional impacts associated with the event were also registered further east in Batu Bara.

Tropical Storm Lionrock (East Asia)

Parts of the Philippines, China, Vietnam and Thailand were affected by Tropical Storm Lionrock on October 3-10. The National Disaster Risk Reduction Management Center of the Philippines noted three fatalities and only minor material losses as the storm made eight separate landfalls in the central part of the country, affecting about 8,000 people. Lionrock's outer bands also prompted significant rainstorms in Macau and Hong Kong, with minor flooding reported; at least one person was killed in Hong Kong due to strong winds and 14 were injured. Authorities in Vietnam reported two fatalities and relatively minor damage due to the storm. Heavy rain since October 8, associated with remnants of Lionrock, later affected multiple provinces of northern and central Thailand. According to the Department of Disaster Prevention and Mitigation, subsequent flash flooding and landslides affected more than 5,400 homes.
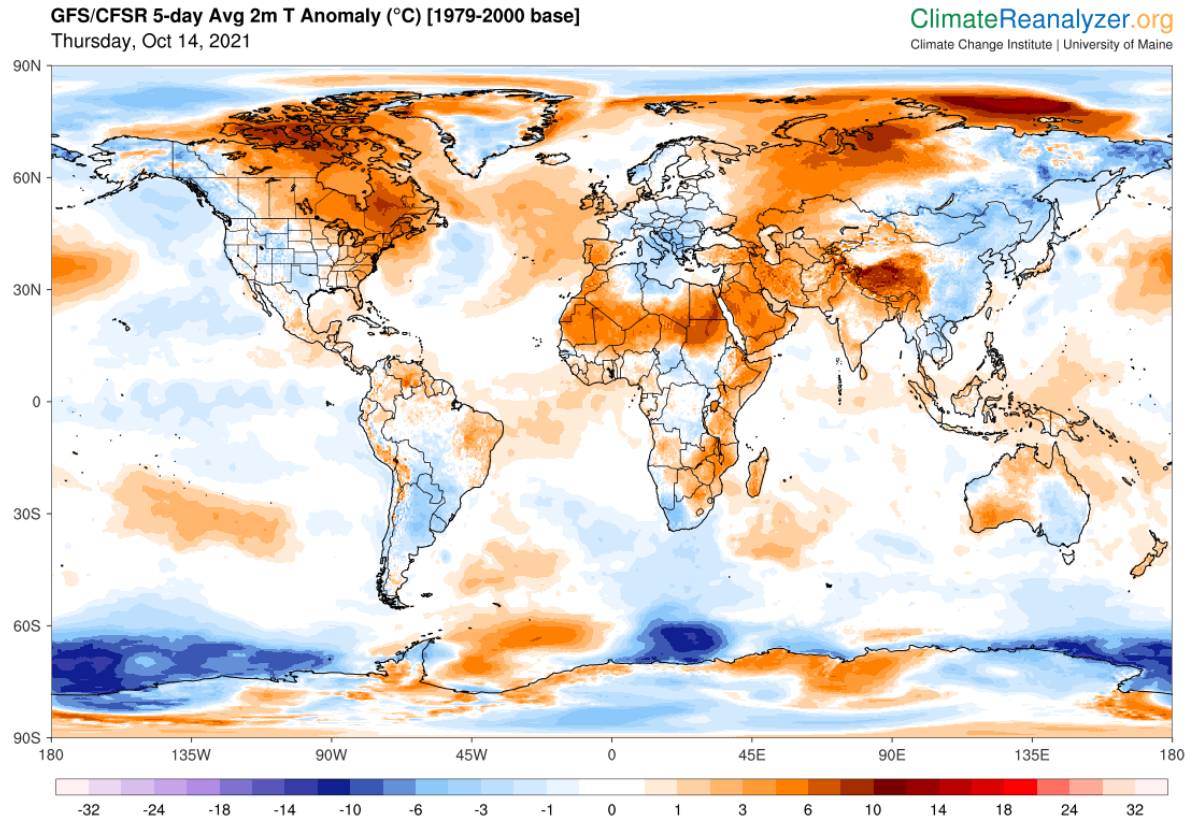
Tropical Storm Kompasu (Philippines)

