

# **Weekly Cat Report**

September 8, 2023



## Executive Summary



Event	Affected Region(s)	Fatalities	Economic Loss (\$)	Page
<b>Flooding</b>	Greece, Turkey, Bulgaria	15	Billions	3
<b>Typhoon Saola</b>	Philippines, Taiwan, China	1	1.0+ billion	8
<b>Typhoon Haikui</b>	Philippines, Taiwan, China	3	10s of millions	8
<b>Flooding</b>	Spain, Algeria	10	100s of millions	11
<b>Flooding</b>	Brazil, Argentina	41	100s of millions	13
<b>SCS &amp; Flooding</b>	India	12	Unknown	15
<b>Flooding</b>	Pakistan	6	Unknown	15
<b>Heatwave</b>	United States, Europe	N/A	N/A	15
<b>Flooding</b>	Indonesia	2	Unknown	15
<b>SCS &amp; Flooding</b>	United States	0	10s of millions	15
<b>Flooding</b>	Hong Kong	0	Millions	16

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>

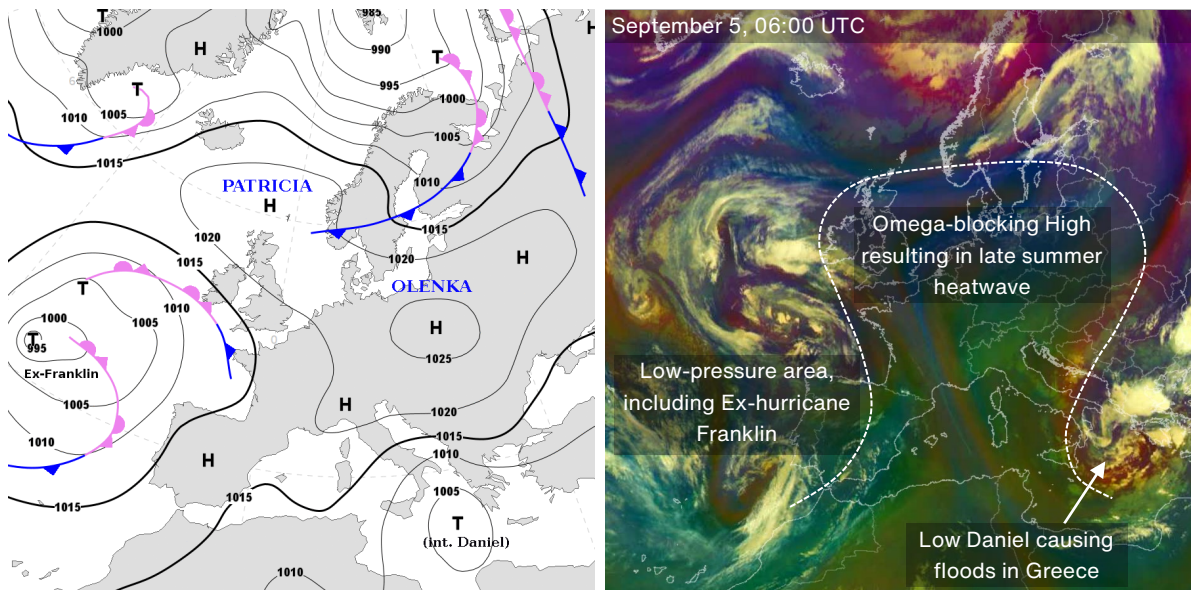
## Greece, Turkey, Bulgaria: Flooding

### Overview

A low-pressure system with an international name *Daniel* produced an extreme amount of rain in Greece on September 4-7, prompting widespread, severe flooding, particularly in Thessaly in the central parts of the country, where significant losses were reported. Damage and casualties were also reported from northwestern Turkey and eastern Bulgaria. Total aggregated economic losses can potentially reach the hundreds of millions EUR, possibly higher, as damage assessments continued.

### Meteorological Recap

Since September 4, eastern parts of the Mediterranean have been affected by a deep trough, which developed over warm seawater of the Ionian Sea, on an eastern side of the well-structured **omega-blocking high** that resulted in a prolonged period of stable, warm, and sunny weather over a large part of Western and Central Europe at the same time, while Spain and southern Balkans experienced major flooding. This deep low-pressure area located southwest of Greece was internationally named **Daniel**.

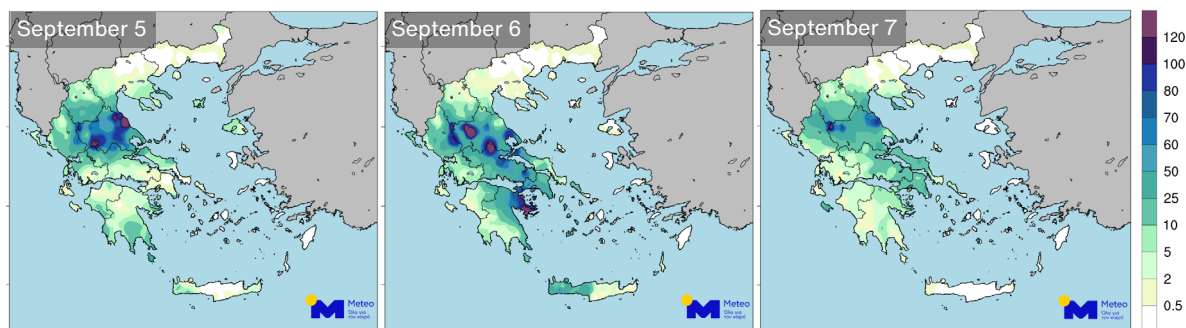


The center of the low Daniel persisted over the Ionian Sea southwest of Greece for several days, then moved slightly south-westward closer to the African coast, however, further deepening as the observed surface water temperature across the Ionian and Aegean Sea remained significantly anomalous, generally from 2 to 4°C (up to 7.2°F) warmer than usual, generating more moisture, which enhanced storms and heavy rainfall development. This weather pattern brought extreme rainfall into the region. Eastern Bulgaria and north-western Turkey experienced heavy rainfall and flooding; unprecedented incessant rain occurred across large portions of Greece. Many locations saw record-breaking daily rainfall totals, nearing the highest totals ever recorded in Europe.

Extremely intense rainfall in Greece was a result of several favorable conditions – persistent and deepening low Daniel, moist airmass over warm seawaters, high winds, and orographic effects. As a result, Greece’s Thessaly Region saw the highest event rainfall totals. According to the Greece National Meteorological Service (HNMS), the national daily precipitation record was broken as **762 mm / 30 inches** of rain and was recorded at the Portaria meteorological station. It is worth noting that daily accumulation was probably even higher at the Zagora station on this day as the station measured 760 mm / 29.9 inches just in a 15-hour period on September 5 before the station was likely disrupted by a flood wave in the evening. Zagora station saw the highest event rainfall total of **906 mm / 35.7 inches**. Rainfall data presented here are to be validated in the next few days or weeks. The table below highlights the highest daily and multi-day totals, according to the data published by HNMS as of September 8. Multiple locations across central Greece saw multi-day accumulations in the range of 400-700 mm (15.7-27.6 inches) and daily rainfall total exceeding 200 mm (7.9 inches).

Highest daily totals			Highest event totals (Sep 4-7)		
Location	Rainfall (mm)	Rainfall (in)	Location	Rainfall (mm)	Rainfall (in)
<b>Portaria</b>	<b>762</b>	<b>30.0</b>	<b>Zagora</b>	<b>906*</b>	<b>35.7</b>
Zagora	760*	29.9	Portaria	885	34.8
Volos	451	17.8	Pezoula	660	26.0
Karditsa	404	15.9	Karditsa	659	25.9
Pezoula	367	14.5	Volos	617	24.3
Kofoi	342	13.5	Kofoi	550	21.7

\* Rainfall total likely affected by station disruption

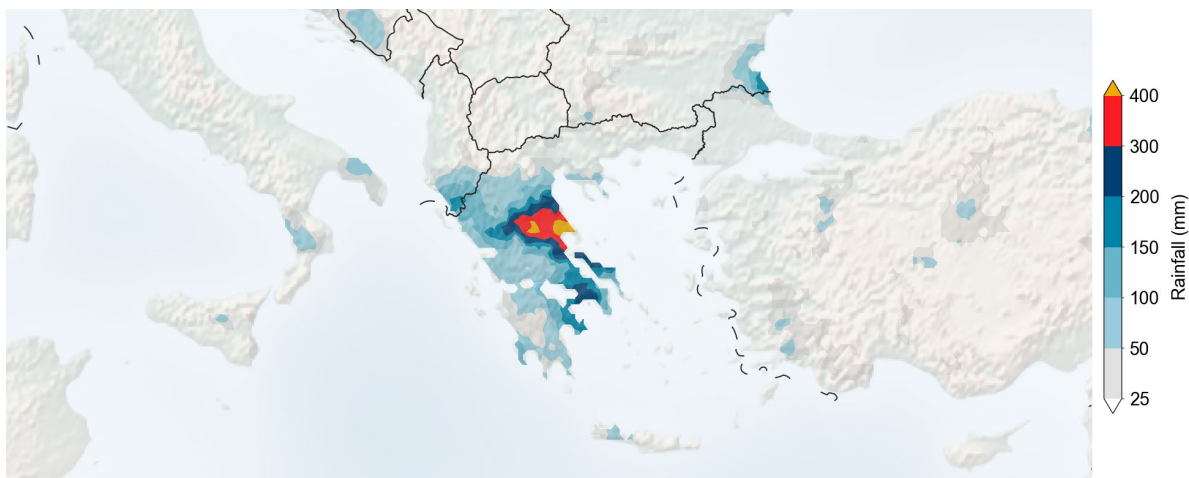


**Daily rainfall on September 5-7 (mm)**

Source: Greece National Meteorological Service

Southeastern parts of Bulgaria and parts of the European Turkey also experienced heavy rains, particularly the Tsarevo municipality in the Burgas province. Some locations reported rainfall exceeding the amount four times higher than the average monthly rainfall for the month of September.





