



PROGRAMME OF  
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# Monitoring and reporting floods worldwide: analytics about GloFAS forecasts

Prof. Assoc. Ilias Pechlivanidis (SMHI)  
CEMS Floods – Analytics and Dissemination Centre



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# Background - DISS perspectives





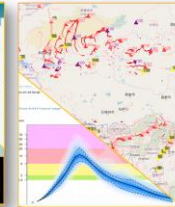
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Monitoring & ongoing situation



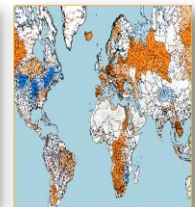
Riverine flood forecast (hazard)



Riverine flood forecast (impact)

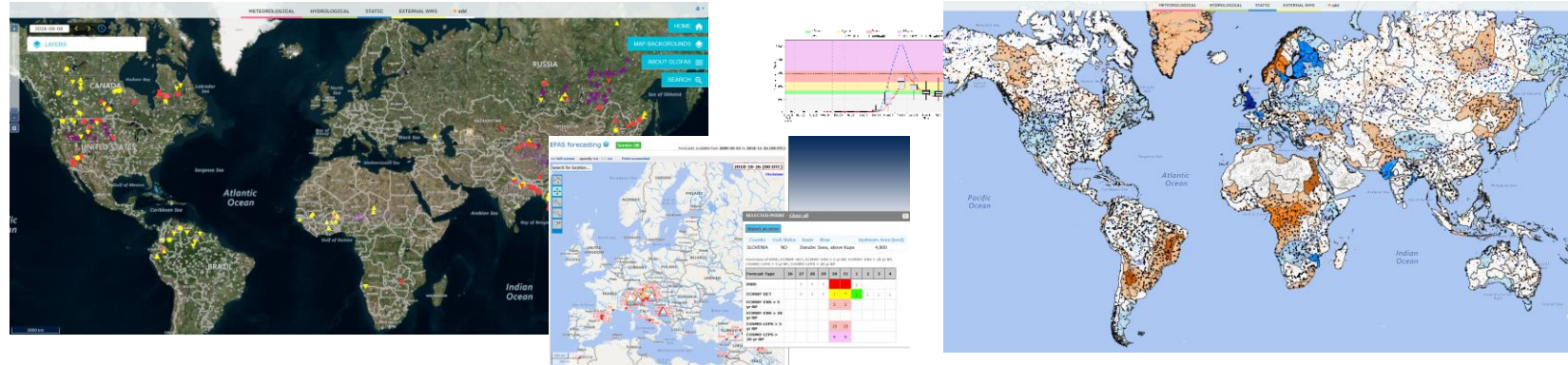


Seasonal outlook



# GloFAS service

**Provides** free and open hydrological predictions (up to 30 days & 4 month)



**Supports GloFAS users:** provide a global overview; added value & complementary information for national/ regional authorities; research and businesses

5373 registered GLOFAS users

**Supports ERCC:** provide an overview on ongoing and forecasted flood events for facilitate the disaster management in case of international aid is needed





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# Global flood reporting tool

<http://www.gdacs.org/>

GLOBAL ERCC REPORTING

FLOOD REPORTS ACTIVE (73)

LIST VIEW MAP VIEW SEARCH ADD NEW

- Africa
- Americas
- Asia
- Europe
- Oceania

Asia

- Afghanistan
- Farah
- Hilmand
- Hirat
- Kandahar
- Indonesia

Afghanistan, Pakistan and Iran, March 2019

DATA MAP EDIT

gflags severity not set yet

region Farah - Afghanistan Asia

onset March 1st 2019, 12:00 am

expires March 1st 2019, 12:00 am

effective March 1st 2019, 12:00 am

categories Geo Geophysical (inc. landslide)  
Met Meteorological (inc. flood)

urgency Immediate: Responsive action SHOULD be taken immediately

severity Extreme: Extraordinary threat to life or property

certainty Observed: Determined to have occurred or to be ongoing

headline Heavy rain has caused flash flooding and landslides in areas of Iran, Pakistan and Afghanistan over the last few days. Parts of Kandahar Province in Afghanistan recorded around half its annual rainfall.