Kompasu was officially named by the JMA on October 7 after it merged with tropical depression Nando and strengthened to a tropical storm with a large area of circulation, while the JTWC and PAGASA noted the assimilation of Nando's remnant low on a later date. On October 11, the storm made its first landfall near the Fuga Island in the Cagayan Province of the Philippines and spawned widespread flooding and landslides. As of October 14, the National Disaster Risk Reduction and Management Council (NDRRMC) noted 30 fatalities, 14 missing and three injured. Nearly 15,000 people were displaced. Preliminary damage assessments revealed at least 325 damaged homes and 62 other structures, although these totals were expected to increase. Economic losses to the agriculture sector and infrastructure alone were initially expected to reach PHP1.2 billion (USD23 million).
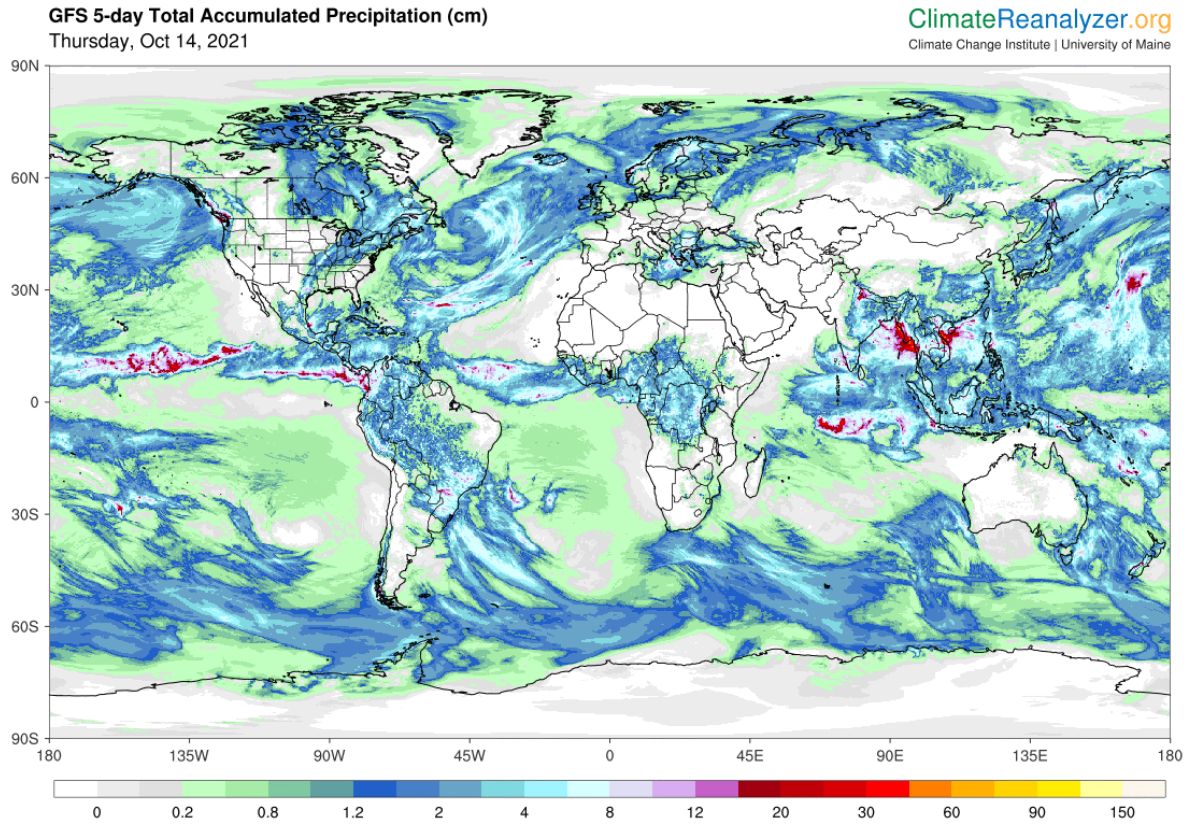
Earthquake (Greece)

A strong, magnitude-6.4 earthquake struck the eastern tip of the island of Crete in southern Greece on October 12. Its epicenter was located in the area of Palaikastro. Strong shaking resulted in some property and infrastructural damage, although initial reports suggested that total losses remained relatively limited. Notably, a church in Lassithi collapsed. There were no reports of casualties.

