Weekly Cat Report

October 7, 2022

Executive Summary
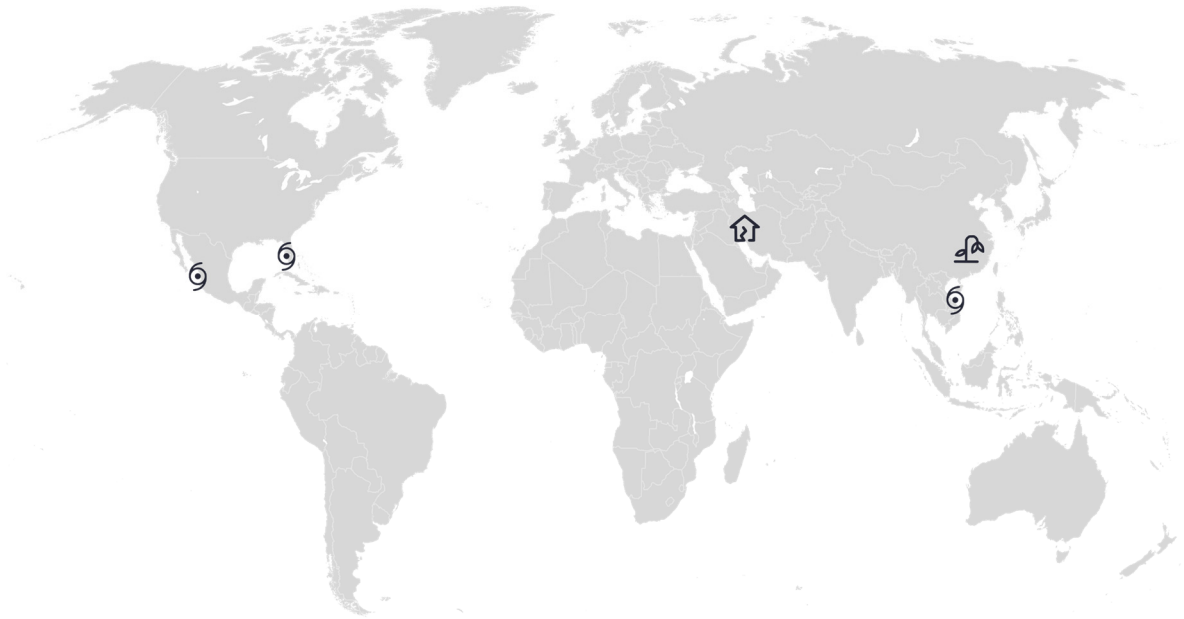
Event	Affected Region(s)	Fatalities	Economic Loss ($)	Page
Hurricane Ian	United States	130+	10s of billions	3
Drought	China	NA	100s of millions	8
Hurricane Orlene	Mexico	0	Unknown	10
Earthquake	Iran	0	10s of millions	10
Tropical Storm Noru	Thailand	3	Millions	10

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
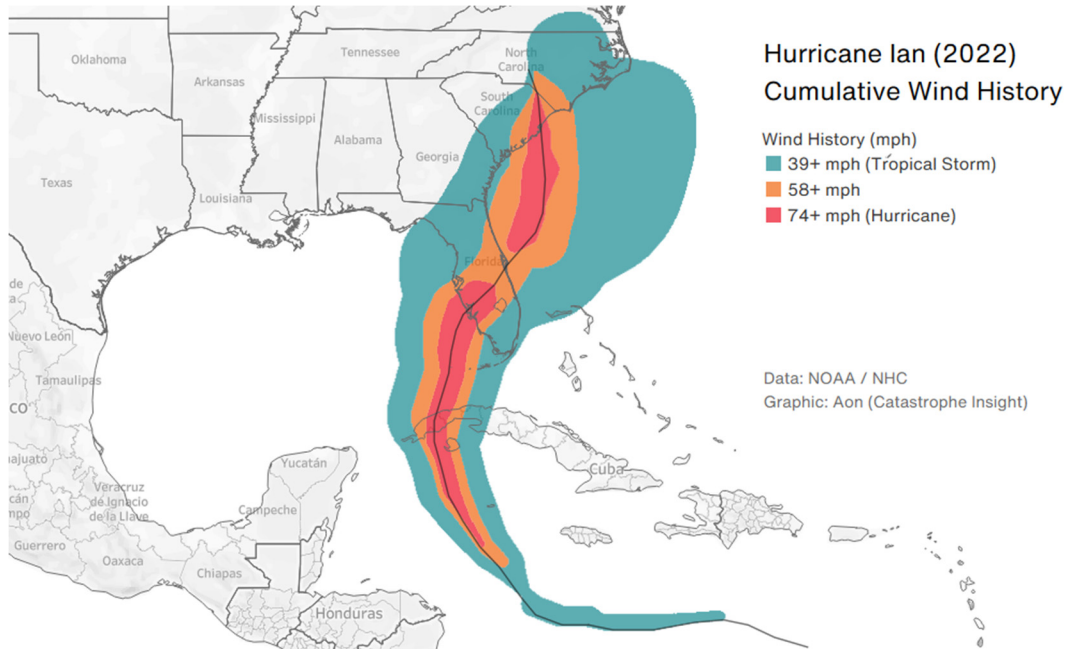
United States: Hurricane Ian

Overview

After generating catastrophic damage due to storm surge, wind, and exceptional flooding across the Florida Peninsula, Ian regained hurricane status over the warm waters of the Atlantic Gulf Stream. Hurricane Ian made a final landfall in South Carolina as a Category 1 storm on September 30 and resulted in significant tropical impacts across the Southeast and Mid-Atlantic. As of this writing, Ian has been associated with at least 130 deaths in the United States and Cuba – a majority of which occurred in Florida. According to various publicly available industry loss estimates, total economic and insured losses from Hurricane Ian were anticipated to potentially reach into the tens of billions (USD). The overall death toll and full financial impact from Ian is expected to continue to develop in the coming weeks and months and will likely be heavily affected by inflationary pressure, demand surge, specific characteristics of the local insurance industry and other factors.

Meteorological Recap
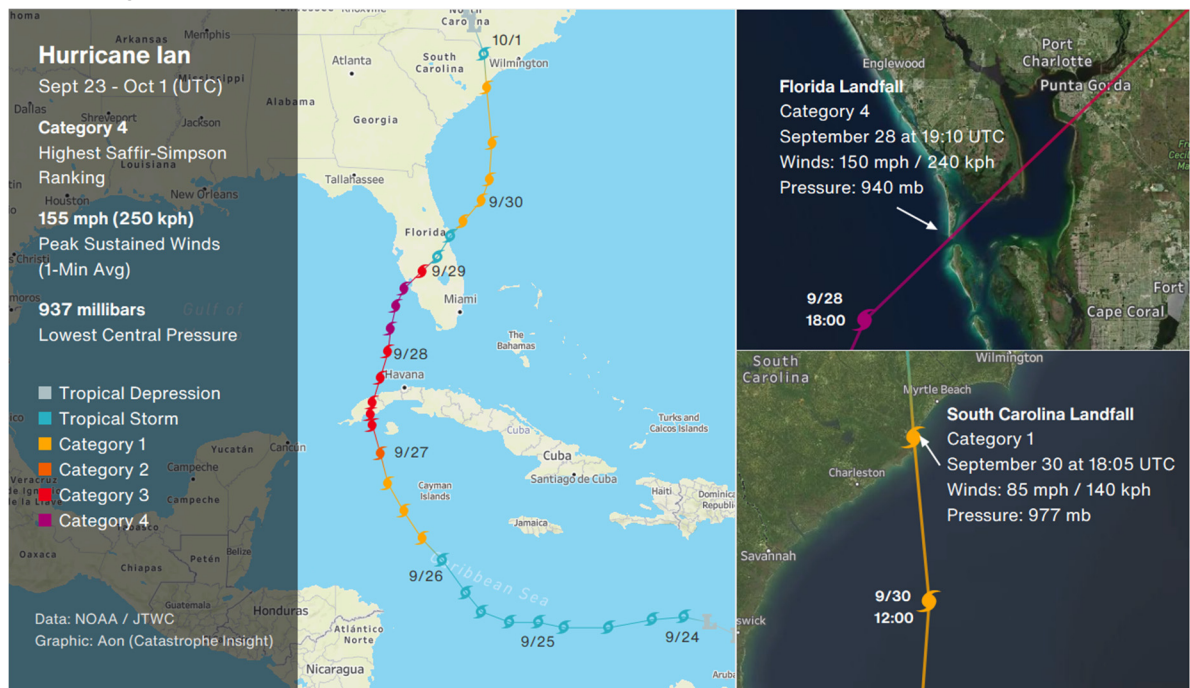
After generating catastrophic impacts from storm surge, wind, and flooding across the Florida Peninsula the center of weakened Tropical Storm Ian emerged into the western Atlantic Ocean during the afternoon of September 29, north of Cape Canaveral. Ian was able to re-intensify while slowly churning over the warm waters of the Gulf Stream. Ian regained hurricane status several hundred miles (kilometers) south of Charleston, South Carolina by 5:00 PM EDT (21:00 UTC) on September 29, as maximum wind speeds increased to 75 mph (120 kph).