description Heavy rain has caused flash flooding and landslides in areas of [Iran](http://floodlist.com/tag/iran/), [Pakistan](http://floodlist.com/tag/pakistan/) and [Afghanistan](http://floodlist.com/tag/afghanistan/) over the last few days. Parts of Kandahar Province in Afghanistan recorded around half its annual rainfall in 30 hours. Parts of Pakistan have also been affected by severe snowstorms. According to media reports, as many as 50 people have died as a result of flooding, landslides or collapsing buildings across the 3 countries.

web <http://www.floodlist.com>

Critical parameters

name	value
affected_description	"NA"
affected_quantitative	"NA"
death_description	"NA"
death_quantitative	"NA"
damage_description	"40 [people] Fatalities in Afghanistan"
damage_description	"14 [people] Fatalities in Balochistan"
damage_description	"8,000 [people] Rescued in Balochistan"
damage_description	"12 [people] Fatalities in Khyber Pakhtunkhwa"
damage_description	"3 [people] Fatalities in Mirjaveh"
damage_description	"2,546 [buildings] Buildings damaged in Balochistan"
damage_description	"9 [people] Fatalities in Federally Administered Tribal Areas"
damage_description	"5,000 [people] Evacuated in Kandahar"
damage_description	"3,800 [buildings] Buildings destroyed in Afghanistan"

GDACS  
Global Disaster Alert and Coordination System

GDACS is a cooperation framework between the United Nations, the European Commission and disaster managers worldwide to improve alerts, information exchange and coordination in the first phase after major sudden-onset disasters.

HOME ALERTS VIRTUAL ISOCC MAPS & SATELLITE IMAGERY KNOWLEDGE ABOUT

Latest news Tropical Cyclones IDAI-19 Earthquake in Reykja

Map of disaster alerts in the past 4 days. Last 24 hours events are highlighted in yellow. Small earthquakes are shown as green boxes. European Union, 2015. Map produced by EC-JRC. The boundaries and the names shown on this map do not imply official endorsement or acceptance by the European Union.

EARTHQUAKES

- Reykjanes Ridge (5.9M) - 10 Mar 18:04
- Reykjanes Ridge (5.5M) - 10 Mar 17:58
- Japan (5.8M) - 10 Mar 17:10
- Papua New Guinea (6.1M) - 10 Mar 12:48
- Fiji (6.2M) - 10 Mar 08:12
- South Indian Ocean (5.5M) - 10 Mar 07:53
- Philippines (5M) - 09 Mar 15:06

TROPICAL CYCLONES

- IDAI-19 (213km/h) - 11 Mar 06:00
- HALEH-19 (65km/h) - 09 Mar 00:00

FLOODS

- Iran, Islamic Republic of - 07 Mar 00:00
- Pakistan - 07 Mar 00:00
- Afghanistan - 06 Mar 00:00

VOLCANOES

No Volcanoes events in the past 4 days

DROUGHTS

- Southern Africa-2018 - 11 Mar 11:47
- Hispaniola-2019 - 11 Mar 11:47
- Eastern Australia-2019 - 11 Mar 11:47
- Venezuela-2019 - 11 Mar 11:47
- Central America-2019 - 11 Mar 11:47
- Colombia-2019 - 11 Mar 11:47
- Southern South America - 11 Mar 11:47

- Daily reporting
- Currently only based on [www.floodlist.org](http://www.floodlist.org)
- In future also: GloFAS and rapid mapping activations