**Satellite rainfall estimate for September 3-7 (mm)**

Data: NASA

## Historical Context

One of the most impactful Mediterranean tropical-like cyclones, named Ianos, developed in September 2020 and brought torrential rainfall into the region. In Greece, Mediane Ianos resulted in total economic damage of around \$1 billion / €930 million (2023 inflated). According to the event report presented by Zekkos et al. in 2020, recent rainfall generated by low Daniel was significantly higher. The table below shows rainfall data from selected meteorological stations, which recorded the highest rainfall totals in 2020. This year, the most exposed stations saw three times more rain, along with a larger area inundated.

Medicane Ianos, Sep 17-19, 2020			Storm Daniel, Sep 4-6, 2023	
Location	3-day total (mm)	3-day total (in)	3-day total (mm)	3-day total (in)
Pertouli	317	12.5	367	14.4
Mouzaki	274	10.8	410	16.1
Ithaki	228	9.0	6	0.2
Karpenisi	224	8.8	52	2.0
Karditsa	213	8.4	632	24.9

Medicane Ianos from 2020 also ranked among the costliest natural disaster events ever recorded in Greece:

Date	Event Name	Economic Loss (\$ bn)	Economic Loss (\$ bn 2023)
September 7, 1999	Athens Earthquake	4.2	7.6
August 24-30, 2007	Wildfires	2.9	4.2
September 17-19, 2020	Medicane Ianos	1.0	1.2

## Event Details

Since September 4, **Greece** has been severely affected by one of the worst natural catastrophes that hit the country in the modern era. The wildfire threat from recent weeks was replaced by historic flooding. As of September 7, fire brigades from various regions of the country received 4,870 emergency calls, most of the calls were intervened in Thessaly Region, including the regional units of Magnesia, Karditsa, Trikala, Skiathos, and the coastal zone of Larissa that were the hardest hit. Volos Municipality was also badly affected by severe flooding, which caused significant infrastructural damage. Dozens of calls were also reported in the regions of Central Greece, Central Macedonia, and Peloponnese.

Further losses will be incurred from the agricultural sector as more than 66,000 ha (163,000 acres) of arable land was flooded, according to the latest Copernicus Rapid Mapping damage assessment.

As of this writing, at least four people died in Volos, Pelion, Karditsa, and Domokos, while two people are still missing.



**Flooding in Thessaly Region – Aerial footage of suburbs of Trikala (left), infrastructure damage near Volos (right)**

Source: Meteo.gr



**Initial estimation of the flooding footprint by the Rapid Mapping System**

Source: Copernicus

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In north-western **Turkey**, 7 people died in Kırklareli Province (5) and in the country's capital Istanbul (2), several others remained missing. Additional four deaths and missing persons were reported in Burgas Province, eastern **Bulgaria**. The most affected area was in the municipality of Tsarevo and its surroundings.

### **Financial Loss**

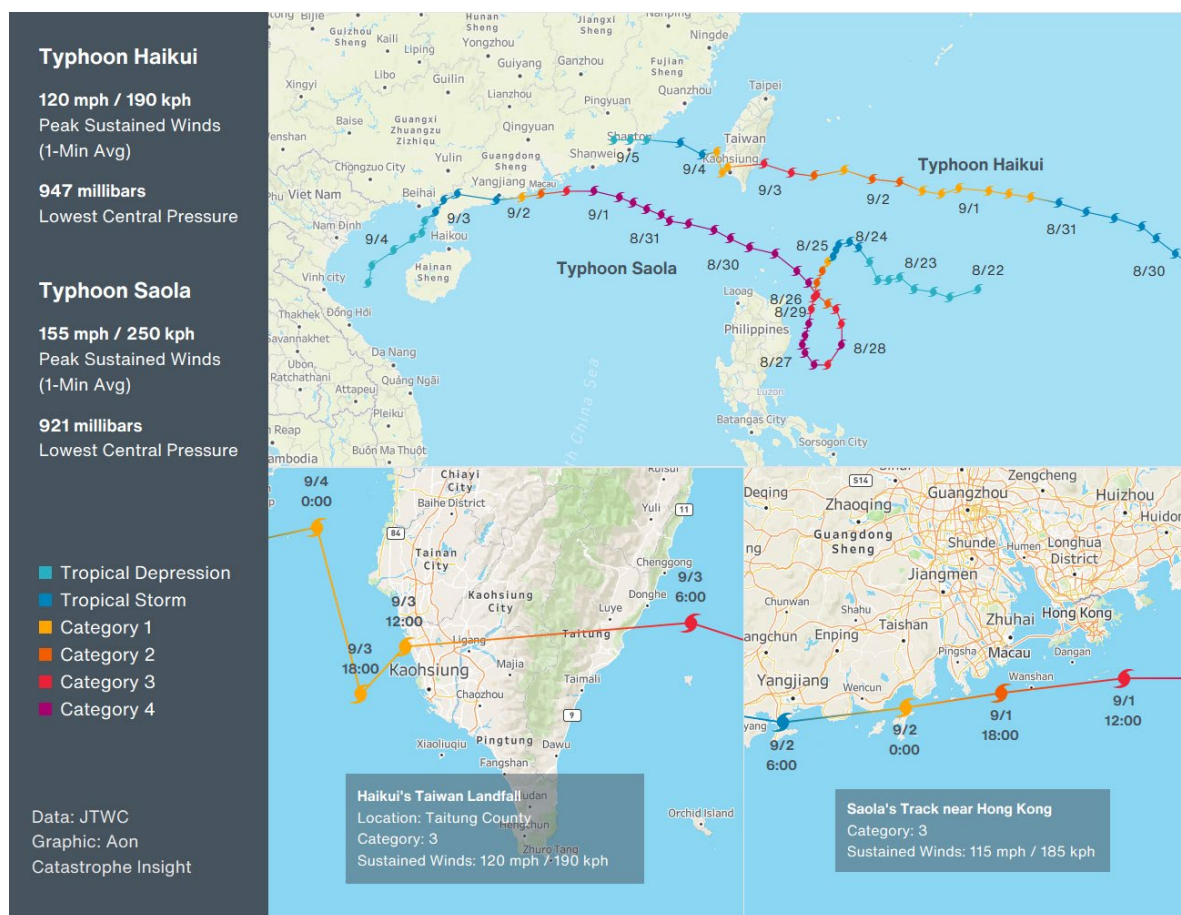
Given the ongoing nature of the event and extensive damage caused over a large area, it was too early to determine the estimated economic impact on the national economy of Greece. However, initial assessments from the area suggest significant impact on property, infrastructure and agriculture, that will likely run to at least hundreds of millions of EUR. Insured losses will be notably lower due to relatively low insurance penetration.

## Philippines, Taiwan, China: Typhoons Saola & Haikui

### Overview

*Typhoons Saola and Haikui, equivalents to Category 3+ storms on the Saffir-Simpson scale, consecutively impacted the northern Philippines, Taiwan, and coastal provinces of China, including Hong Kong. The storms prompted evacuations of millions of people across densely populated regions, resulted in notable material damage, killed at least two people, and injured dozens of others. Aggregated economic losses resulting from both storms can reach hundreds of millions of USD.*

### Meteorological Recap



### Typhoon Saola / Goring

Following the impact in the Philippines and Taiwan between September 26-31 (see previous Weekly Cat Report), a Category 4 storm Saola (named Goring by PAGASA) continued to track over northern South China Sea towards eastern China's coast, threatening densely populated provinces of Guangdong and Fujian, as well as Hong Kong.