Upon approach to the Carolinas, Ian remained a hybrid tropical cyclone / extra tropical low, characterized by a warm core with a distinct comma pattern on satellite imagery and frontal features in the outer circulations. Hurricane Ian, a Category 1 storm, made its final landfall near Georgetown, South Carolina on September 30 at 2:05 PM EDT (18:05 UTC), with maximum sustained winds of 85 mph (140 kph) and a minimum central pressure of 977 mb. After landfall, Ian generated hurricane force wind gusts along with a wide swath of damaging tropical storm force winds, dangerous storm surge, and locally heavy rainfall across portions of the Carolinas and Mid-Atlantic.

Hurricane Ian (2022)
Cumulative Wind History

Wind History (mph)
- 39+ mph (Tropical Storm)
- 58+ mph
- 74+ mph (Hurricane)

Data: NOAA / NHC
Graphic: Aon (Catastrophe Insight)

In subsequent hours, Ian rapidly weakened and became a post-tropical storm while interacting with a cooler airmass over the southeastern United States. All tropical related watches and warnings were discontinued by the late evening on September 30, and the National Hurricane Center (NHC) stopped public advisories related to Ian on October 1.

Ian produced storm surges which reached 5 to 7 ft (1.5 to 2.1 m) on September 30. According to preliminary data from NOAA, a tidal gage near Springmaid Pier (Myrtle Beach), South Carolina recorded a maximum storm surge of 6.41 ft (1.95 m), while a station in Wilmington, North Carolina reported a maximum storm surge of 5.05 ft (1.54 m) referenced to Mean Higher High Water (MHHW).

Several localities near Ian's South Carolina landfall reported hurricane force and high-end tropical storm wind gusts. The table below highlights select wind gusts, per preliminary data from the National Weather Service (NWS).

Location	Wind Gust (mph)	Location	Wind Gust (mph)
Shutes Folly, SC	92	Southport, NC	85
Winyah Bay, SC	87	Oak Island, NC	78
Fort Sumter, SC	85	Federal Point, NC	77

Maximum radar estimated storm total rainfall across coastal regions of North Carolina and northern South Carolina reached and exceeded 4 to 6 in (100 to 150 mm) and resulted in instances of riverine and flash-flooding.
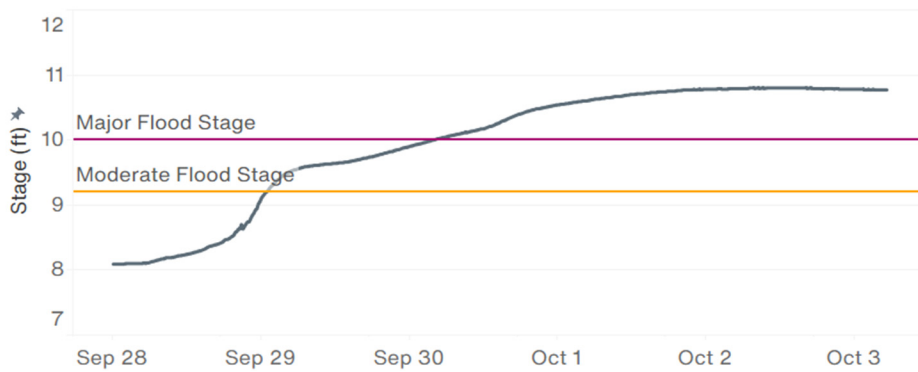
Inland Flooding

Overflow from rivers inundated inland communities, including Bartow in Polk County and Deland in Volusia County, and shut down parts of the Florida interstate highway system for days.
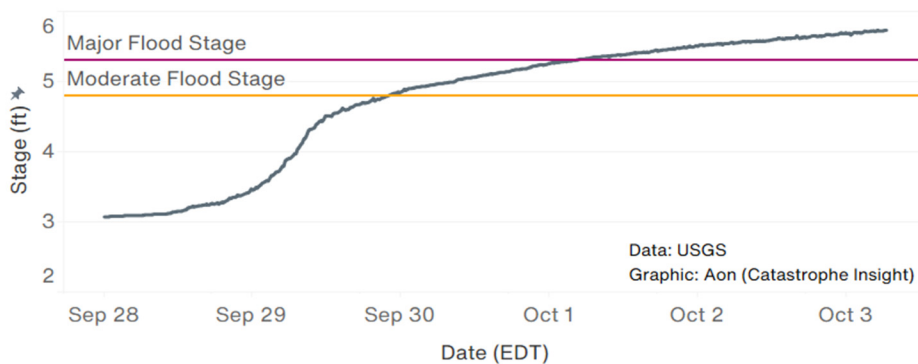

Peace River at Arcadia
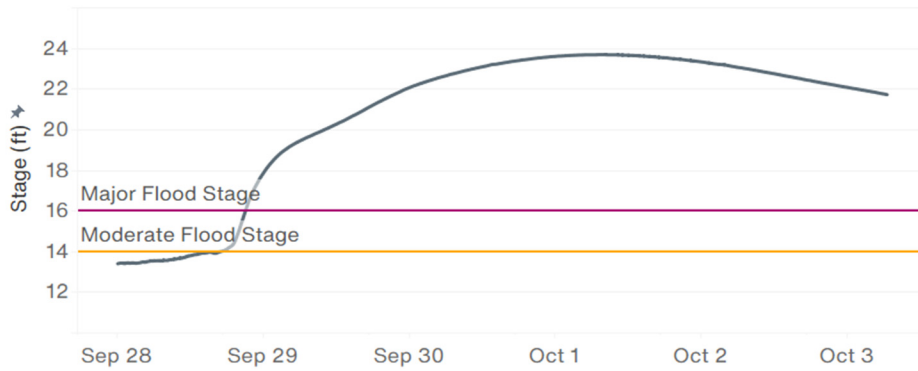
Peace River at Bartow

St John River at Deland

Data: USGS
Graphic: Aon (Catastrophe Insight)

According to data from the Weather Prediction Center (WPC), since 2005 Hurricane Ian ranked 3rd in areal flooding extent associated with the inland coverage of 10 in (250 mm) or greater rainfall in a 24-hour period. Ian was only exceeded by the day-3 and day-2 rainfall extents from Hurricane Harvey in 2017.

Florida is particularly prone to flash-flooding due to an abundance of low-lying terrain. Flooding from Ian was further worsened by already saturated soils generated from recent bouts of heavy rainfall in the days / weeks prior. However, a significant portion of the properties in the state reside in flood-risk areas not recognized by the Federal Emergency Management Agency's flood maps, limiting insurance access.

For a full recap of the meteorological history and impacts of Hurricane Ian, see last week's Weekly Cat Report.

Event Details

As of this writing, Hurricane Ian has been associated with at least 130 deaths in Cuba (5), Florida (120), and North Carolina (5) – search and rescue for those unaccounted for remained ongoing.