Floodlist

HOME AFRICA AMERICAS ASIA EUROPE OCEANIA PROTECTION & RECOVERY CLIMATE NEWS

5 days ago - Colombia - Floods and Landslides Hit Tolima and Antioquia

Report - Flood Losses in Europe to Increase Fivefold by 2050

17 FEBRUARY 2016

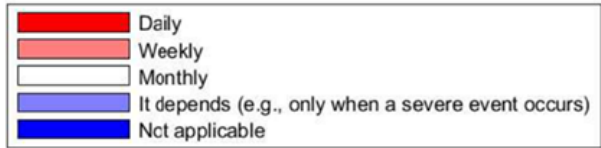
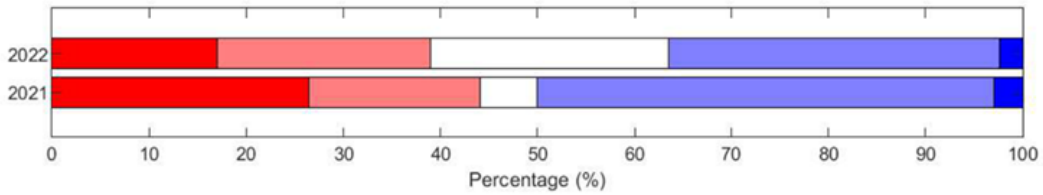
The European Environment Agency recently published a report on flooding in Europe, "Floodplain management: reducing flood risks and restoring healthy ecosystems", where researchers examined data on floods dating from 1980.

Read Full Article



# Analysis of the missed events for GloFAS

## Frequency usage of GloFAS



Analysis of GloFAS missed events in 2022

SC2

05/23

SC3

05/24

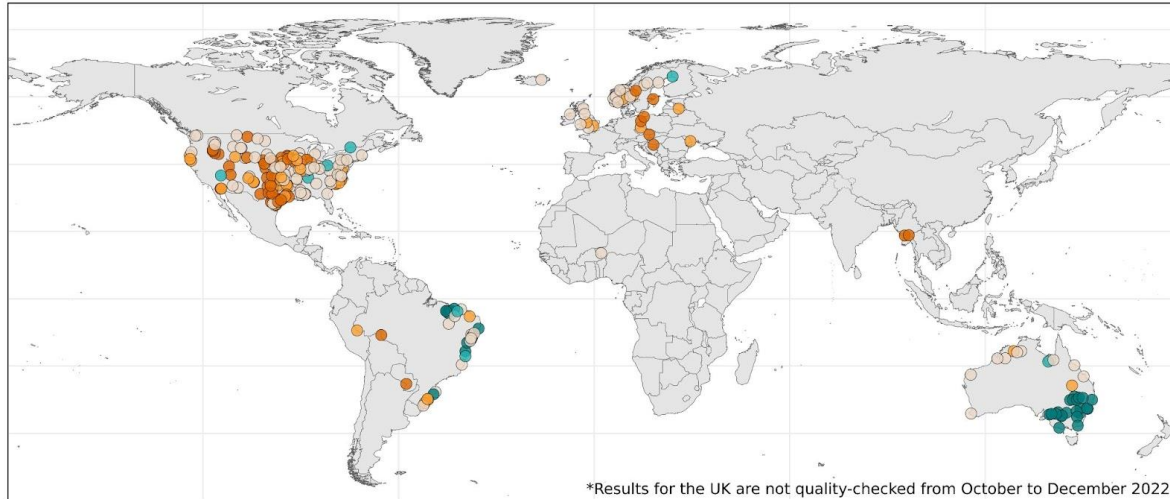
Analysis of GloFAS missed events in 2023