Global Temperature Anomaly Forecast

GFS/CFSR 5-day Avg 2m T Anomaly (°C) [1979-2000 base]
Thursday, Oct 14, 2021

ClimateReanalyzer.org
Climate Change Institute | University of Maine

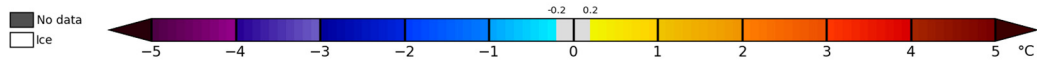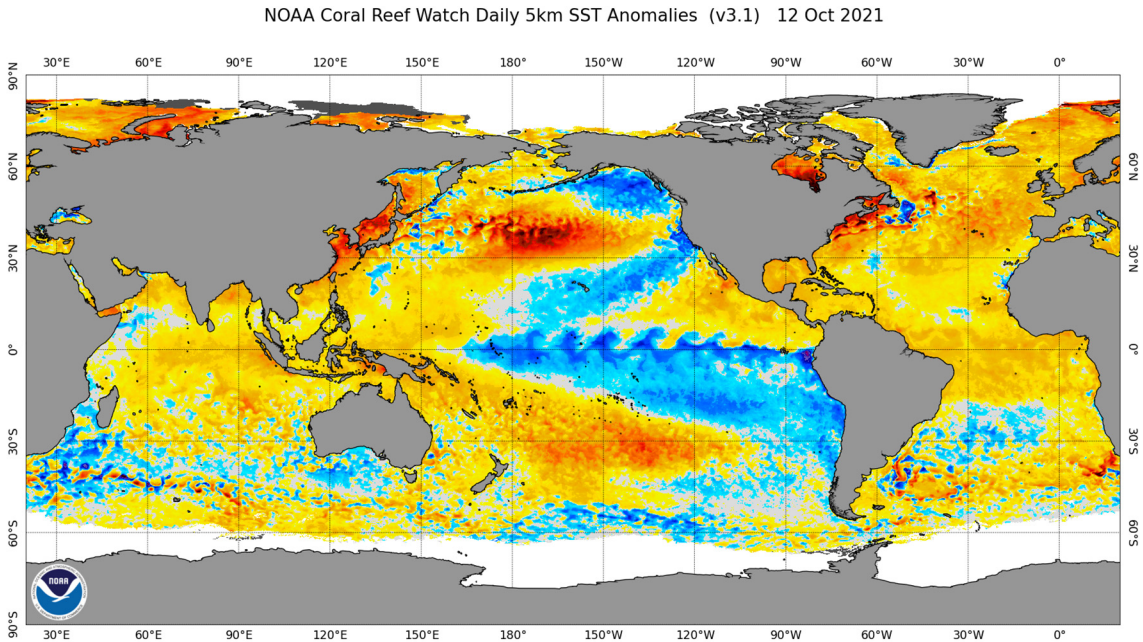Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA
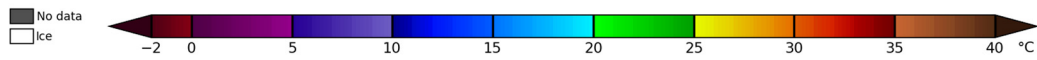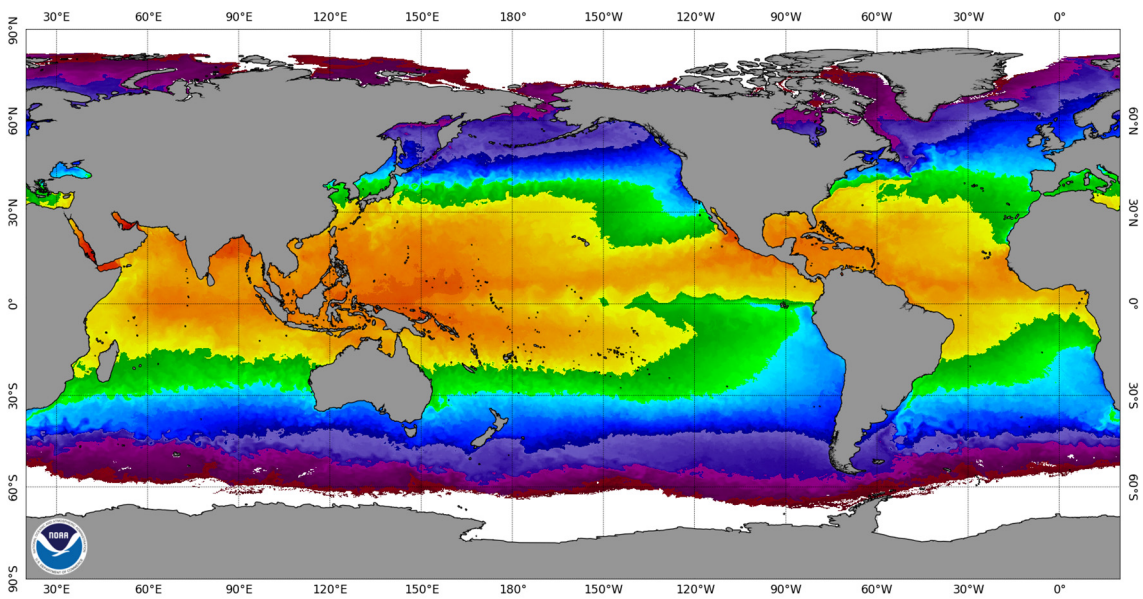
Global Precipitation Anomaly Forecast

Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA
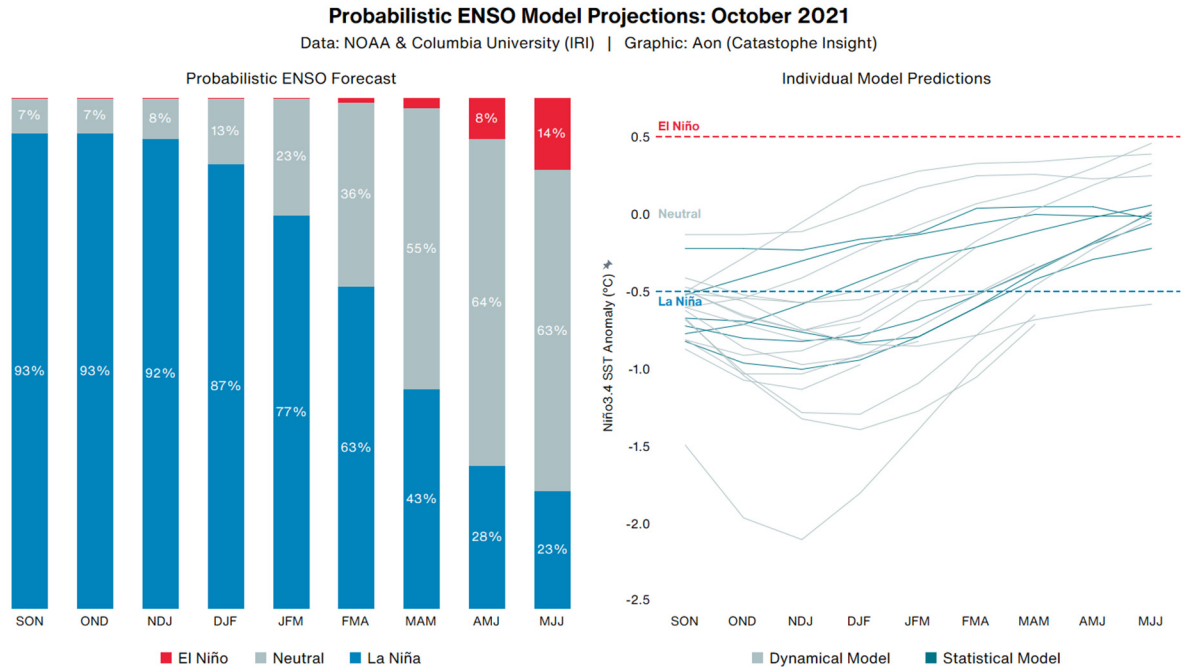
Weekly Sea Surface Temperature (SST) Maps (°C)

NOAA Coral Reef Watch Daily 5km SST Anomalies (v3.1)   12 Oct 2021

NOAA Coral Reef Watch Daily 5km Sea Surface Temperatures (v3.1)   12 Oct 2021

El Niño-Southern Oscillation (ENSO)

Overview

La Niña conditions have returned in the Central and Eastern Pacific Ocean, and NOAA has issued a "La Niña Advisory". NOAA cites an 87% chance of La Niña conditions persisting through the December 2021 - February 2022 timeframe. The agency also anticipates a moderate strength La Niña at its peak before weakening and likely transitioning back to ENSO-neutral conditions by the Northern Hemisphere Spring of 2022.

Probabilistic ENSO Model Projections: October 2021

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

Probabilistic ENSO Forecast

7%	7%	8%	13%	23%	36%	55%	8%	14%
93%	93%	92%	87%	77%	63%	43%	64%	63%
							28%	23%
SON	OND	NDJ	DJF	JFM	FMA	MAM	AMJ	MJJ

■ El Niño ■ Neutral ■ La Niña

Individual Model Predictions

Niño3.4 SST Anomaly (°C)