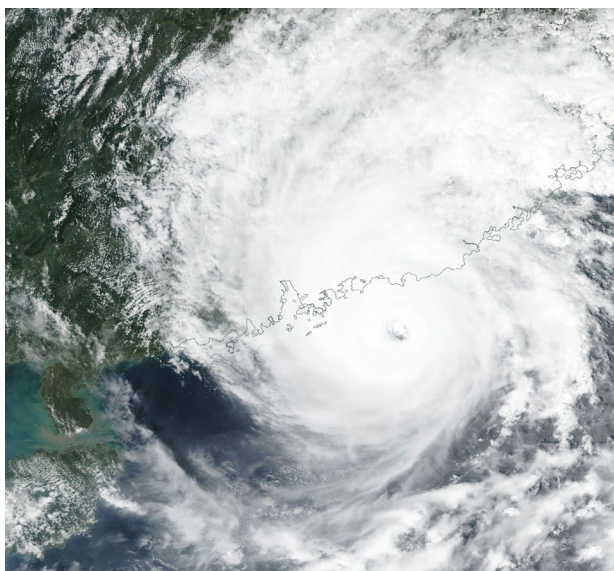


On September 1, the Hong Kong Observatory (HKO) issued **Hurricane Signal No. 10**, the highest level of tropical cyclone warning signals in Hong Kong and the first No. 10 alert since September 2018 when Hong Kong was hit by deadly Typhoon Mangkhut.

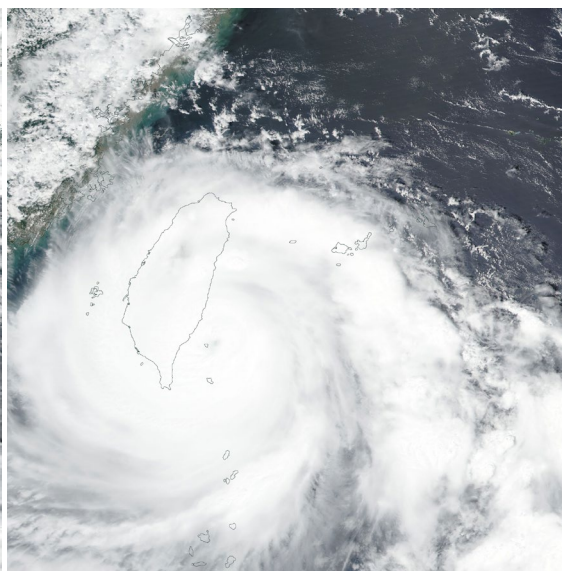
Saola passed south of Hong Kong and Macau as an equivalent to a Category 3 storm, bringing heavy rains, storm surge, and sustained winds of up to 185 kph / 115 mph. Saola then weakened, made landfall, and moved further inland in Guangdong Province, where localized heavy rainfall in excess of 100 mm / 3.9 inches was reported. The storm dissipated on September 5 over the Gulf of Tonkin.

### *Typhoon Haikui / Hanna*

While Typhoon Saola was affecting the Philippines, a new low-pressure area developed into a tropical depression on August 28 and was named Haikui by JMA, or Hanna by PAGASA. Haikui tracked westward over the Philippines Sea, peaking as a Category 3 typhoon on September 3. The same day, Haikui made landfall over Taitung County, south-eastern Taiwan, becoming the first Category 3+ storm to hit the island since Typhoon Megi in 2016. On September 4, Haikui made landfall near Dongshan as a tropical depression, producing heavy rainfall of more than 300 mm / 11.8 inches locally in China's Fujian Province. Maximum total rainfall reached **549 mm / 26.1 inches** in Gaishan Town near the provincial capital Fuzhou. The cumulative rainfall broke 3-hour, 6-hour, 12-hour, and daily records in Fuzhou. A storm further weakened inland and dissipated on September 6.



**Typhoon Saola approaching China's coast on Sep 1**  
Source: NASA, Worldview



**Typhoon Haikui approaching Taiwan on Sep 3**  
Source: NASA, Worldview

### **Event Details**

Both storms threatened densely populated regions. The passage of Saola prompted the highest possible warnings in **Hong Kong**, and it eventually resulted in notable damage, initially estimated in the hundreds of millions of USD. Local transport services were interrupted, and hundreds of flights were canceled due to the storm. At least 86 people were injured in storm-related incidents.

**In China**, Saola prompted evacuations of about 880,000 people in the Provinces of Guangdong and Fujian. Additionally, more than 290,000 displaced people were reported in Fujian Province due to typhoon Haikui. Fuzhou City was one of the hardest impacted. In Fujian Province alone, extreme rainfall and severe flooding cut powerlines, damaged more than 2,500 houses, and inundated nearly 10,000 hectares (24,700 acres) of crops, resulting in a direct economic loss of more than ¥5.05 billion (\$690 million), according to the authorities. As of this writing, 2 people were reported to be killed.

Both typhoons left substantial damage and casualties in the **Philippines**, where disaster authorities (NDRRMC) reported more than 900,000 affected people across 8 regions, two fatalities (one related to Saola / Goring and one related to Haikui / Hanna), three injured and two missing as of September 7. The storms caused notable damage to local infrastructure, more than 7,800 houses, and over 46,000 hectares of crops (113,700 acres). Current economic losses on infrastructure and agriculture are estimated to be around PHP1.9 billion (\$33 million).

While Typhoon Saola caused relatively minor damage in **Taiwan**, the island suffered a direct hit by a Category 3-equivalent typhoon Haikui. The latter resulted in no fewer than 80 injuries, forced about 7,000 people to leave their homes, and caused power outages to more than 160,000 customers. Agricultural losses alone were estimated by the authorities at TWD878 million (\$27 million).

### **Financial Loss**

Both storms were expected to result in notable economic and insured losses, having impacted densely populated areas of China, Taiwan, and the Philippines. Preliminary estimates suggested total aggregated impacts in the hundreds of millions USD, possibly higher.

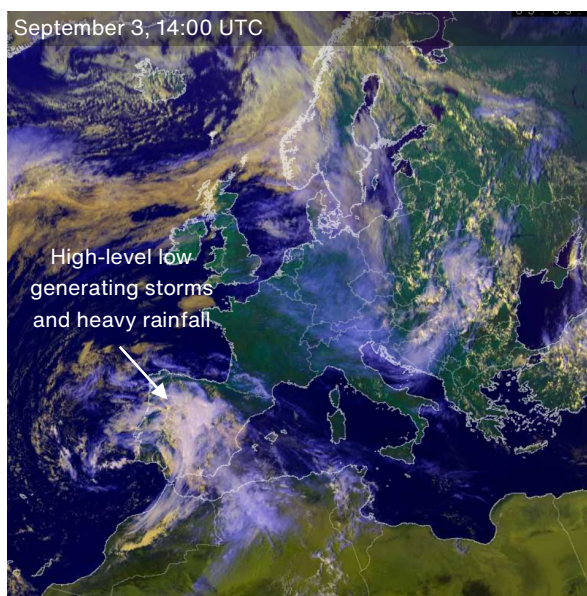
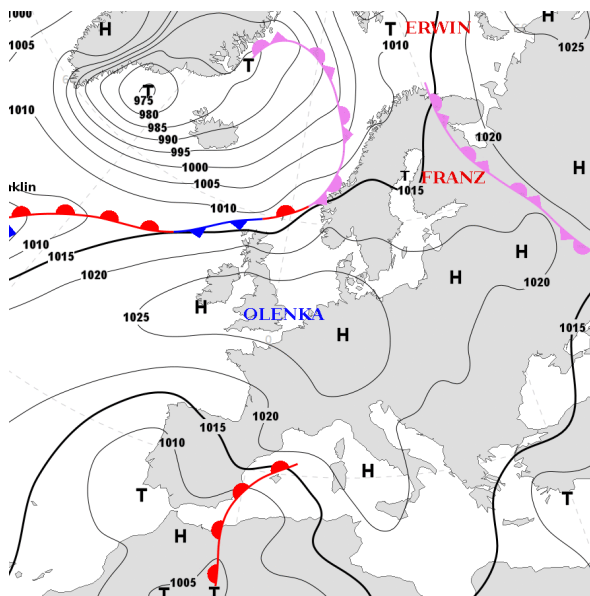
## Spain, Algeria: Flooding

### Overview

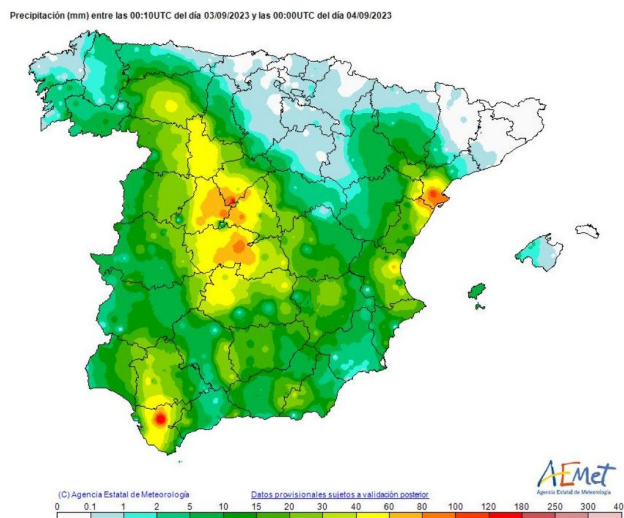
A cut-off low-pressure area brought heavy rainfall that triggered deadly flooding in Spain and Algeria on September 2-3. The flooding resulted in significant property, infrastructural, and motor damage, along with dozens of fatalities and injuries across both countries. Total economic losses can potentially reach hundreds of millions of EUR.