SC1 Kick off  
10/21



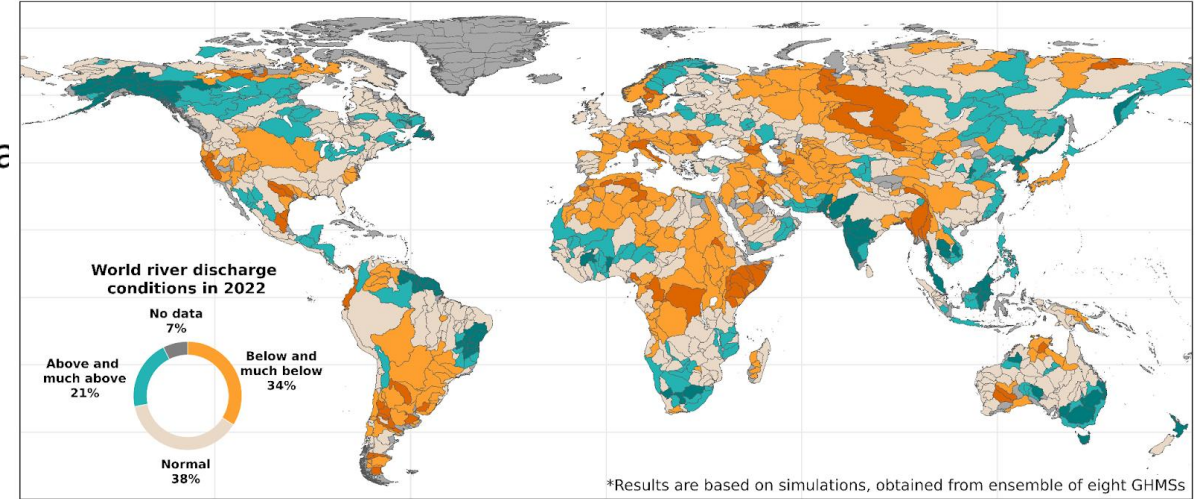
# Insights from the State of Global Water Resources report 2022 (WMO, 2023)