El Niño — 0.5

Neutral — 0.0

La Niña — -0.5

-1.0

-1.5

-2.0

-2.5

SON OND NDJ DJF JFM FMA MAM AMJ MJJ

■ Dynamical Model ■ Statistical Model

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
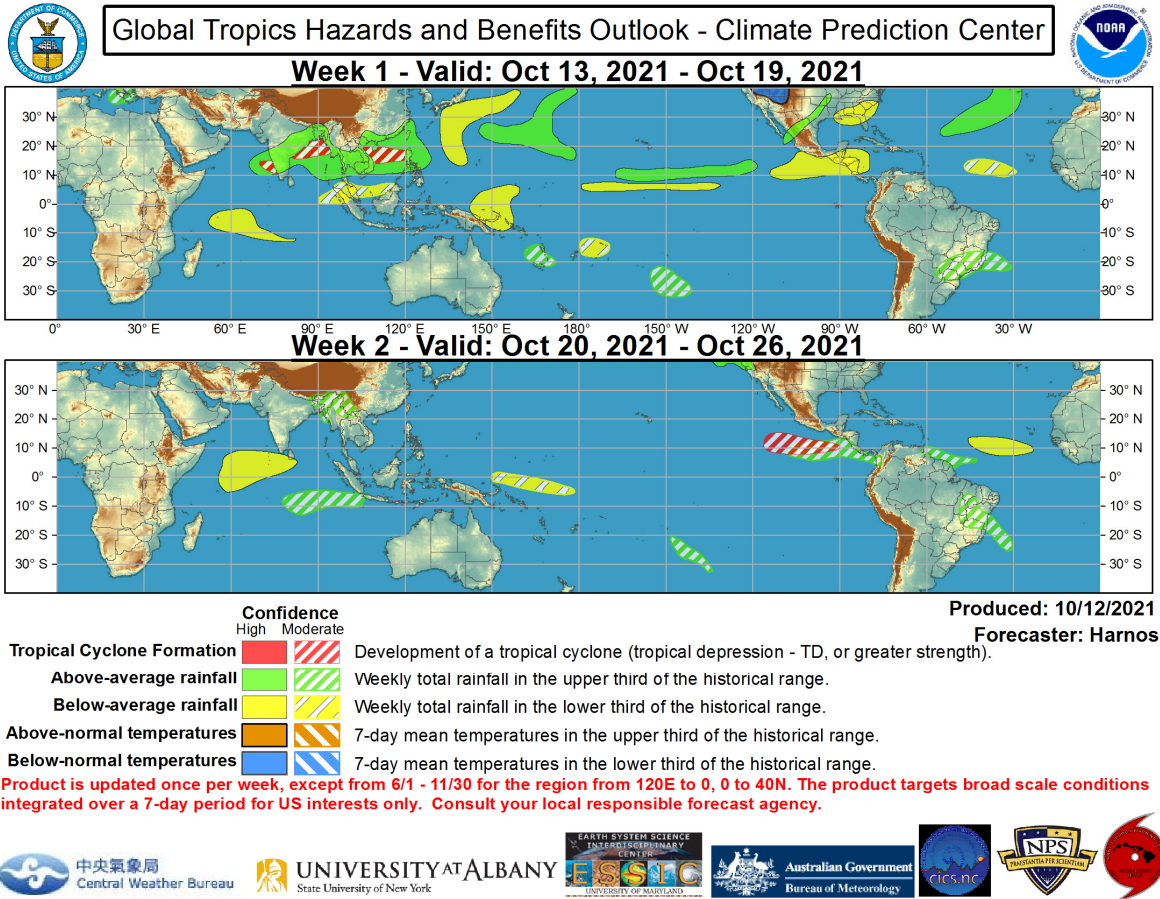
Source: Climate Prediction Center (NOAA)

Current Tropical Cyclone Activity
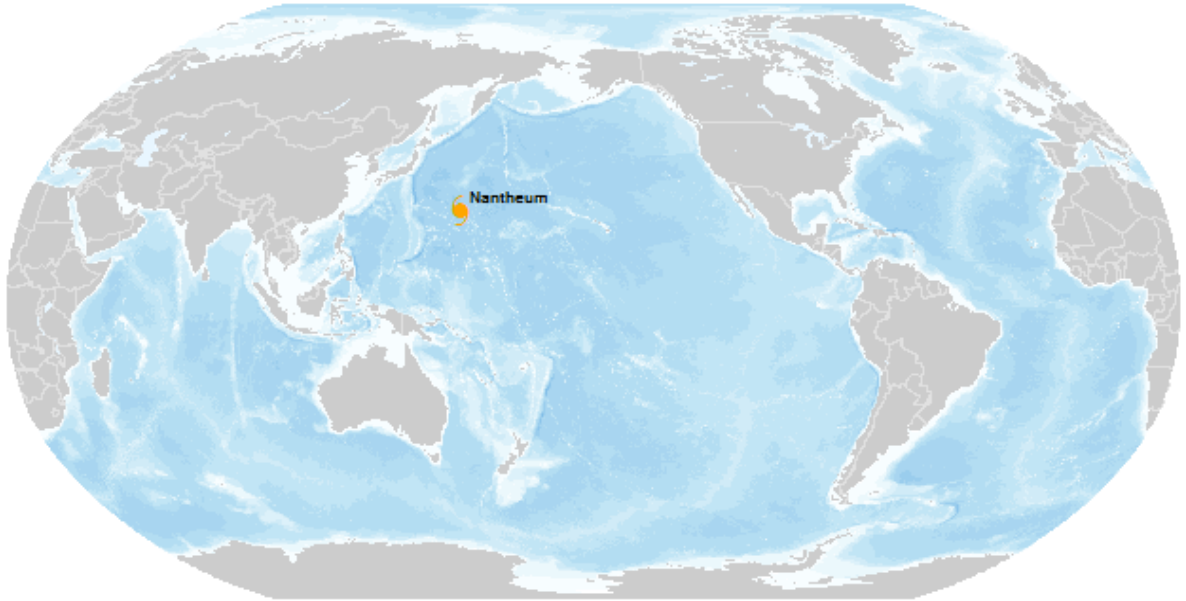
🌀 Tropical Depression 🌀 Tropical Storm 🌀 Category 1 🌀 Category 2 🌀 Category 3 🌀 Category 4 🌀 Category 5