### Meteorological Recap

**Persistent isolated high-level low**, known as DANA from Spanish *Depresión Aislada en Niveles Altos*, generated heavy rainfall across Spain, particularly in central parts of the country. Several locations recorded daily rainfall accumulations of more than 100 mm / 3.9 inches on September 3. Event rainfall totals exceeded 200 mm / 7.9 inches of rain locally. Some meteorological stations saw extreme rainfall amounts of more than 90 mm / 3.5 inches just in 1-hour period. The highest daily rainfall totals from September 3 reported by the State Meteorological Agency (AEMET) are listed in the table below. The same low-pressure system generated heavy rainfall that triggered deadly flash flooding in north-western portions of Algeria.



Location	Rainfall total (mm)
San José del Valle	172.2 (6.78 in)
San Rafael	147.8 (5.82 in)
Estación de Tortosa	117.2 (4.61 in)
Villanueva de la Cañada	104.9 (4.13 in)
Cebreros	96.0 (3.78 in)



## Event Details

Torrential rainfall triggered severe flash flooding, which resulted in notable material damage across **Spain** between September 2-3. Regions of Catalonia, Valencia, Andalusia, Castile and León, Castilla-La Mancha, and Madrid were amongst of hardest hit by flooding. Emergency services responded to nearly 1,900 severe weather-related calls in Castilla-La Mancha alone during this rainy period, nearly 1,500 incidents were reported across Madrid Region. Flooding caused significant infrastructural damage, flooded thousands of homes, and swept dozens of vehicles away. As of this writing, three people were killed and three others remain missing, according to the authorities.



**Flood-related motor damage**  
Source: Madrid Emergency Service

The low-pressure system also brought deadly flash flooding to north-western **Algeria** on September 2-3, claiming at least 7 lives in the Provinces of Tlemcen (4) and El Bayadh (3). Several people remain missing and at least 218 suffered injuries.

## Financial Loss

Flooding in Spain was expected to result in notable economic and insured losses. As of September 7, the public insurance consortium expected approximately 10,500 claims related to the event, with total loss estimated at €60-70 million (\$64-75 million). Damage to various sectors in both Spain and Algeria will likely drive the total aggregated economic impact into the hundreds of millions of EUR.

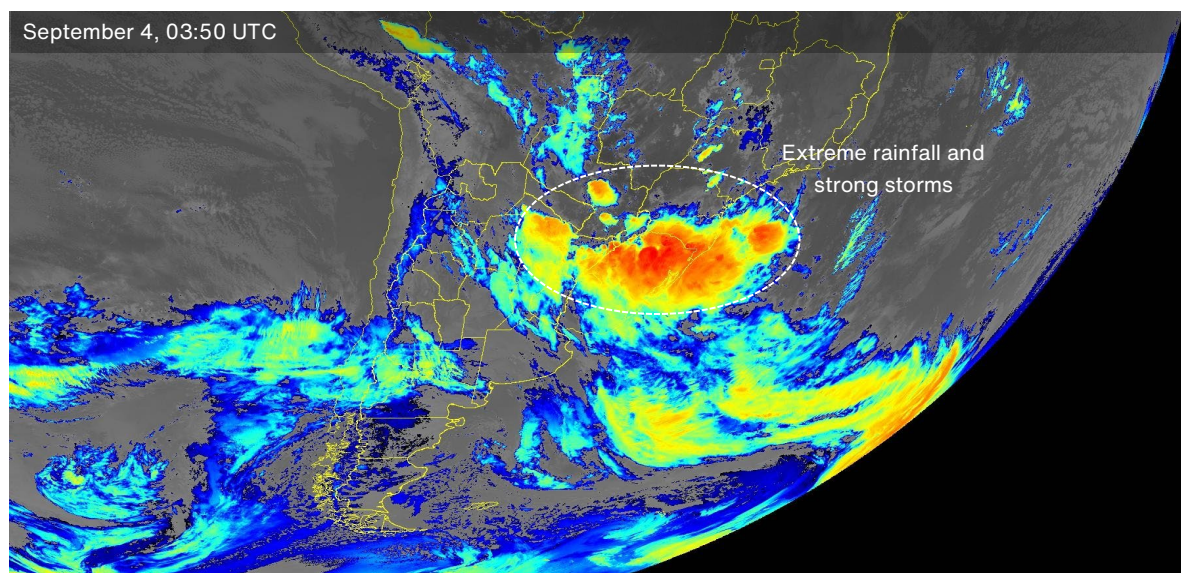


## Brazil, Argentina: Flooding

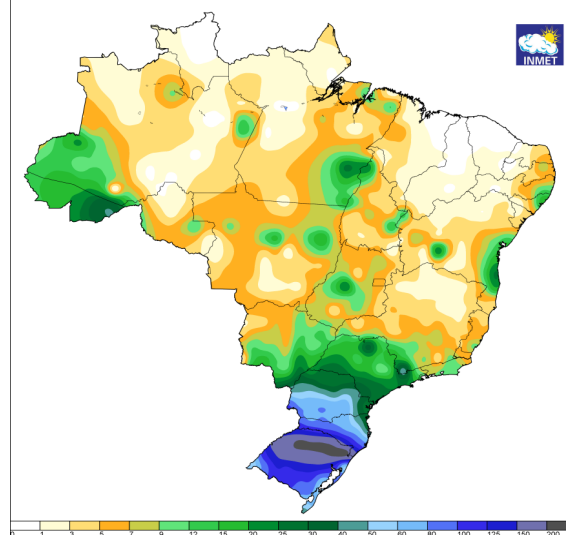
### Overview

Several consecutive days of heavy rainfall affected much of southern Brazil and northeastern Argentina between September 1-5. Devastating flooding and landslides caused widespread destruction, especially in the Brazilian State of Rio Grande do Sul. As of September 7, 41 people have been killed while over 3,000 people have been rescued. Total economic losses could reach hundreds of millions of USD.

### Meteorological Recap



A channel of hot, humid air adjacent to a low-pressure system brought heavy rainfall to much of southern Brazil and northeastern Argentina on September 1-4. The slow progression of this system over these two countries meant several regions saw widespread flooding and landslides across multiple days. In Argentina, the heaviest precipitation fell over the Misiones, Formosa, and Corrientes provinces. Notably, the city of Ituzaingo received more than 366 mm (14.41 inches) during this 4-day period, which broke its monthly rainfall record according to the National Meteorological Service (SMN). The states of Rio Grande do Sul, Santa Catarina, and Parana in Brazil also saw heavy rain.



Rainfall totals on September 2-6 in Brazil

Source: INMET

Then, as the low-pressure system moved into the Atlantic Ocean on September 4, convection further intensified and produced more extreme rainfall, particularly in Rio Grande do Sul. This prompted Brazil's National Institute of Meteorology (INMET) to issue its highest rainfall warning for northern Rio Grande do Sul. Then, on September 4-5, parts of the state received more than 200 mm (7.87 inches) of rain which triggered additional flooding and landslides. Passo Fundo, Cruz Alta, and Serafina Correa all broke 24-hour rainfall records on September 4. In fact, Passo Fundo and Cruz Alta both received over 160 mm of rain, which broke records set over a century ago.

Below are September 1-5 rainfall totals from various municipalities in Rio Grande do Sul:

Location	Rainfall total (inches)	Rainfall total (mm)
Passo Fundo	11.72	297.8
Cruz Alta	11.49	291.8
Serafina Correa	11.42	290.0
Ibiruba	9.98	253.6
Sao Luiz Gonzaga	9.65	245.2
Cambara do Sul	9.34	237.2
Vacaria	8.69	220.6
Palmeira Das Missoes	8.06	204.8
Bento Goncalves	8.02	203.8
Santiago	7.76	197.0

### Event Details

In **Argentina**, more than 6,000 people across Misiones, including many from the Municipality of Posadas, were affected by flooding. In Corrientes province, particularly near the towns of Gobernador Virasoro and Ituzaingo, more than 40 people were evacuated due to flood waters.

In **Brazil**, the state of Rio Grande do Sul has been, by far, the most affected by flooding – with claims that this recent cyclone is the state's worst-ever weather disaster. Multiple rivers, especially the Taquari and Cai rivers, overflowed their banks due to the extreme rainfall. As a result, many nearby towns were heavily flooded, including Mucum, Lajeado, and Roca Sales.

As of late September 7, flooding and landslides have affected 83 municipalities, affected around 123,000 people, injured 43 people, and caused 41 deaths. 15 of those fatalities were recorded in Mucum alone as 85% of the town's structures were inundated. According to preliminary government surveys, 3,037 people have been rescued while 25 remain missing. The widespread flooding has also damaged 2,300 homes, partially or completely blocked 16 highways, and caused 2 bridges to fully collapse. Due to the devastation across Rio Grande do Sul, a state of emergency is in effect and parades for Brazilian Independence Day on September 7 were suspended.