### River Discharge anomalies based on insitu data



much below   below   normal   above   much above

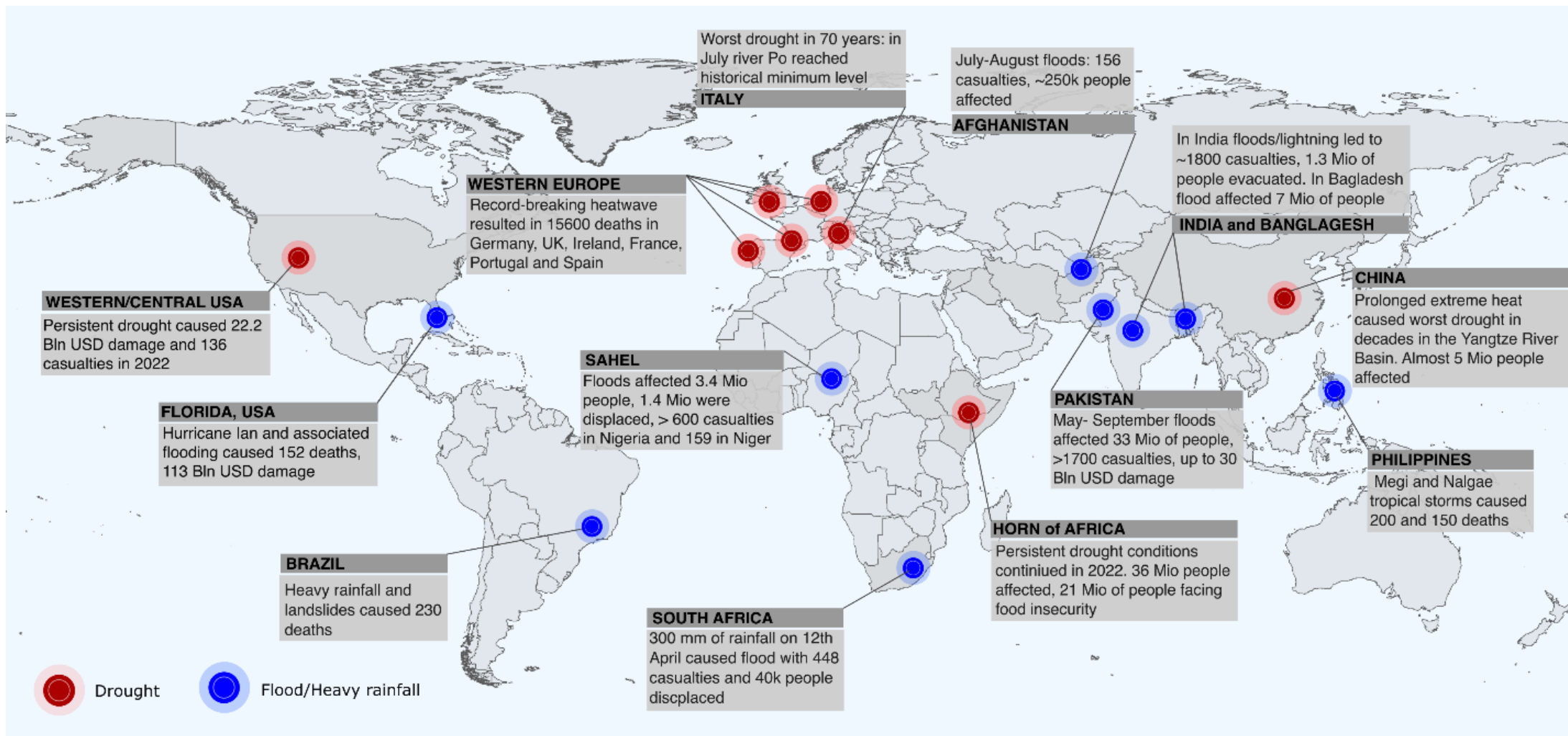
### River discharge anomalies 2022



much below   below   normal   above   much above



# Selected High Impact Hydrological Events 2022







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# Insights so far





# GloFAS analysis of different events reported in GDACS

## Aim

Improve the understanding of the drivers for missing (or capturing) a flood event.