Storm Name	Location	Winds	Location from Nearest Land Area
Nantheum	25.1N, 159.0E	40 mph	250 mi (405 km) E of Minami Tori Shima, Japan

* 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 (≥M4.0): October 8-14

Magnitude   · 4.0 - 4.9   • 5.0 - 5.9   ● 6.0 - 6.9   ● ≥ 7.0   —— Tectonic boundary
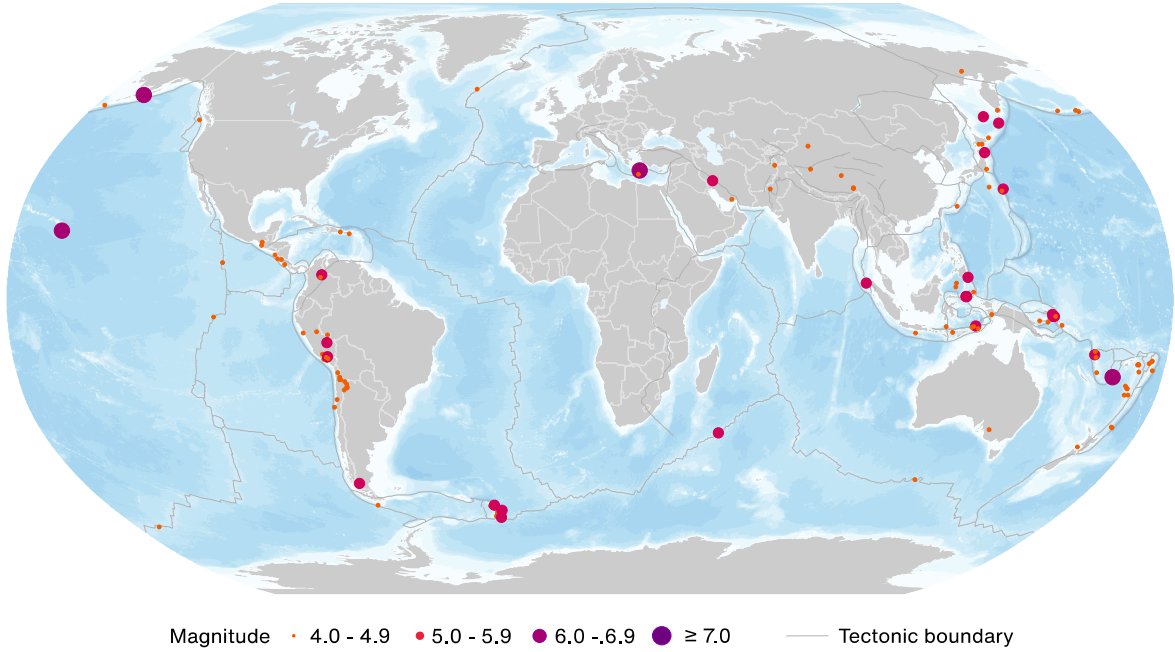
Date (UTC)	Location	Magnitude	Epicenter
10/9/2021	21.17S, 174.53E	6.9	Vanuatu region
10/10/2021	18.82N, 155.53W	6.2	27 km (17 mi) SSE of Naalehu, Hawaii
10/11/2021	56.26N, 156.55W	6.9	11 km (7 mi E of Chignik, Alaska
10/12/2021	35.19N, 26.26E	6.4	SSE of Palekastro, Greece