In **Florida**, hundreds of thousands of customers endured without power into the first week of October. Boil water advisories concurrently persisted across the most affected communities – including the hardest hit Lee and Charlotte Counties. As of this writing, search and rescue teams carried out no less than 1,600 operations across Florida, as numerous residents were stranded in the aftermath of the storm. Thousands of homes, businesses, and structures across the state were impacted by storm surge, coastal and inland flooding, and exceptional winds.

Hundreds of Florida Department of Transportation members were working to construct temporary roadways to safely reach Pine Island and Sanibel Island by vehicle, after Ian destroyed portions of the only roadways leading to the barrier island communities. Multiple healthcare facilities which were impacted across the hardest hit regions of the state were forced to evacuate at least 7,000 patients.

Post event storm surveys revealed no fewer than six tornado touchdowns were spawned by the hurricane in Florida. A strong EF2 tornado in Palm Beach County resulted in torn off and collapsed roofs, snapped trees, and flipped vehicles near the communities of Boca Raton and Delray Beach. At least 30 people were evacuated, and two injuries were reported.

U.S. Coast Guard Florida Hurricane Response
Source: U.S. Coast Guard (USCG)

In the **Carolinas,** Ian left hundreds of thousands of customers without electricity – fortunately most outages were restored within several days. Ian's winds and storm surge left widespread damages consisting of downed trees, debris, property damage and inundated roadways. Coastal communities from Georgia to the Mid-Atlantic were flooded by storm surge associated with Ian. In **South Carolina**, parts of the Pawleys Island Pier were washed away, as nearby residences sustained significant damage. Notable coastal erosion was evident in Myrtle Beach, where several boardwalks and piers were collapsed.

The Gulf coast has endured destructive Category 4 landfalling hurricanes in each of the last three seasons, including Laura (2020), Ida (2021), and Ian (2022).

Recent reports by the Intergovernmental Panel on Climate Change (IPPC) have indicated warmer global sea surface temperatures were likely to aid in an increase in the frequency of tropical cyclone rapid intensification events observed in recent decades. This trend was accompanied by slower translational speeds, specifically over the United States. Furthermore, a warmer and wetter atmosphere has resulted in heavier precipitation on a per storm basis. This is particularly true in a warming climate, as warmer air can hold more moisture than cooler air.

Modelled Footprints

Impact Forecasting (IF), Aon's model development center, has released post-landfall in-season scenarios and footprints for Hurricane Ian. Modeled representations of Ian's wind, storm surge and flood impacts were made available. In-season scenarios are developed post-landfall and are calibrated with station measurements; they improve on IF's hurricane Automated Event Response service, which is an automated modeling solution based on forecast data.

Example of wind and combined storm surge & pluvial flood footprint:
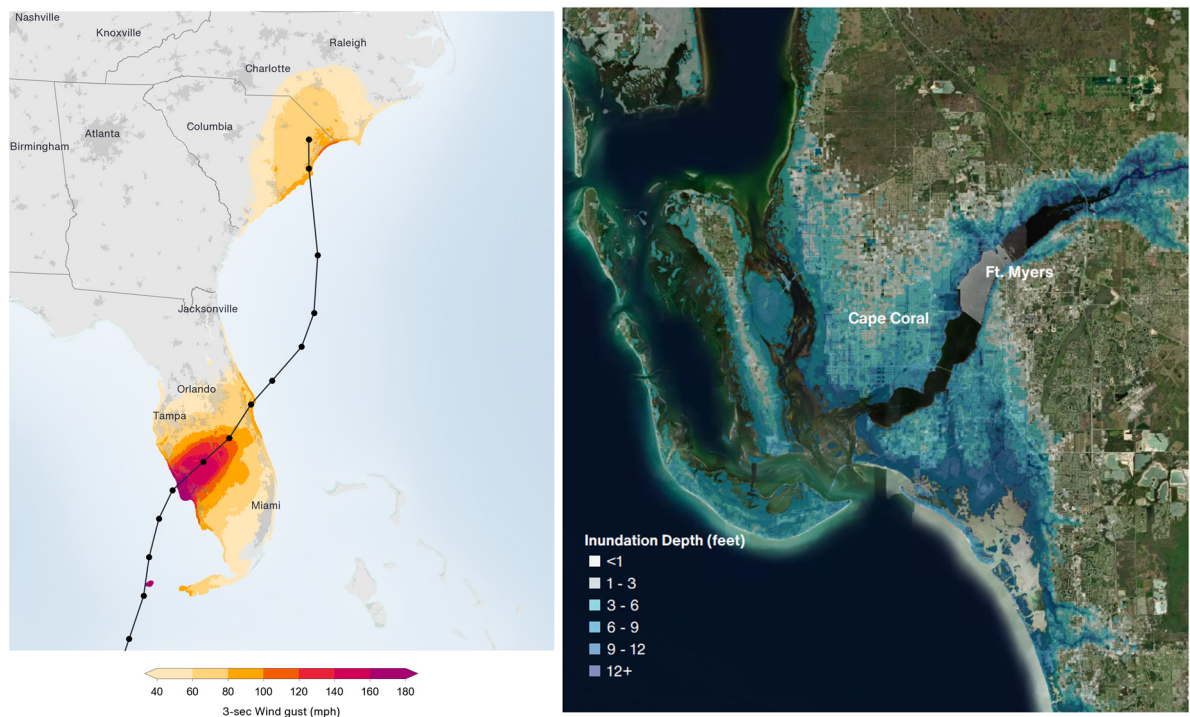

Financial Loss

Catastrophic impacts from Hurricane Ian were expected to result in an economic and insured loss each individually reaching into the tens of billions (USD). A large part of the toll followed the widespread wind-related, storm surge, and inland flooding damage across Florida, with additional non-negligible losses expected in the Southeast United States and Cuba. The overall death toll and full financial impact from Ian is expected to continue to develop in the coming weeks and months.

China: Drought

Overview

Agricultural drought losses in China during July and August had resulted in an economic loss of at least ¥35.5 billion ($5 billion). Seasonal rainfall in several cities was less than one-tenth of their climatological normal, leading to escalation of severe drought conditions in the provinces of Hunan, Hubei, Jiangxi, and Anhui. The middle and lower reaches of the Yangtze basin recorded at least 50 continuous days of medium-level drought, the highest such total since 1961. Drought losses for the month of September were anticipated to reach into the hundreds of millions (USD), if not, higher.