## Approach

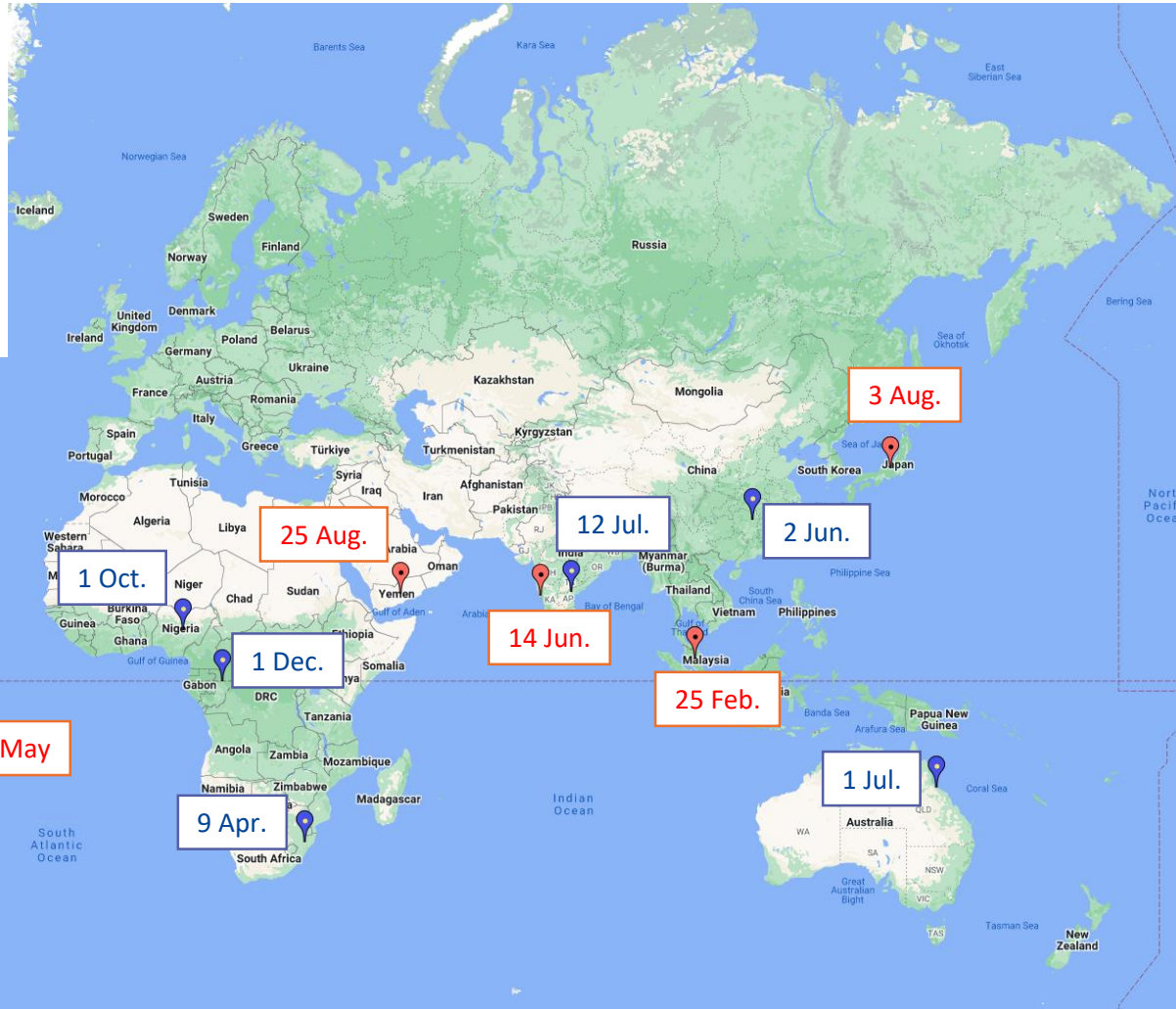
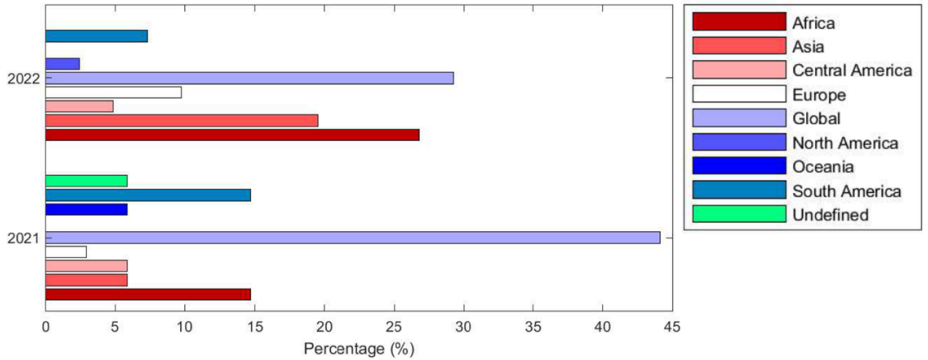
DISS analysed from a GloFAS service perspective, some key flood events that were observed, monitored and reported in the GDACS through the Global Reporting Tool during 2022.

A set of hydro-meteorological factors have been identified to diagnostically guide the analysis, targeting the meteorological forecasts, the model performance and the hydrological forecast characteristics.

The analysis here not only includes hydro-meteorological information (i.e. high precipitation volume, forecast persistency in 5- or 20-year return period exceedance) but also information on the flood impact extracted using the Rapid Impact Assessment product from GloFAS-IS.