Source: United States Geological Survey

U.S. Hazard Outlook

Day 3-7 U.S. Hazards Outlook
Valid: 10/17/2021-10/21/2021

For the latest information on flooding - https://www.wpc.ncep.noaa.gov/nationalfloodoutlook/index.html

Flooding Likely | Flooding Occurring/Imminent | Flooding Possible | Severe Drought

Heavy Precipitation 10/17

Heavy Precipitation 10/18 - 10/20

High Winds 10/17

Weather Prediction Center
Made: 10/14/2021 3PM EDT

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- Flooding remains a concern across parts of Texas due to high stream flows and saturated soils from recent bouts of heavy rainfall and tropical moisture.

- Extreme drought conditions are expected to persist across much of the West and Northern Tier, with minimum precipitation forecast over the medium range.

Source: Weather Prediction Center (NOAA)

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

U.S. Significant Wildfire Potential
■ Above Normal ■ Near Normal ■ Below Normal

Data: NIFC
Graphic: Aon (Catastrophe Insight)
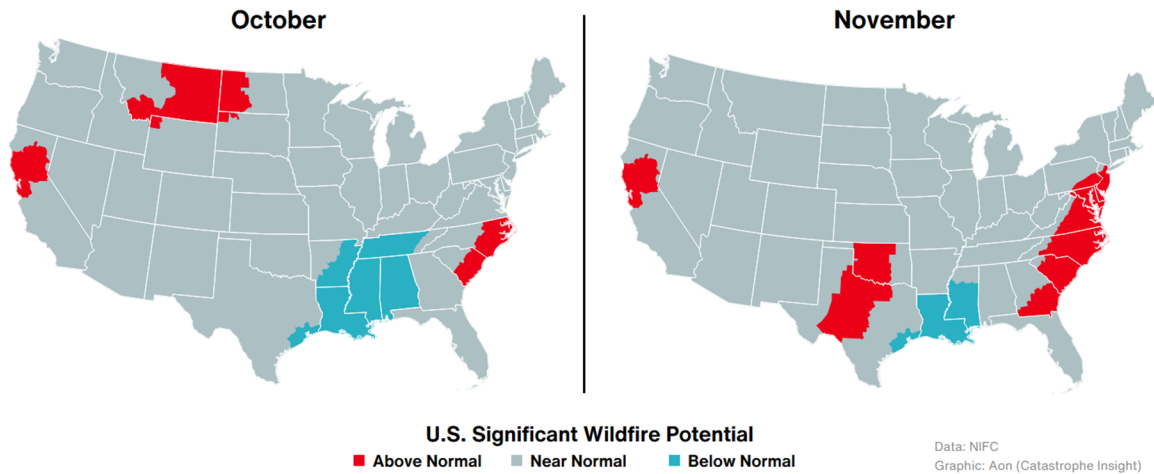
Annual YTD Wildfire Comparison: October 14

Year	Number of Fires	Acres Burned	Acres Burned Per Fire
2017	51,178	8,726,522	170.51
2018	49,723	8,145,157	163.81
2019	42,962	4,448,654	103.55
2020	45,749	8,285,894	181.12
2021	47,201	6,480,861	137.30
10-Year Average (2011-2020)	**48,442**	**6,820,927**	**140.81**

Top 5 Most Acres Burned by State: October 14

State	Number of Fires	Acres Burned	Acres Burned Per Fire
California	8,443	2,381,919	282.12
Montana	2,410	718,412	298.10
Oregon	1,590	672,337	422.85
Arizona	1,656	532,097	321.31
Idaho	1,288	449,267	348.81