### Financial Loss

Given the large number of inundated homes and significant infrastructure damage in Brazil, losses may reach the hundreds of millions USD. Losses may further increase as more heavy rain is forecasted over Rio Grande do Sul in the near future.

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## Natural Catastrophes: In Brief

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### **SCS & Flooding (India)**

A series of thunderstorms and heavy monsoon rain showers since September 2 has caused at least 12 fatalities and 14 injured people in several districts of Odisha State in eastern India. Casualties were reported from the districts of Khurda, Balangir, Angul, Boudh, Dhenkanal, Gajapati, Jagatsinghpur, and Puri. Additionally, 246 people have been evacuated while 212 homes have been damaged by flooding.

### **Flooding (Pakistan)**

Since September 1, more monsoon rainfall has continued to affect much of Pakistan, especially the Punjab, Sindh, and Balochistan provinces. The recent flooding has killed 6 people, injured 101 people, and killed over 8,000 livestock. An additional 17,900 homes, 7,000 shelters, 15 roads, and 44 schools have also been damaged by flood waters.

### **Heatwave (United States & Europe)**

An unusual, late-season heatwave affected much of the United States since the start of September. Over 200 million people were under heat alerts in the Northern Plains, Midwest, and Mid-Atlantic during the Labor Day holiday weekend. Temperatures 15-20 °F (8-11 °C) above normal were seen in many major population centers such as Minneapolis, Chicago, Washington D.C., Philadelphia, and Raleigh. Late-summer heatwave conditions also ensued in Europe due to the large omega blocking pattern, with temperatures rising to up to 38 °C (100.4 °F) in some countries.

### **Flooding (Indonesia)**

Heavy rainfall and flooding have impacted Sumatra Island since August 30. Across the North Sumatra Province, 2 people have died and over 1,000 people have been evacuated. Around 2,900 houses have been damaged in Gunung Sitoli City alone in North Sumatra. Heavy flooding has also damaged around 300 homes in the North Maluku Province and around 168 homes in the Aceh Province.

### **SCS & Flooding (United States)**

Persistent monsoon moisture helped spark severe thunderstorms and localized flooding in the Southwest and Western U.S. on August 31-September 3. Strong storms near Phoenix, Arizona on August 31 triggered a large dust storm, knocked out power for 30,000 people, and caused minor property damage. Then, between 0.5-1 inch (12.7-25.4 mm) of rain fell over many arid regions in the western U.S. on September 1-3. Notably, the resulting muddy terrain trapped nearly 80,000 people for multiple days at the annual Burning Man Festival in Black Rock Desert, Nevada. The lone death at the festival is not believed to be weather-related.

## **Flooding (Hong Kong)**

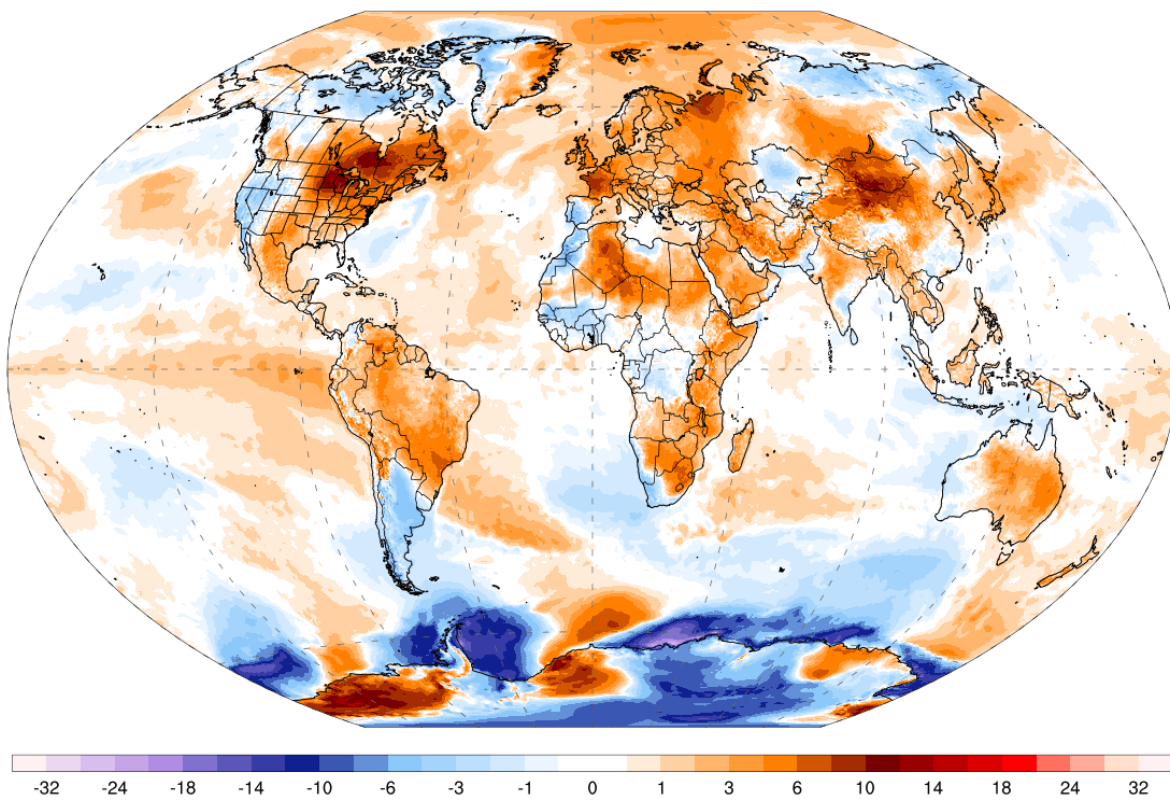
Flash flooding paralyzed Hong Kong on September 8 after the heaviest rainfall since 1884. The city saw 158 mm / 6.2 inches of rain in just one hour, daily totals were close to 500 mm / 19.7 inches. Flash flooding inundated metro stations, and caused widespread traffic disruption. A large number of vehicles remained flooded in the streets. According to the local hospital authority, 119 people suffered injuries.



## Global Temperature Anomaly Forecast

GFS 2m T Anomaly (°C) [CFSR 1979-2000 baseline]  
Days 1-3 Avg | Sun, Sep 03, 2023