# Analysis of 13 events across the world in 2022



 Not missed

 Missed

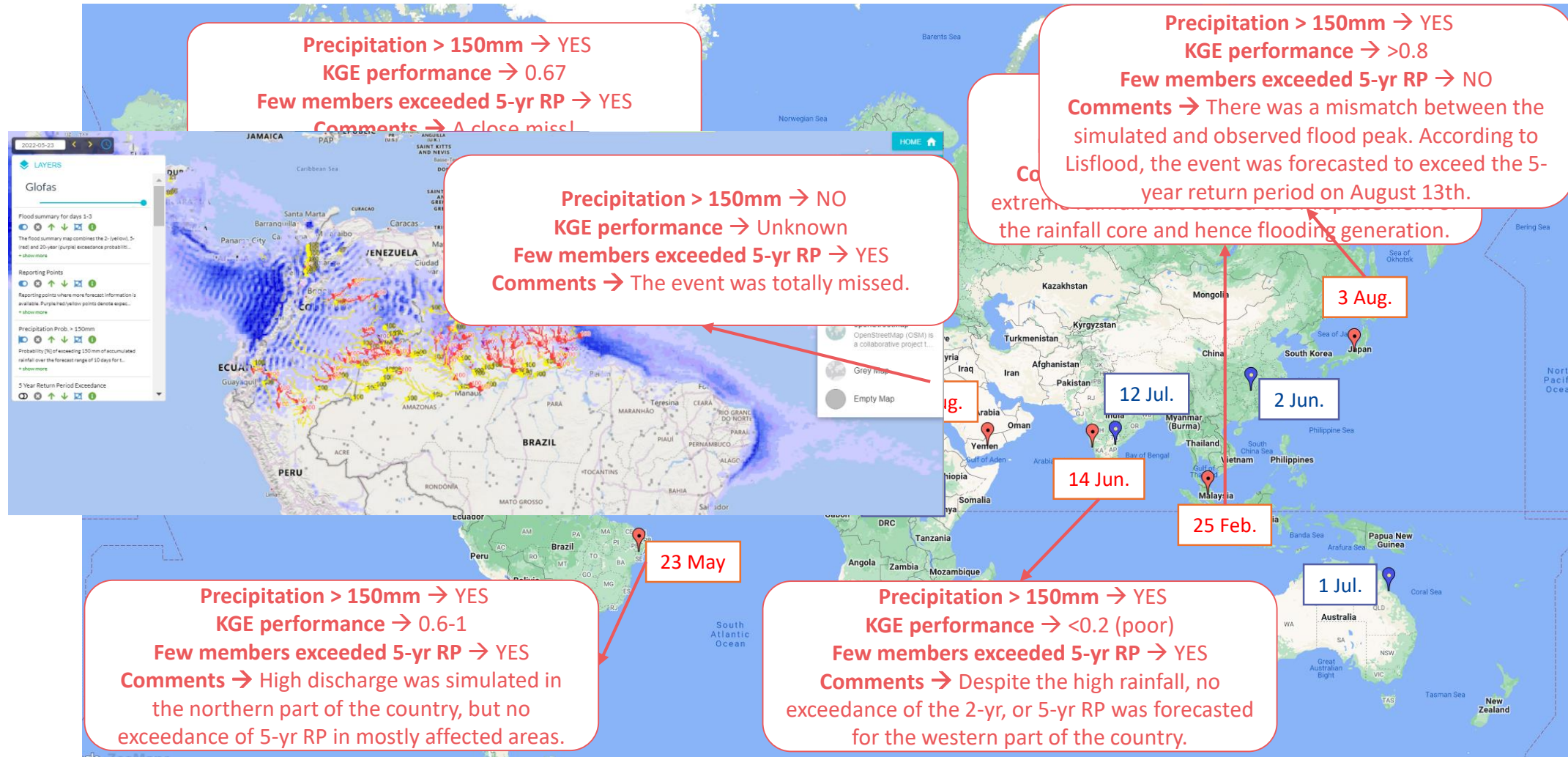


# Assessing the characteristics of selected events

Generic information				Potential drivers affecting the flood generation						Additional information	
#	Onset date	Country and Region	Was the event missed?	Precipitation	Model performance (KGE)	Calibrated	Only few members exceeded the 5-yr RP	Only few members exceeded the 20-yr RP	Other (please specify)	Comments	Screenshots
	YYYY-MM-DD	YES/NO Flood Summary layer 1-3 days	< 150mm YES/NO "Accumulated precipitation layer", choose maximum amount in the area, check both onset date and onset date -5 days!		KGE from Hydrological Model Performance layer	YES/NO Hydrological Model Performance layer	YES/NO Flood Summary layer days 1-3, <75%	YES/NO Flood Summary layer days 1-3, <30%		e.g. small drainage area, to be seen in LISFLOOD Drainage Network layer	at least one representative reporting point alternatively/additionally: <ul style="list-style-type: none"> <li>Flood summary layer 1-3 days</li> <li>Accumulated precipitation on onset date</li> </ul>