Meteorological Recap
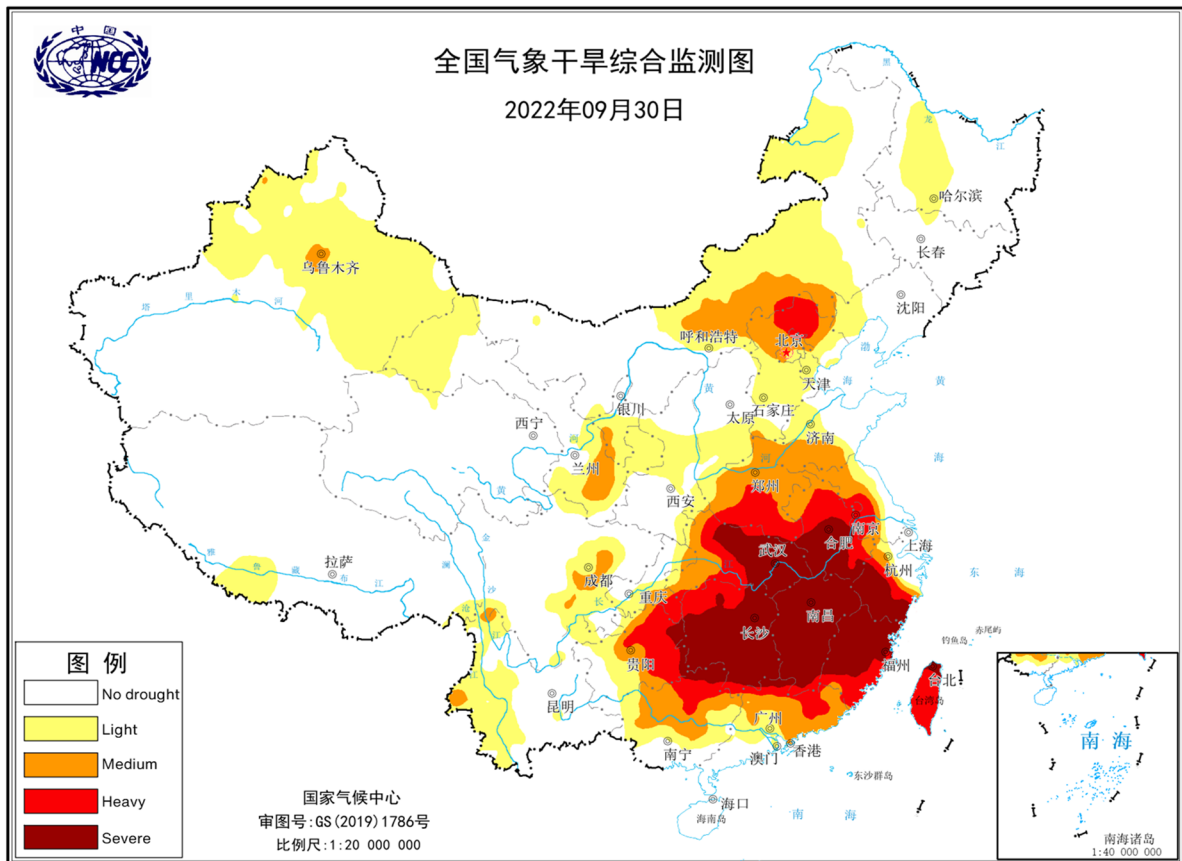
A prolonged subtropical high following an early end of the plum rain season suppressed rainy weather over southeastern China. Nanchang, capital of Jiangxi, received less than one-tenth of its normal rainfall since July 1. China logged its hottest October day with multiple monitoring sites breaking 40°C (104°F) before the cold wave. Drought severity of medium level or higher had persisted in the lower and middle reaches of the Yangtze Basin for a record span of at least 50 days since comprehensive records began in 1961. Further details can be found in earlier Weekly Cat Report (see August 19 Weekly Cat Report).

Event Details

Satellite imagery of Poyang Lake on July 10 and September 28
Source: Sentinel-2

Nearly 95 percent of Jiangxi had come under severe drought. The Poyang Lake, China's largest freshwater lake in Jiangxi, fell from 19.4 m (63.7 ft) on June 23 to 7.1 m (23.3 ft) on September 23, breaking the previous record set in 2004. The lake entered 'extremely dry' water levels on September 6 as levels first dipped below 8 m (26.2 ft). Dry and hot weather also pushed the Dongting Lake in Hunan, the second largest lake in China, to a record low of 19.4 m (63.6 ft) on September 30. Approximately 98 percent of Hunan was under medium drought, of which, 43 percent was in severe drought conditions. Through the end of September, the Ministry of Water Resources estimated at least 12 million ha (29 million acres) of cropland in the Yangtze Basin were affected by drought.

Financial Loss

While less extensive than the drought conditions observed in August, drought losses for the month of September are likely to reach into the hundreds of millions (USD), if not, higher.

Natural Catastrophes: In Brief

Hurricane Orlene (Mexico)

Hurricane Orlene rapidly intensified and briefly obtained Category 4 status on the Saffir-Simpson Hurricane Wind Scale (SSHWS) on October 2, while heading toward the southwestern Mexican coast. Due to unfavorable wind shear, a weakened Orlene made landfall on October 3 at 7:45 AM MDT (13:45 UTC) north of the Nayarit and Sinaloa border as a Category 1 storm with maximum sustained winds of 85 mph (140 kph). No fewer than 53,000 customers in Nayarit and Sinaloa lost electricity in the wake of the hurricane. Across the affected region, damaged power poles, fallen trees, mudslides, and impacted drinking water systems were reported. Hundreds of people were evacuated and many families in rural communities were isolated. Damages were less than initially feared due to hurricane weakening prior to landfall, however, damage assessments remained ongoing.

Earthquake (Iran)

A moderate magnitude-5.6 earthquake shook Iran at 3:51 AM local time on October 5. The temblor struck at a shallow depth of 15 km (9.3 mi) about 8.6 km (5.3 mi) away from Khowy. Moderate, shallow earthquakes are common in Iran, arising from oblique reverse faulting within the converging Arabia and Eurasia plates. At least 1,100 people were injured according to the Health Ministry, but no deaths were reported. Preliminary assessments found 500 damaged houses. Economic losses were estimated in the tens of millions (USD), based on the USGS PAGER methodology.

### Remnants of Tropical Storm Noru (Thailand)

The remnants of Tropical Storm Noru affected northern Thailand, after making landfall in central Vietnam early on September 28. Heavy rain continued through October 4 following its dissipation. This pushed rivers, mainly in the northern and central provinces, to crest above critical levels in at least 38 locations. Among the worst was the Ping River in Chiang Mai which broke its bank on October 3. Three people died and two were injured in Sisaket province. At least 13,000 people were displaced, and no fewer than 160,000 ha (395,000 acres) of cropland were inundated. Surging floodwaters from the North and dam releases were flowing downriver, putting the capital on alert for flood risk in the coming days.

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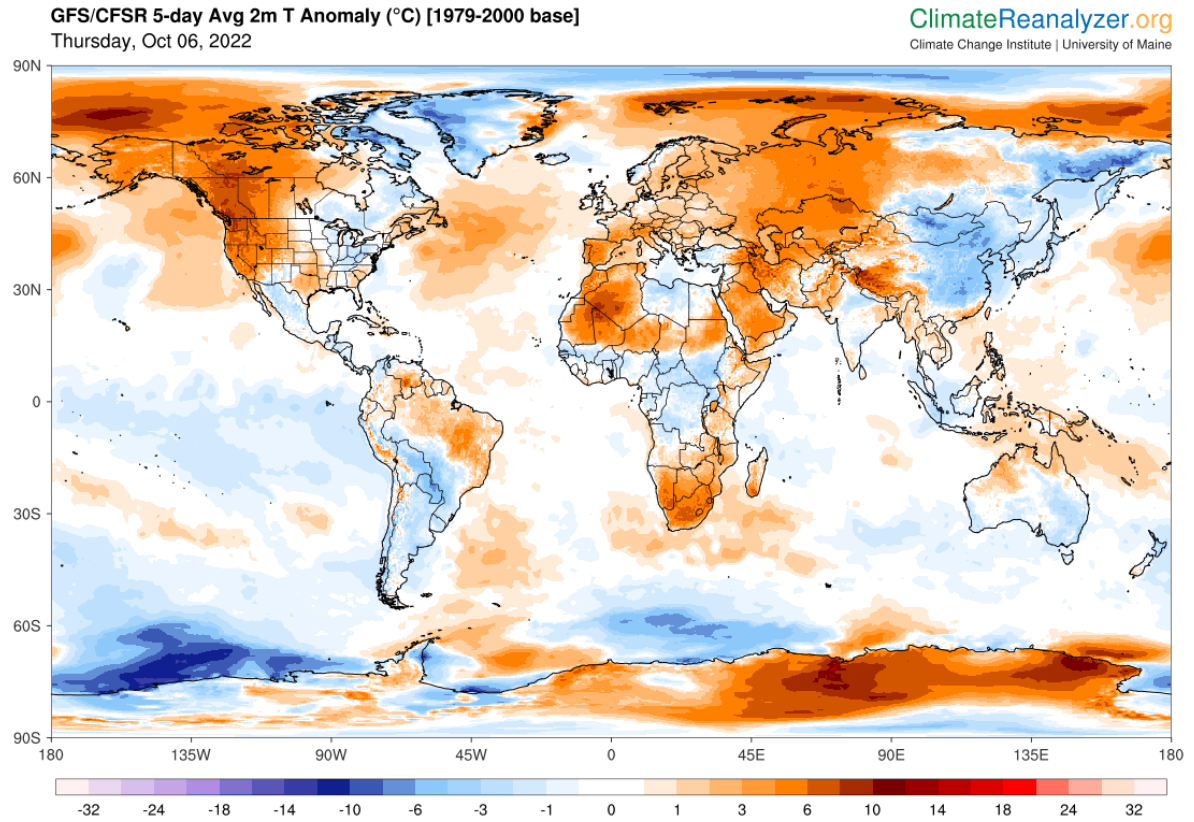
Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