ClimateReanalyzer.org  
Climate Change Institute | University of Maine

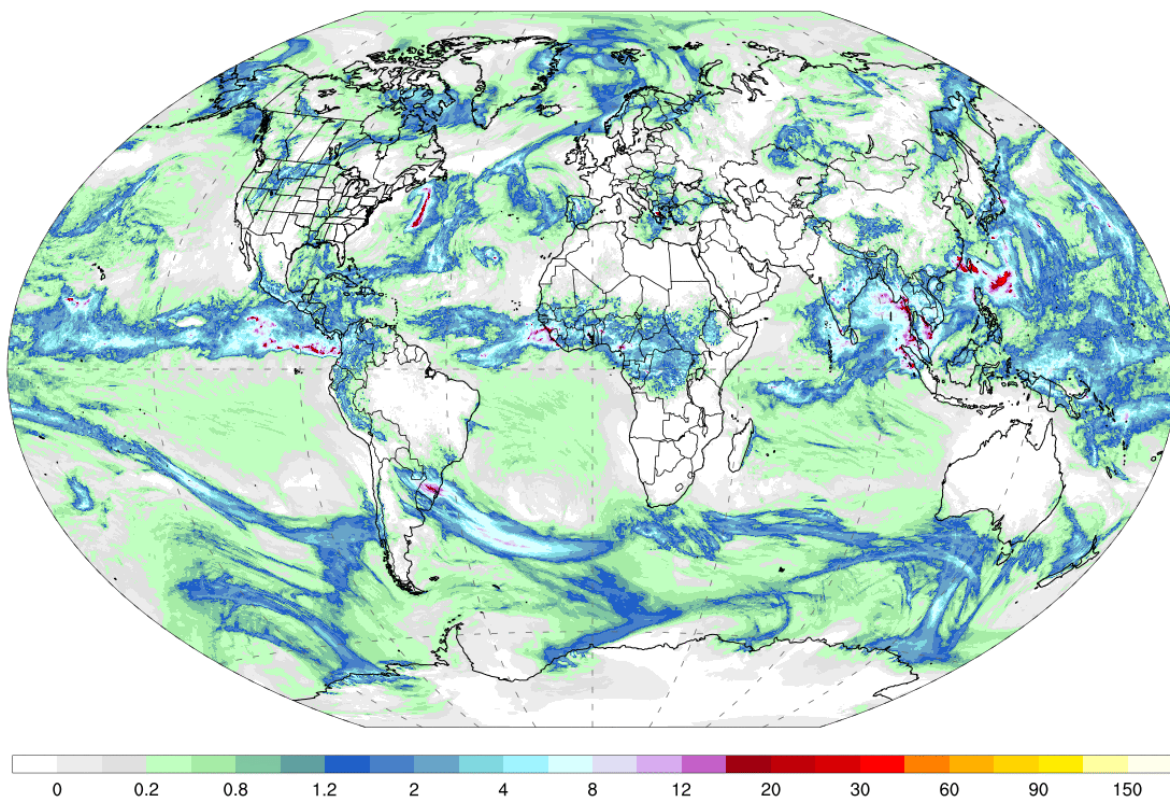


Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

## Global Precipitation Forecast

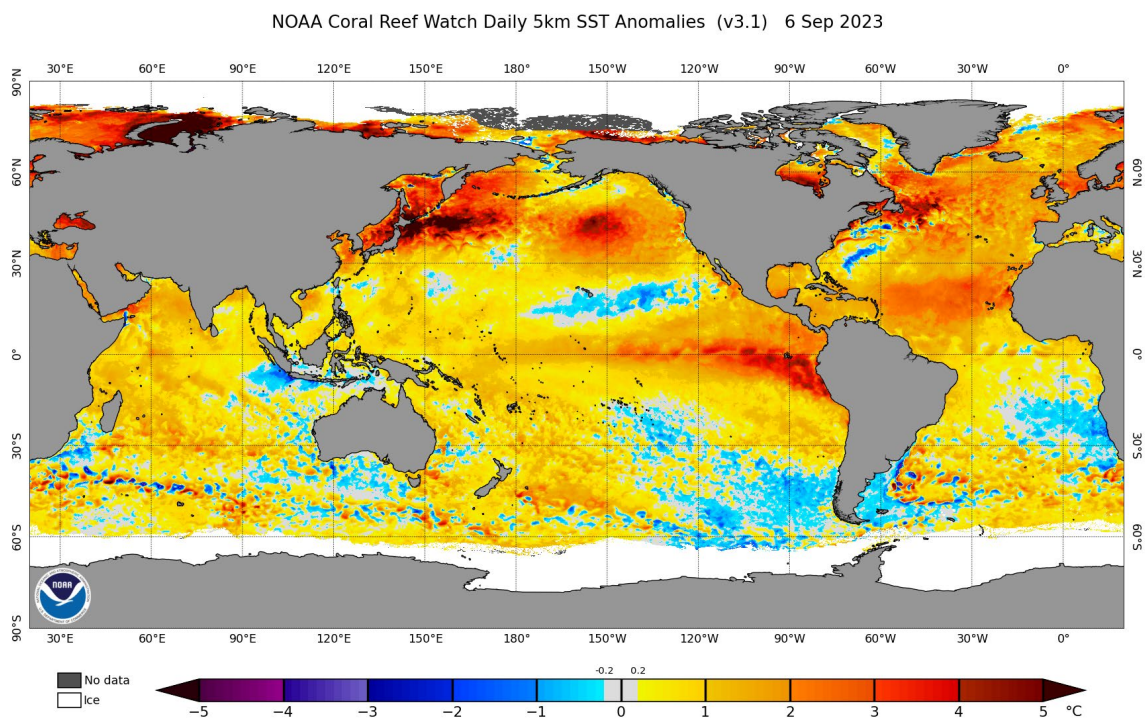
GFS Accumulated Precipitation (cm)  
Days 1-3 Total | Sun, Sep 03, 2023

ClimateReanalyzer.org  
Climate Change Institute | University of Maine

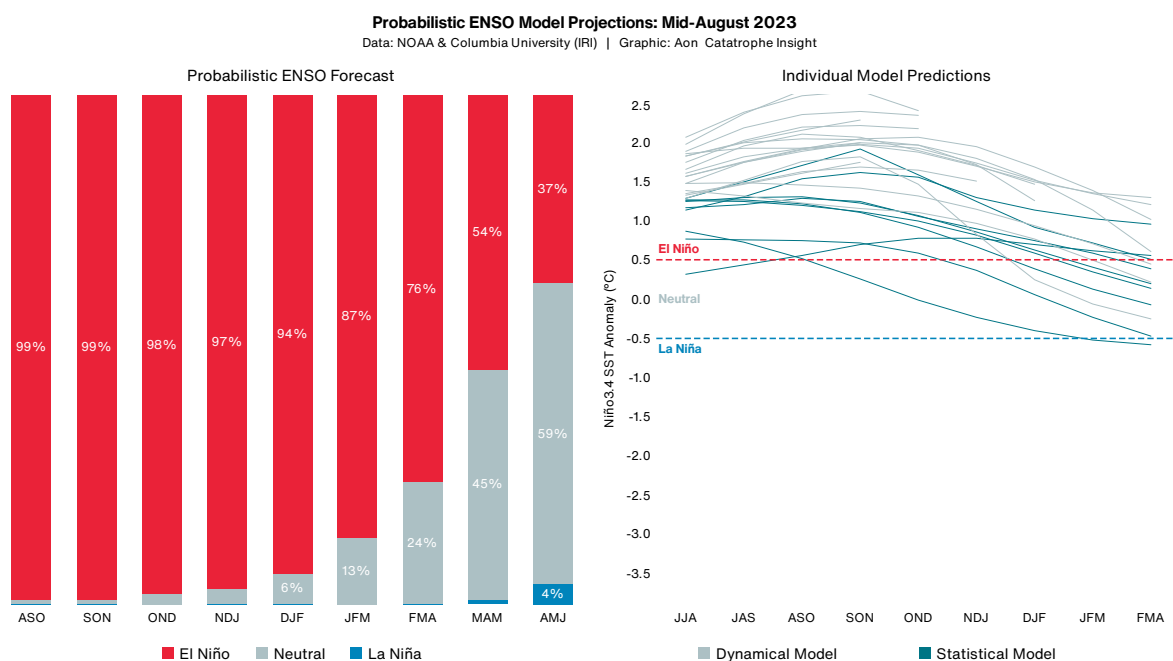


Source: Climate Reanalyzer, Climate Change Institute, University of Maine, USA

## 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.

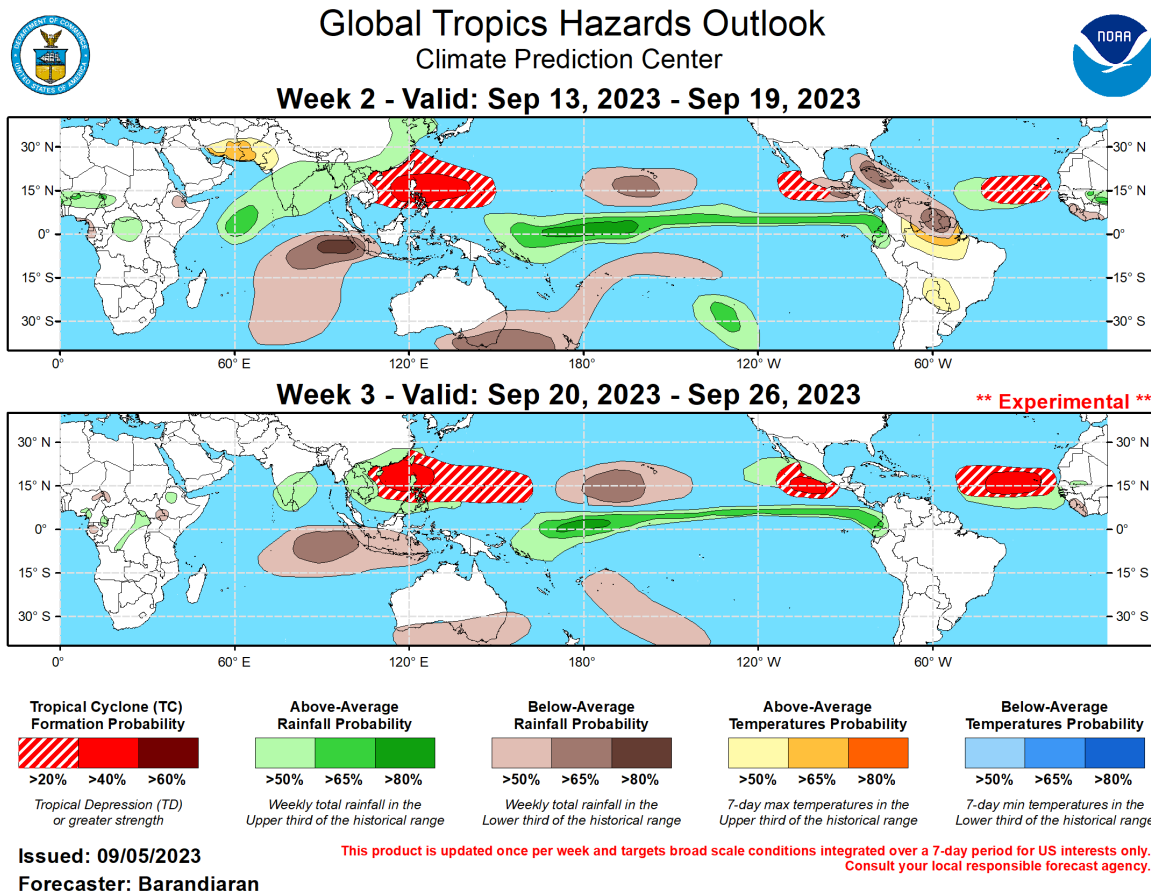
**La Niña:** Cool phase of an ENSO cycle. Sea surface temperatures of -0.5°C occur across the east-central equatorial Pacific.