# Diagnostics



Not missed



Missed



# Summary

- The analysis of these events indicates that a key factor for the missed events is due to **precipitation input** which **either lacks forecast persistency (described here with the probability of exceeding 150mm) or is misplaced**. For the latter, the spatial variability of precipitation is a key factor on flood generation and its misrepresentation has led to the lack of generating high streamflow; see for instance event #1 in Southern Thailand and Peninsular Malaysia. In other cases (event #3 in Guyana), the **precipitation exceeded 150mm however there was lack of persistency at the 5- and 20-year return period threshold**, and hence the event was not considered from a model-perspective as a severe one. This might indicate towards regional model structural and/or parametric improvements to allow a "faster" runoff generation process.
- In addition, there are results that **point towards modelling efforts**. For instance, the flood event #11 in Yemen was missed since the precipitation amount was not high enough. This indicates potential **rainfall forecast limitation, while the region can also be considered ungauged as no model validation is performed**. Consequently, the **hydrological model possibly lacks of adequate representation of the dominant processes**. Moreover, we note that there have been events that the hydrological forecasts were accurate to predict the flooding. This was the case also in poorly performing domains such as in Australia, India, Nigeria and Congo (events #8, #9, #12 and #13 respectively) indicating that **strong precipitation signal could overcome limitations from the poor model performance, particularly in large river systems**.



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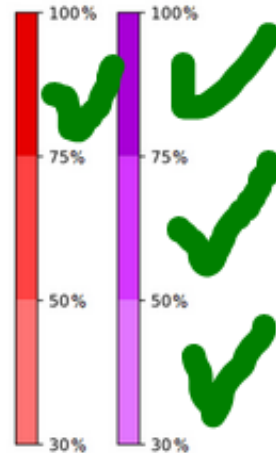
# Efforts in 2023-24





# Agreed criteria for identifying a missed event

- Any **GRT event with >500 people affected/displaced/relocated/missing** is assessed.
  - For those events, we report the **region named in GRT** and check the respective administrative region in GloFAS to determine whether the event was missed.
1. Use the “**Flood Summary layer 1-3 days**” to determine whether an event was missed:
    - Check the GLOFAS forecasts +/- 5 days from the "Onset date" stated in the GRT.



2. Complete the *Potential drivers affecting the flood generation section*





# Assessing the characteristics of selected events

Generic information				Potential drivers affecting the flood generation						Additional information	
#	Onset date	Country and Region	Was the event missed?	Precipitation	Model performance (KGE)	Calibrated	Only few members exceeded the 5-yr RP	Only few members exceeded the 20-yr RP	Other (please specify)	Comments	Screenshots
	<p>YYYY-MM-DD</p> <p>YES/NO Flood Summary layer 1-3 days</p>		<p>&lt; 200mm <del>&lt;150mm</del> YES/NO "Accumulated precipitation layer", choose maximum amount in the area, check both onset date and onset date -5 days!</p>		<p>KGE from Hydrological Model Performance layer</p>	<p>YES/NO Hydrological Model Performance layer</p>	<p>YES/NO Flood Summary layer days 1-3, &lt;75%</p>	<p>YES/NO Flood Summary layer days 1-3, &lt;30%</p>		<p>e.g. small drainage area, to be seen in LISFLOOD Drainage Network layer</p> <p>at least one representative reporting point alternatively/additionally:</p> <ul style="list-style-type: none"> <li>Flood summary layer 1-3 days</li> <li>Accumulated precipitation on onset date</li> </ul>	



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*Further information*  
**www.globalfloods.eu**

*Queries*  
**info@globalfloods.eu**

# Thank you

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