Global Precipitation Anomaly Forecast

GFS 5-day Total Accumulated Precipitation (cm)
Thursday, Oct 06, 2022

ClimateReanalyzer.org
Climate Change Institute | University of Maine
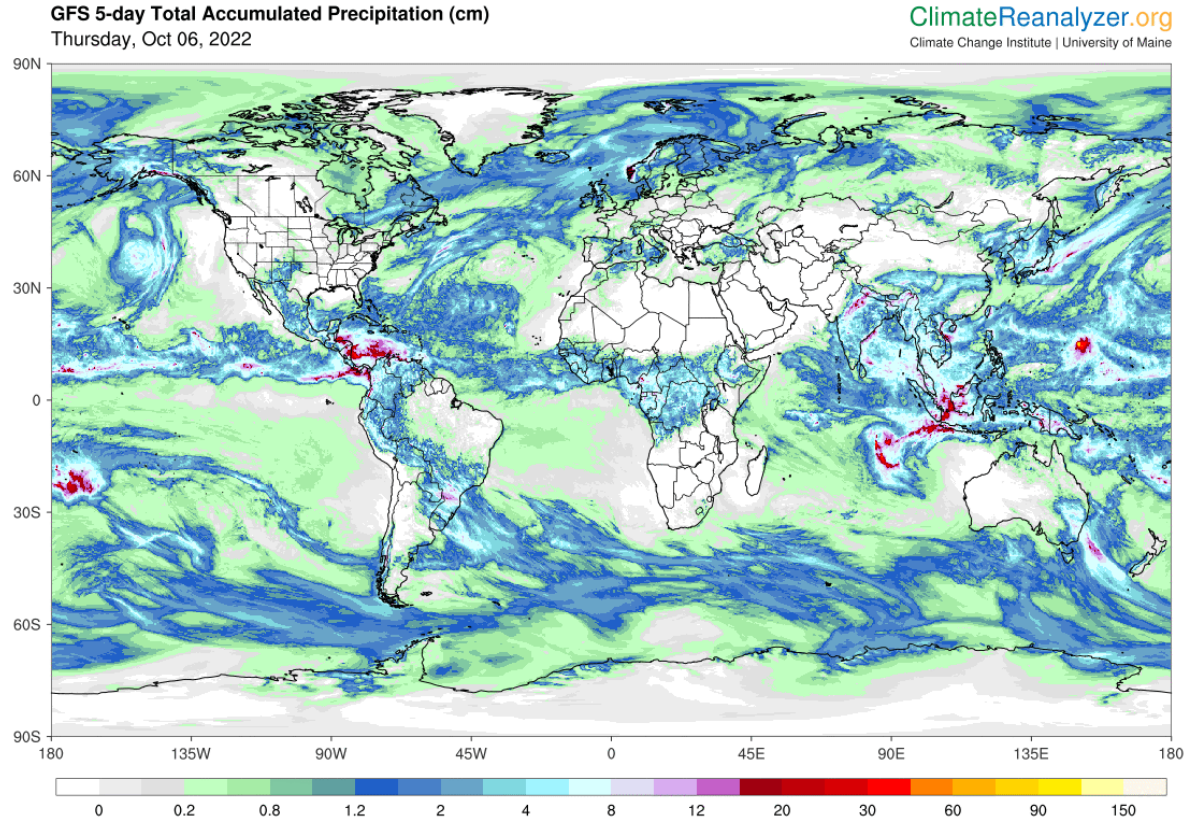
Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

Weekly Cat Report

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

NOAA Coral Reef Watch Daily 5km Sea Surface Temperatures (v3.1)   5 Oct 2022
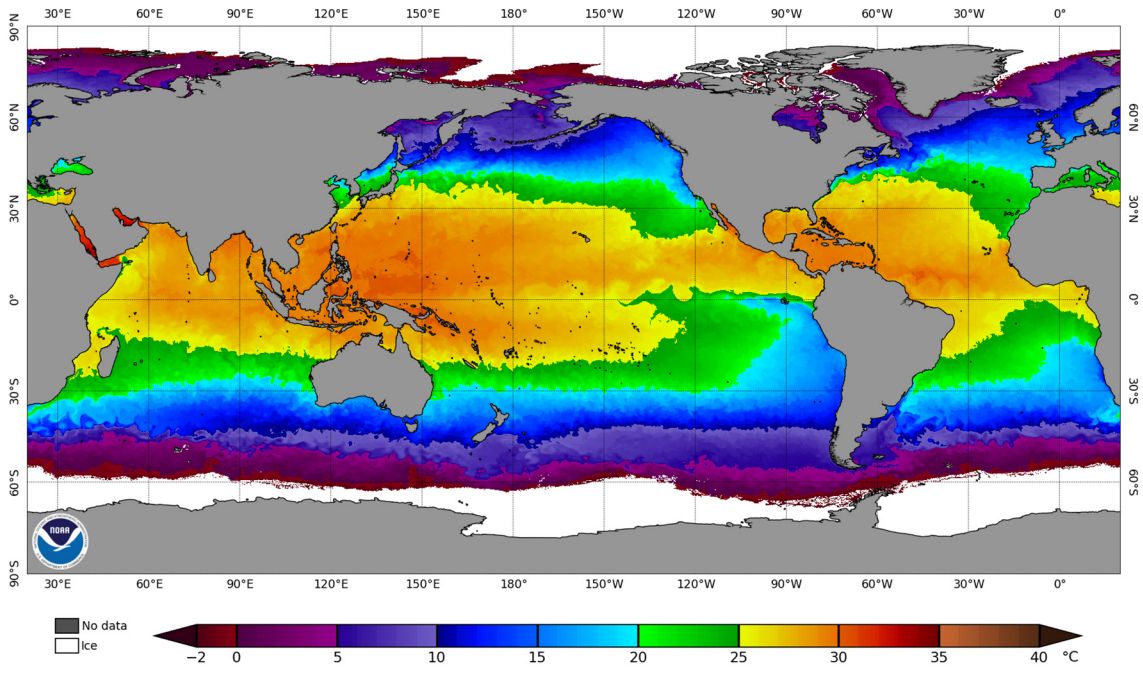
NOAA Coral Reef Watch Daily 5km SST Anomalies (v3.1)   5 Oct 2022
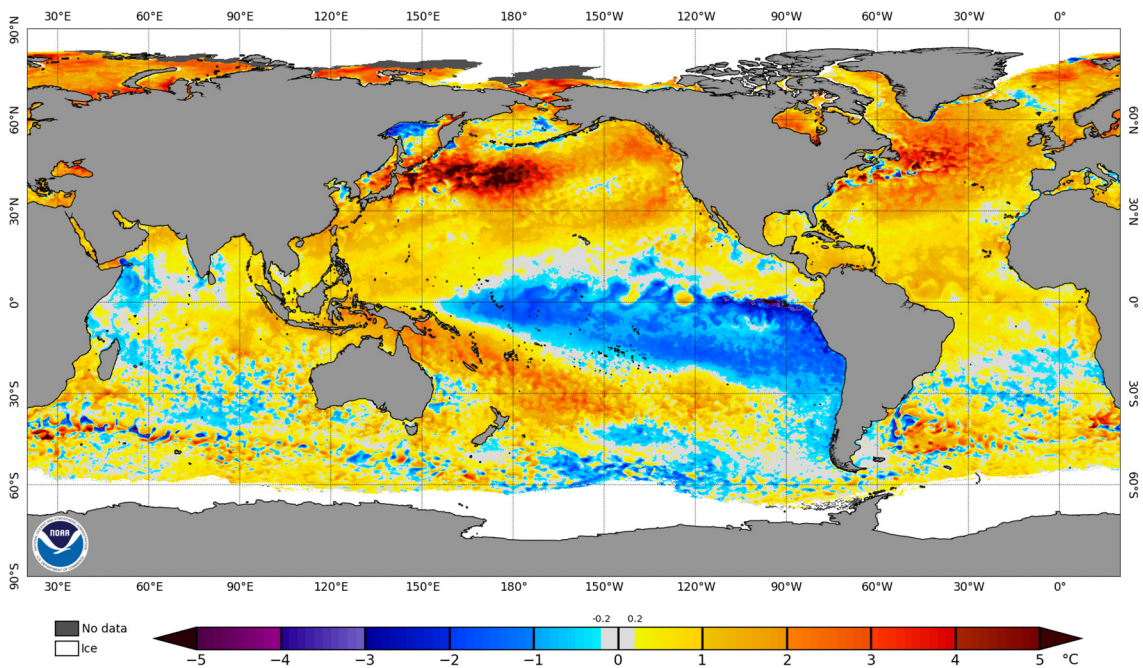
El Niño-Southern Oscillation (ENSO)

Overview

La Niña conditions are very likely to continue for the next several months. NOAA cites a 91 percent chance of La Niña conditions persisting through November, and then gradually declining to 54 percent during the boreal (northern hemisphere) winter months of January, and February.