Source: National Interagency Fire Center

U.S. Current Riverine Flood Risk

| High Flows (Percentile) | ≥ 99 / Above floodstage
95 - 99
90 - 95 | Hydrological Drought | Severe Drought
Moderate Drought
Below Normal |
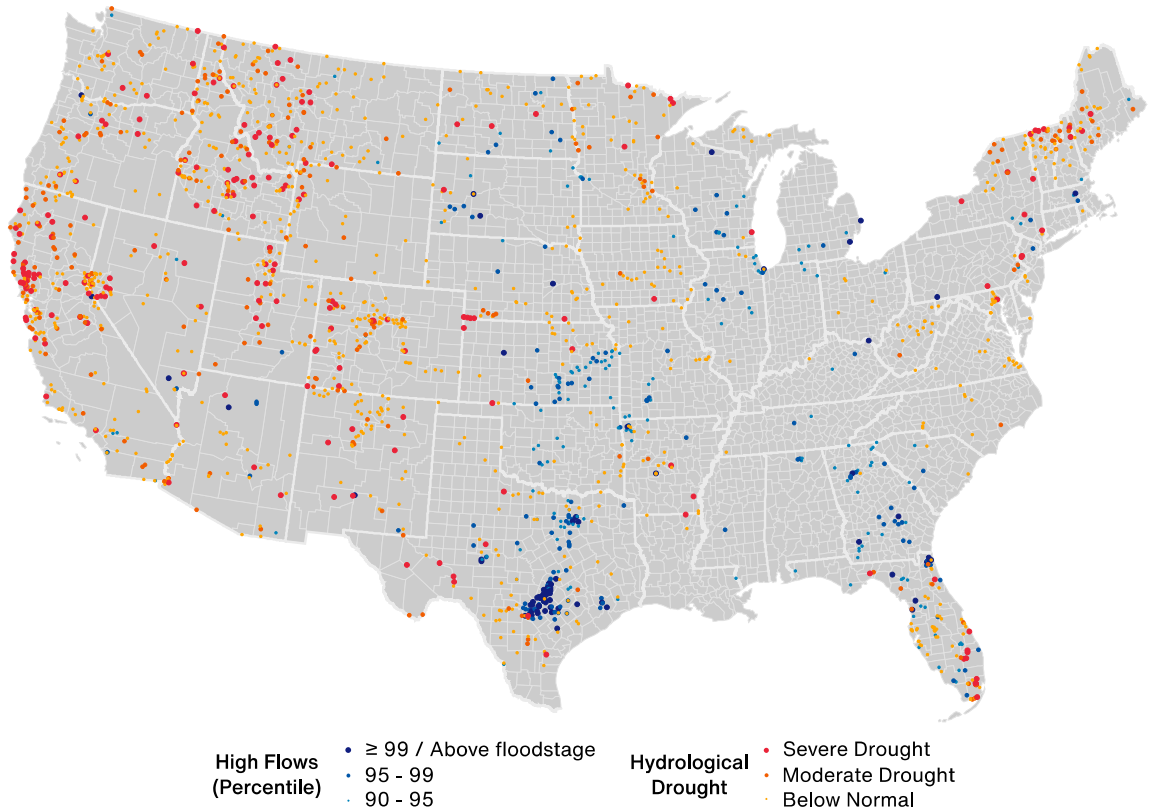
A ≥99th percentile indicates that estimated streamflow is greater than the 99th percentile for all days of the year. This methodology also applies for the other two categories. A steam in a state of severe drought has 7-day average streamflow of less than or equal to the 5th percentile for this day of 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
Flint River at Albany, Georgia	9.96	99.12
Laurel Hill Creek at Ursina, Pennsylvania	1.08	99.03
Blanco River at Wimberley, Texas	8.41	98.95
Apalachicola River at Chattahoochee, Florida	53.29	98.94
Wakarusa River near Lawrence, Kansas	12.79	98.91

Source: United States Geological Survey

Source Information

United States: Severe Weather

U.S. National Weather Service

U.S. Storm Prediction Center

Hail storm causes damage throughout Norman, *ABC 5 KOCO*

Some homes still without power Monday morning following overnight storms, *ABC 8 WFFA*

Damage seen as tornado warned storms move through Oklahoma City metro, *Oklahoma News 4*

China: Flooding

Shanxi Meteorological Bureau

Dyke breach in Yellow River tributary closed in China's Shanxi, *Xinhuanet*

China – Thousands Evacuate Floods in Shanxi*, Floodlist*

China floods: Nearly 2 million displaced in Shanxi province*, BBC*

15 killed, 3 missing as rainstorms hit north China's Shanxi, *Xinhuaet*

Mexico: Hurricane Pamela

National Hurricane Center (NHC)

Storm Pamela knocks down trees, floods streets in western Mexico, *Reuters*

Hurricane 'Pamela' causes flooding in Nayarit, *El Sol De Mexico*

'Pamela' hits the coasts of Sinaloa and degrades into a tropical storm, *El País*

Natural Catastrophes: In Brief

National Board for Disaster Management, Indonesia

United States Geological Survey

National Disaster Risk Reduction Management Center, Philippines

Department of Disaster Prevention and Mitigation, Thailand

Vietnam Disaster Management Authority

Contacts

Steve Bowen

Managing Director

Head of Catastrophe Insight

steven.bowen@aon.com

Brian Kerschner

Senior Catastrophe Analyst

brian.kerschner@aon.com

Michal Lörinc

Senior Catastrophe Analyst

michal.lorinc@aon.com

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