**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).

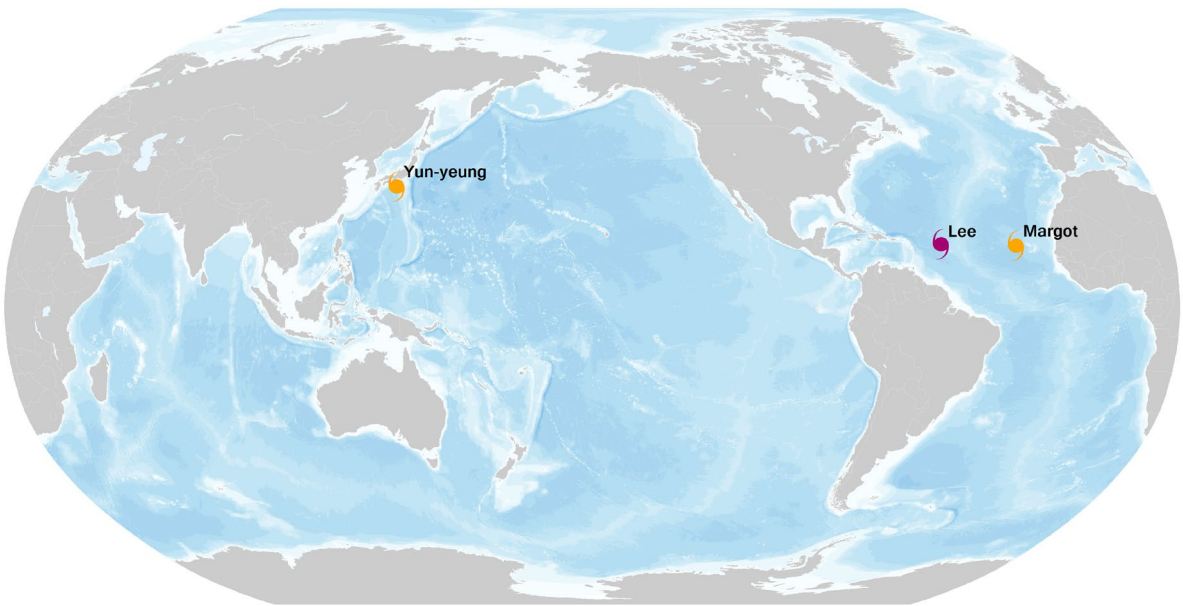


## Global Tropics Outlook



Source: Climate Prediction Center (NOAA)

# Current Tropical Cyclone Activity



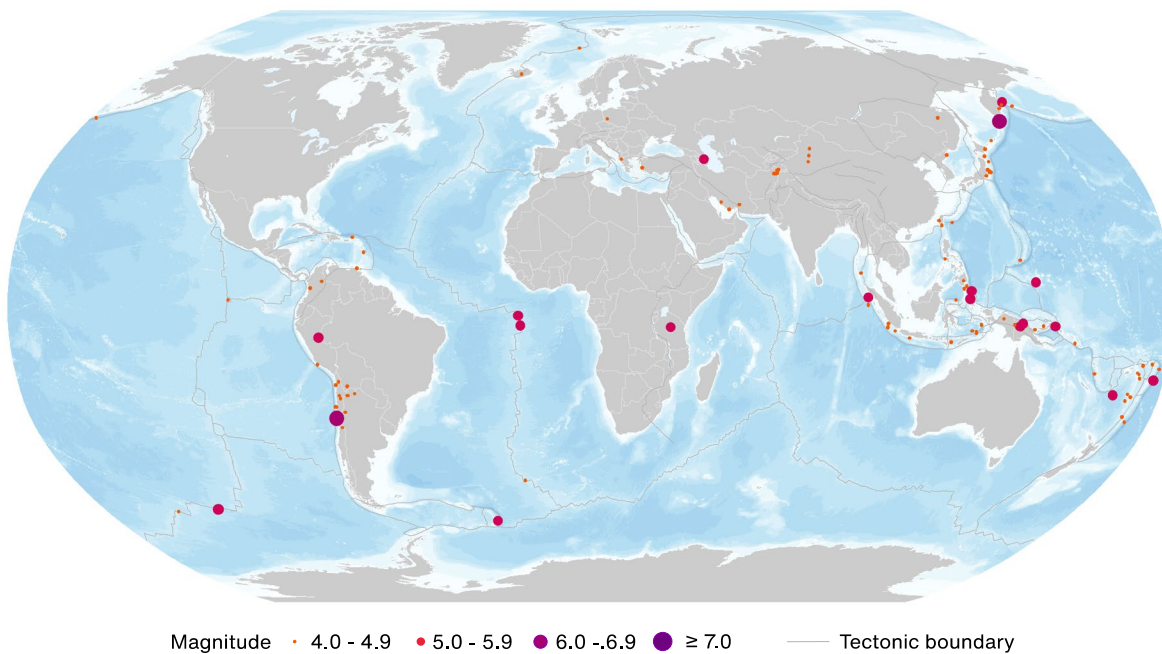
🌀 Tropical Depression 🌀 Tropical Storm 🌀 Category 1 🌀 Category 2 🌀 Category 3 🌀 Category 4 🌀 Category 5

Name	Location	Winds	Center
TS Margot	16.6N, 28.6W	40	355 miles (575 km) W from Praia, Cape Verde
HU Lee	17.0N, 51.8W	155	585 miles (945 km) NE from Bridgetown, Barbados
TS Yun-yeung	32.6N, 137.1E	45	175 miles (285 km) SE from Osaka, 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)

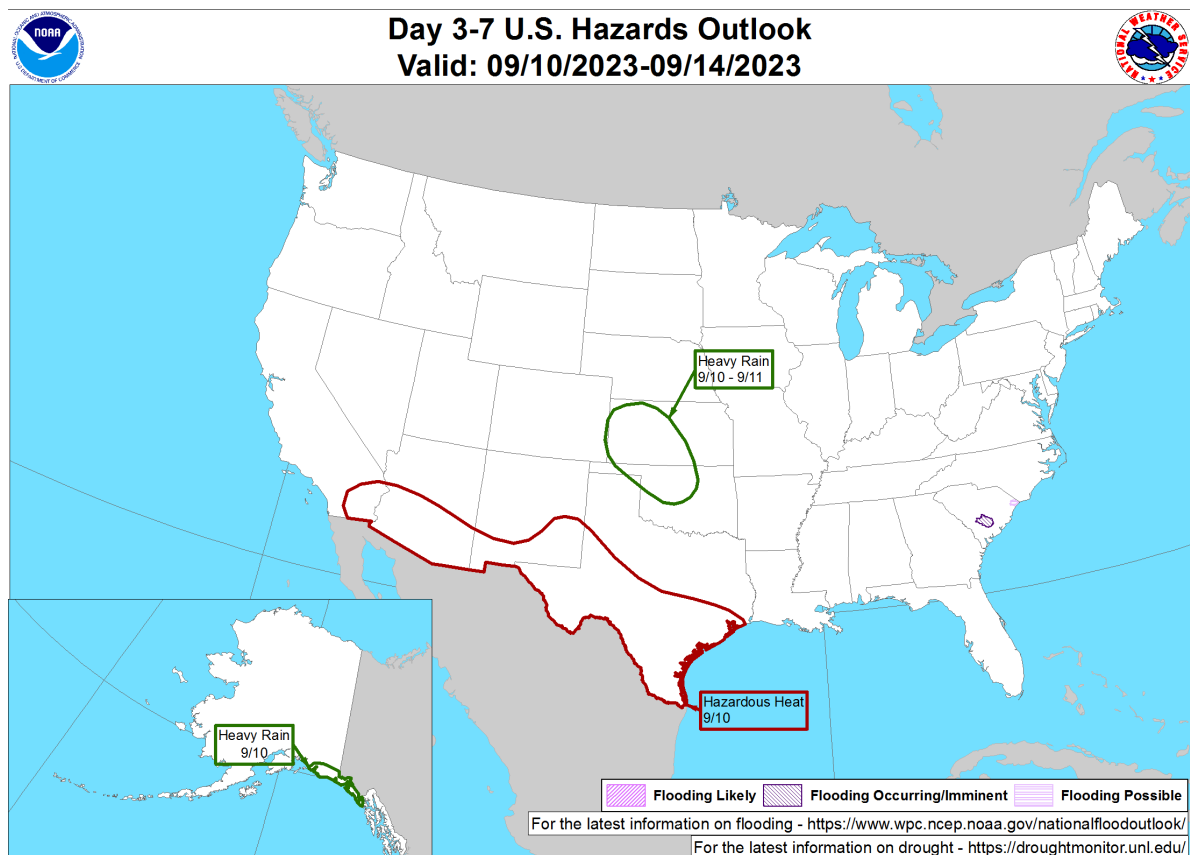
## Global Earthquake Activity ( $\geq M4.0$ ): September 1-7