Probabilistic ENSO Model Projections: September 2022

Data: NOAA & Columbia University (IRI) | Graphic: Aon (Catastrophe Insight)
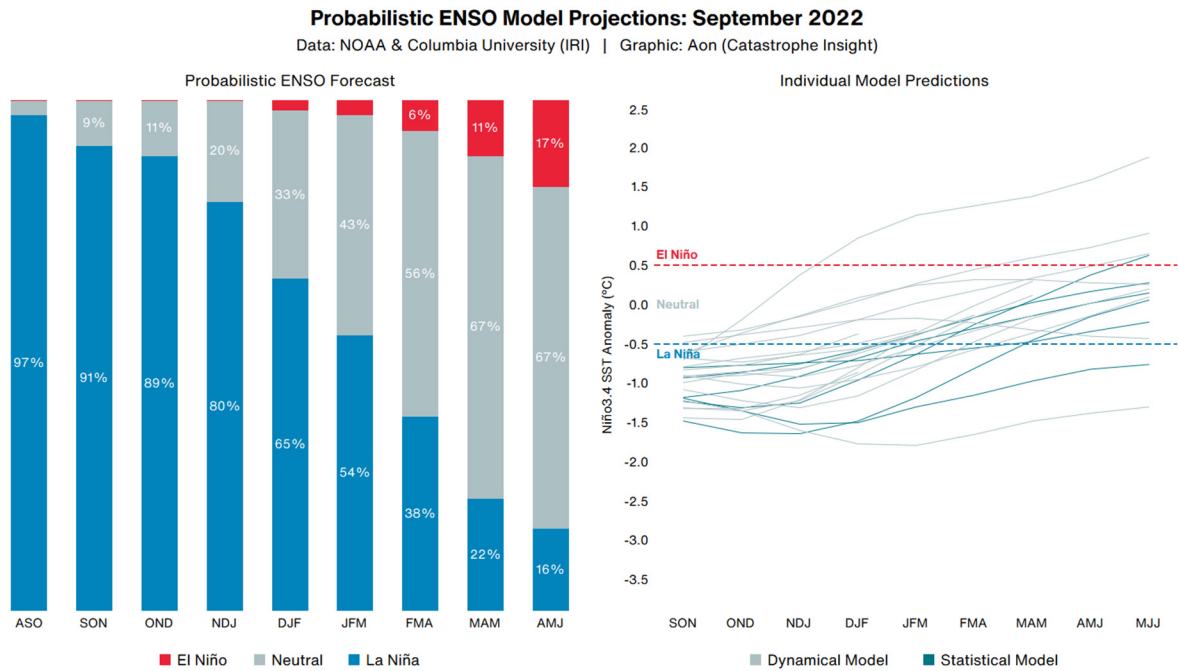
El Niño: Warm phase of an ENSO cycle. Sea surface temperatures of +0.5°C occur across the east-central equatorial Pacific.

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
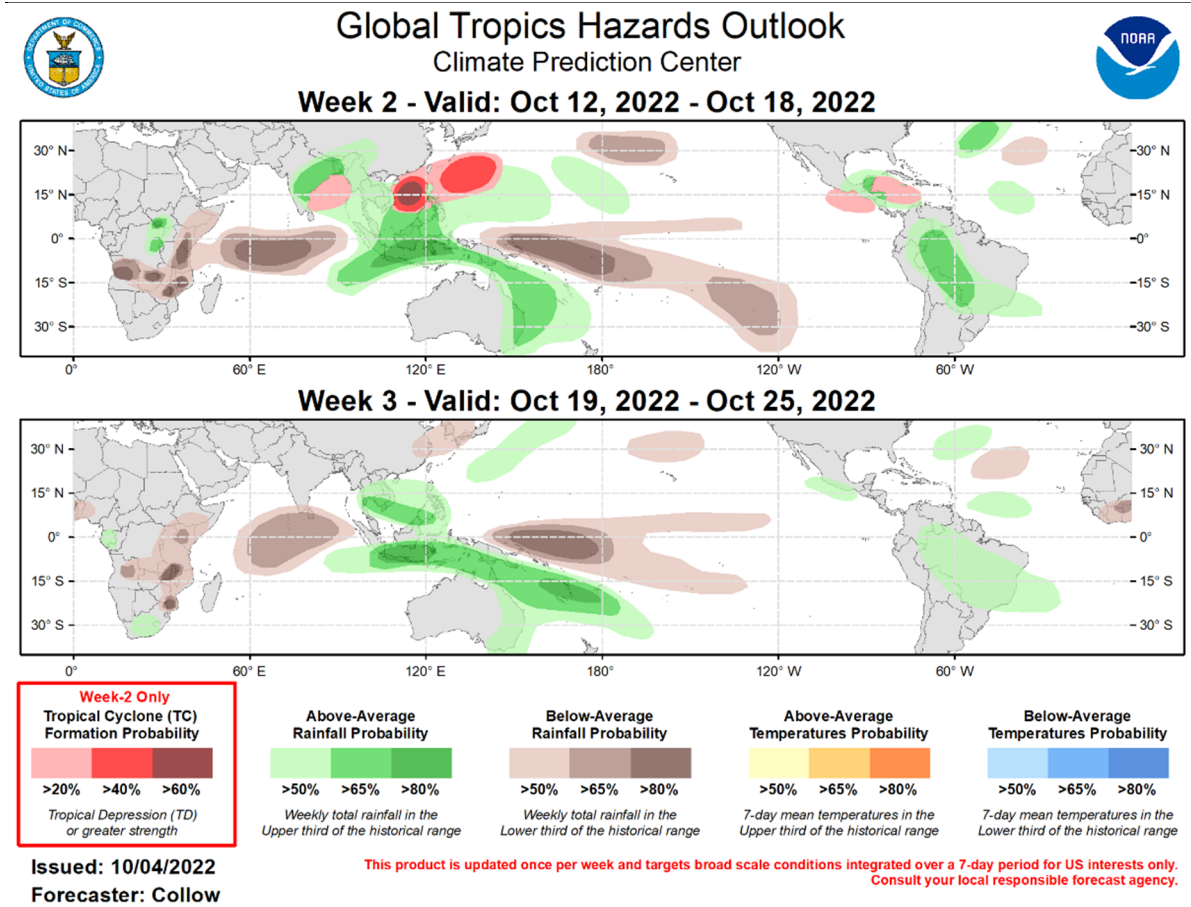
Source: Climate Prediction Center (NOAA)

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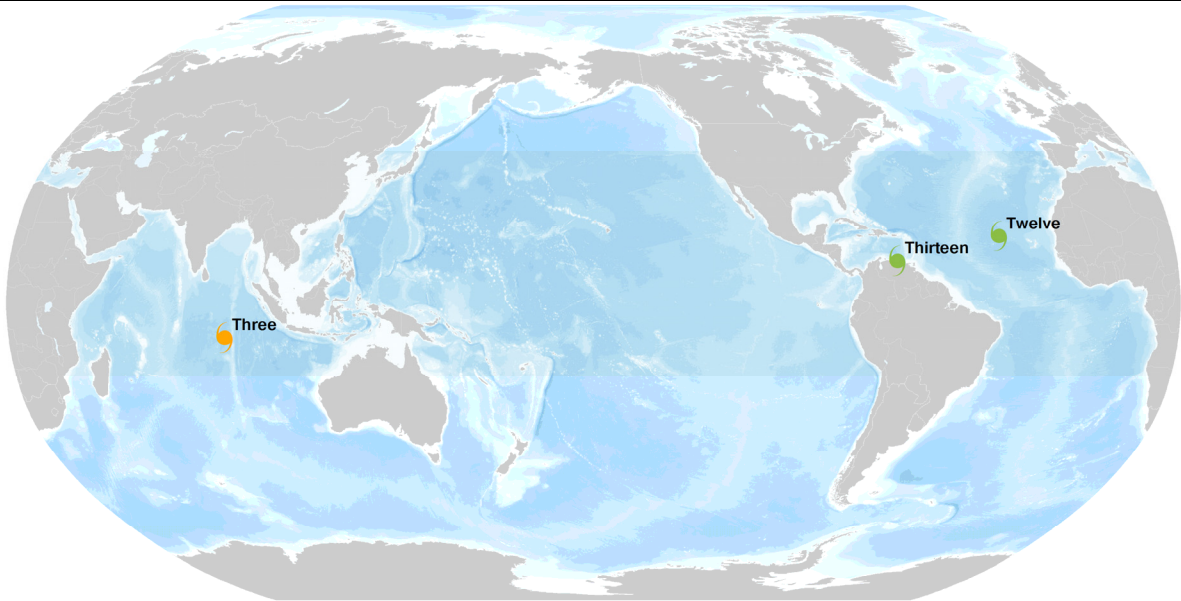
🌀 Tropical Depression   🌀 Tropical Storm   🌀 Category 1   🌀 Category 2   🌀 Category 3   🌀 Category 4   🌀 Category 5

Storm Name	Location	Winds	Location from Nearest Land Area
TD Thirteen	11.4N, 66.3W	35	75 mi (120 km) NE from Caracas, Venezuela
TD Twelve	18.1N, 33.9W	30	720 mi (1160 km) W from Praia, Cape Verde
TS Three	9.4S, 86.5E	40	1,115 mi (1795 km) SW from Padang, Indonesia

* TD: Tropical Depression, TS: Tropical Storm, HU: Hurricane, TY: Typhoon, CY: Cyclone; PTC: Potential Tropical 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): Sept 30 – Oct 6
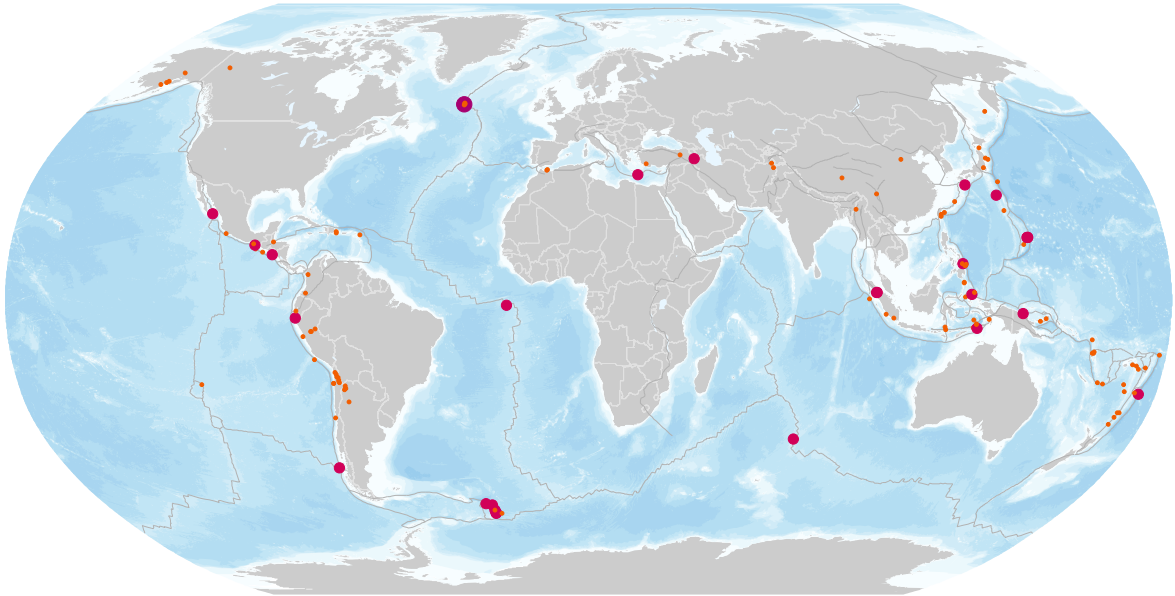
Magnitude   · 4.0 - 4.9   • 5.0 - 5.9   ● 6.0 -.6.9   ● ≥ 7.0   —— Tectonic boundary

Date (UTC)	Location	Magnitude	Epicenter
10/1/2022	53.71N, 35.54W	6.0	Reykjanes Ridge

Source: United States Geological Survey

U.S. Hazard Outlook

Day 3-7 U.S. Hazards Outlook
Valid: 10/09/2022-10/13/2022

Weather Prediction Center
Made: 10/06/2022 3PM EDT

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www.wpc.ncep.noaa.gov
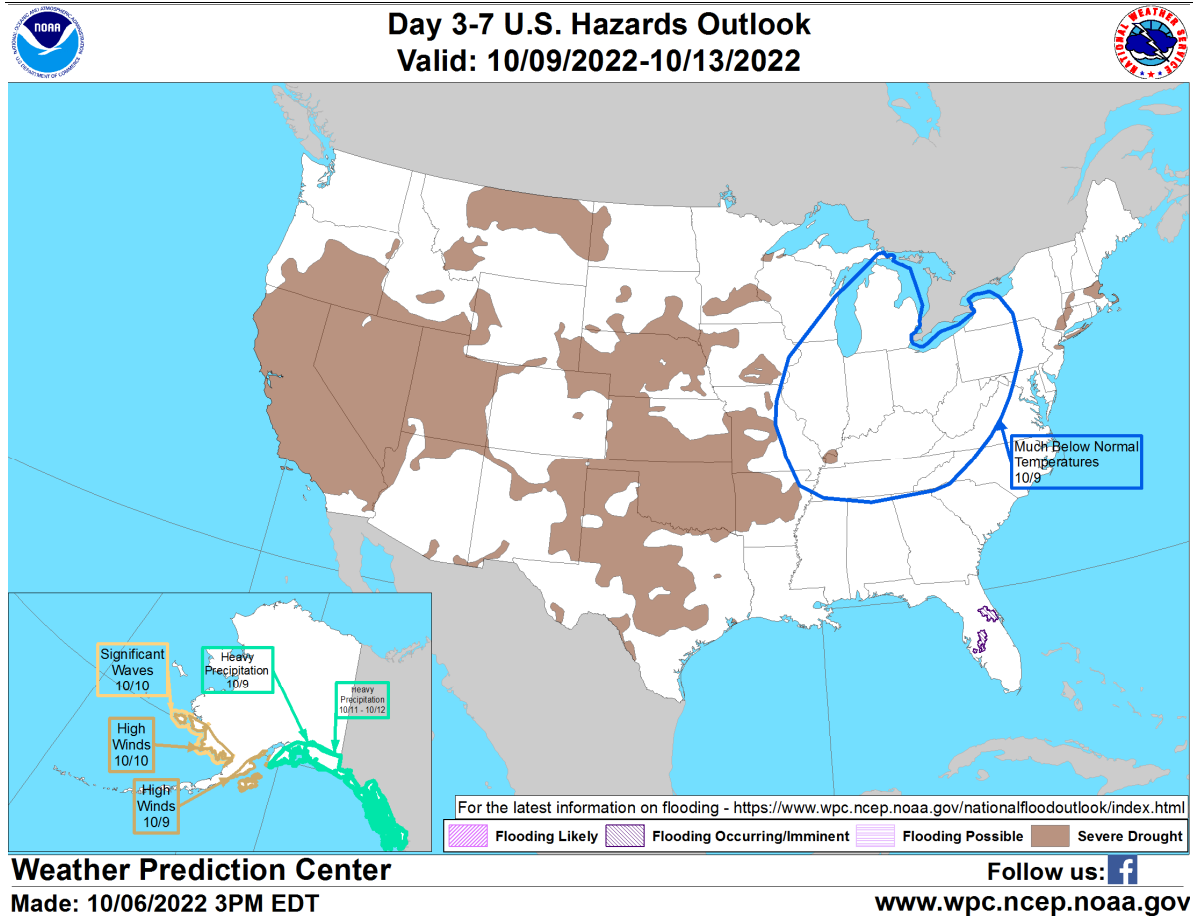
- A cold and dry Canadian airmass will generated much below normal temperatures across parts of the Plains, Midwest, Ohio Valley and Appalachians by October 9. For some, this Fall-like weather will bring the first frost of the season.