Source: United States Geological Survey

Date (UTC)	Location	Mag	Epicenter
9/1/2023	50.70N, 156.27E	6.1	10 km (6 miles) ENE of Severo-Kurilsk, Russia
9/6/2023	30.28S, 71.54W	6.2	Near the coast of Coquimbo, Chile

## U.S. Hazard Outlook



**Weather Prediction Center**

Made: 09/07/2023 03:26 PM EDT

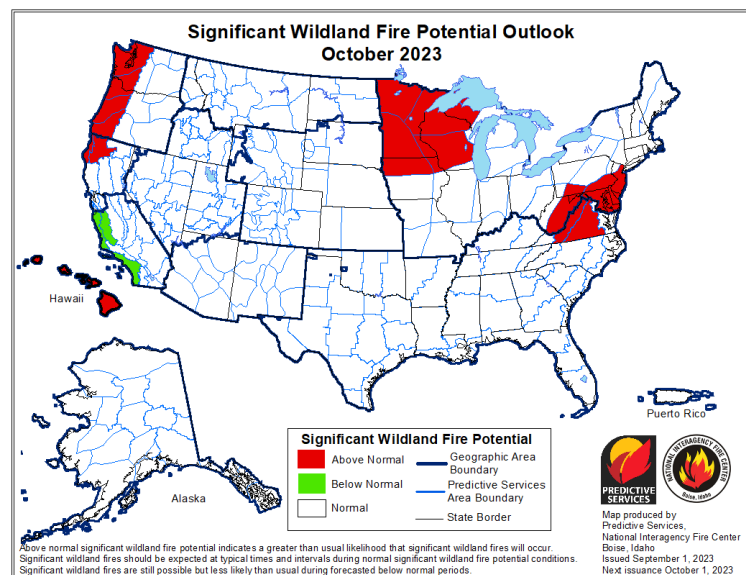
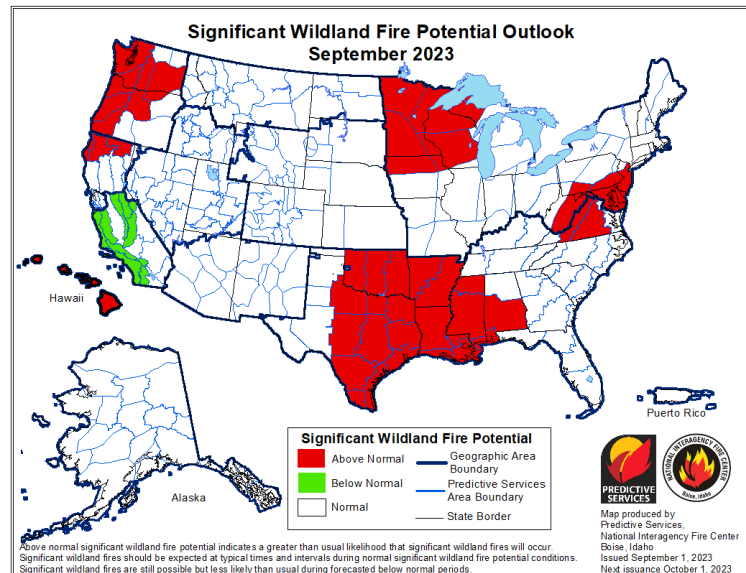
Source: Climate Prediction Center (NOAA)

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[www.wpc.ncep.noaa.gov](https://www.wpc.ncep.noaa.gov)

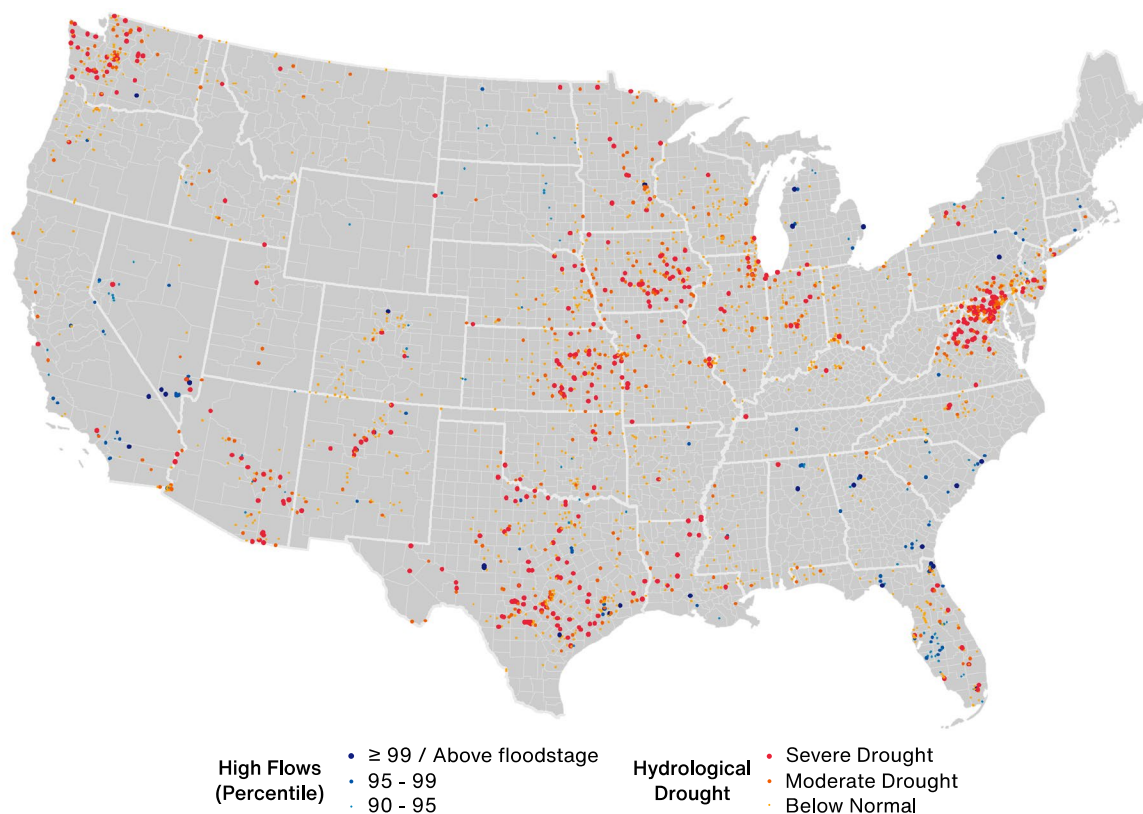


## U.S. Wildfire: Significant Fire Risk Outlook & Activity



Source: NIFC

## U.S. Current Riverine Flood Risk



A  $\geq 99^{\text{th}}$  percentile indicates that estimated streamflow is greater than the 99<sup>th</sup> 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 5<sup>th</sup> percentile for this day of the year. Moderate drought indicates that estimated 7-day streamflow is between the 6<sup>th</sup> and 9<sup>th</sup> percentile for this day of the year and 'below normal' state is between 10<sup>th</sup> and 24<sup>th</sup> percentile.

Source: United States Geological Survey

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## Source Information

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### **Greece, Turkey, Bulgaria: Flooding**

The European Severe Database (ESWD)

The Greece National Meteorological Service (HNMS)

The Greece Civil Protection

The DANA leaves houses and streets flooded, vehicles trapped and train and highway cuts throughout Spain. *RTVE*

Seven dead as severe storms trigger flooding in Greece, Turkey and Bulgaria. *The Guardian*

The September 18-20 2020 Medcane Ianos Impact on Greece, Zekkos et al. 2020

### **Philippines, Taiwan, China: Typhoons Saola & Haikui**

Hong Kong Observatory (HKO)

The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA)

The Philippine National Disaster Risk Reduction and Management Council (NDRRMC)

Hong Kong issues No 1 typhoon warning as Haikui nears; billions of dollars in economic losses estimated from Saola. *South China Morning Post*

Typhoon Haikui forces nearly 300,000 residents to evacuate in Chinese coastal province. *Xinhua*

### **Spain, Algeria: Flooding**

The Spanish Meteorological Agency (AEMET)

The European Severe Database (ESWD)

### **Brazil, Argentina: Flooding**

Civil Defense of Rio Grande do Sul State Government

With 27 deaths, last extratropical cyclone passage surpasses the state's greatest natural tragedy, *G1 Rio Grande do Sul*

Brazilian state reels after its worst cyclone disaster, *BBC*

Rio Grande do Sul has forecast more rain in the coming days, *National Institute of Meteorology*

### **Natural Catastrophes: In Brief**

National Emergency Response Centre (NDMI)

September heat wave to invade central U.S. before scorching the Mid-Atlantic, *The Washington Post*

Floodlist

Wait times to exit Burning Man drop after flooding left tens of thousands stranded in Nevada desert,

*ABC News*

ASEAN Disaster Information Network (ADINet)

Hong Kong paralyzed by flash flooding after heaviest rainfall since 1884. *CNN*

Hong Kong floods: more than 100 people sent to hospitals, extreme weather to last till 6pm amid black rainstorm alert. *South China Morning Post*

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