- Following the historic impacts from Hurricane Ian, flooding remains a concern across portions of the Southeast, particularly the central Florida peninsula.

Source: Weather Prediction Center (NOAA)

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

October

November

U.S Significant Fire Potential
Near Normal ■ Above Normal ■
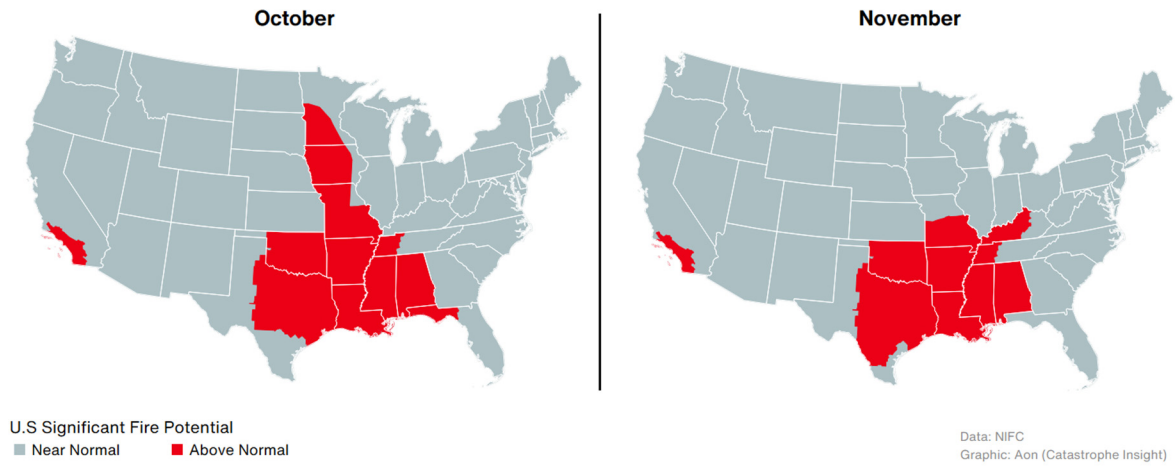
Annual YTD Wildfire Comparison: October 6

Year	Number of Fires	Acres Burned	Acres Burned Per Fire
2018	48,245	8,061,936	167.10
2019	41,587	4,391,196	105.59
2020	45,086	7,901,227	175.25
2021	47,072	6,428,559	136.57
2022	54,863	6,993,854	127.48
10-Year Average (2012-2021)	**45,837**	**6,488,528**	**141.56**

Top 5 Most Acres Burned by State: October 6

State	Number of Fires	Acres Burned	Acres Burned Per Fire
Alaska	593	3,107,189.20	5,239.78
New Mexico	721	858,995.10	1,191.39
Texas	10,251	649,993	63.41
Idaho	987	390,773.10	395.92
Oregon	1,407	341,222.40	242.52

Source: National Interagency Fire Center

U.S. Current Riverine Flood Risk
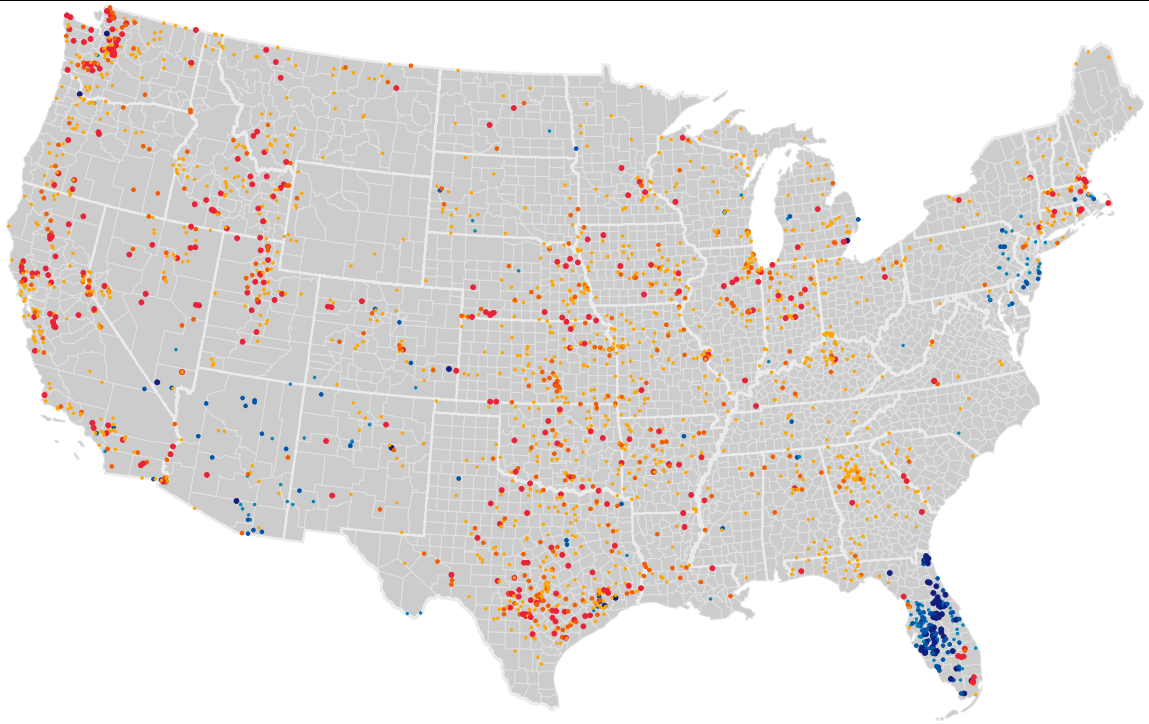
| High Flows (Percentile) | • ≥ 99 / Above floodstage
· 95 - 99
· 90 - 95 | Hydrological Drought | • Severe Drought
· Moderate Drought
· Below Normal |

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
Great Egg Harbor River at Folsom, New Jersey	5.22	98.97
Peace River at Arcadia, Florida	17.67	98.91
Maurice River at Norma, New Jersey	3.45	98.89
Peace River at US-17 at Zolfo Springs, Florida	19.92	98.89
Wekiva River near Sanford, Florida	5.96	98.86

Source: United States Geological Survey

Source Information

United States: Hurricane Ian

U.S. National Weather Service

U.S. Storm Prediction Center

Deaths from Ian pass 100; 91L looms, *Yale Climate Connections*

Frustration and desperation mount as Ian's effects linger, *AP News*

China: Drought

China's National Climate Center

Changjiang Hydrology

Drought causes water in Poyang to hit lowest level in decades, *China Daily*

Determined efforts to mitigate drought impacts in parts of southern China, *Xinhua*

Natural Catastrophes: In Brief

Comisión Federal de Electricidad - Mexico (CFE)

They report a blackout, damage to services and fallen trees in Escuinapa, *El Universal*

United States Geological Survey (USGS)

Thailand – Worst flood in years damage crops, *Agroinsurance*

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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.