GloFAS in ERCC Operations

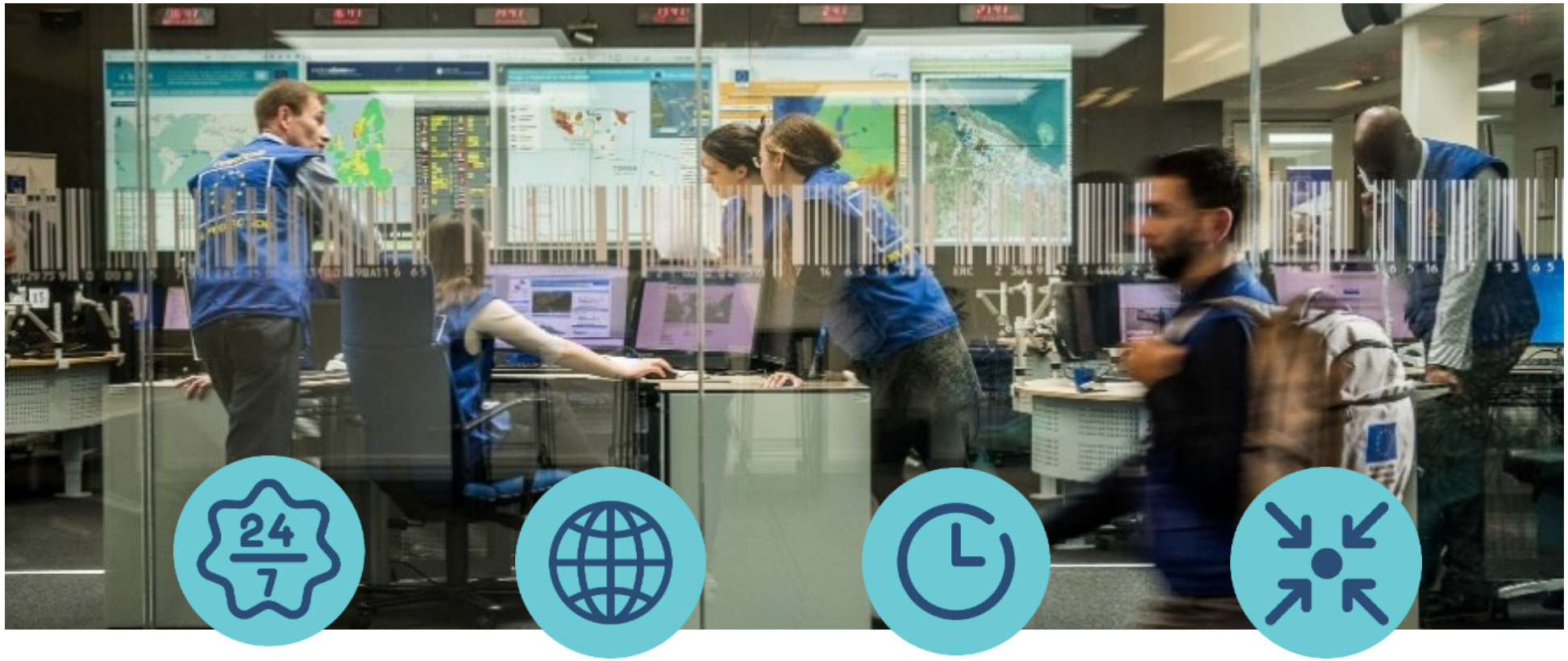
Arjan Hijlkema

Scientific analyst at the ERCC, DG ECHO

03 April 2025

European Commission

The Emergency Response Coordination Centre (ERCC)



Monitors disasters around the globe

Maps disaster risks

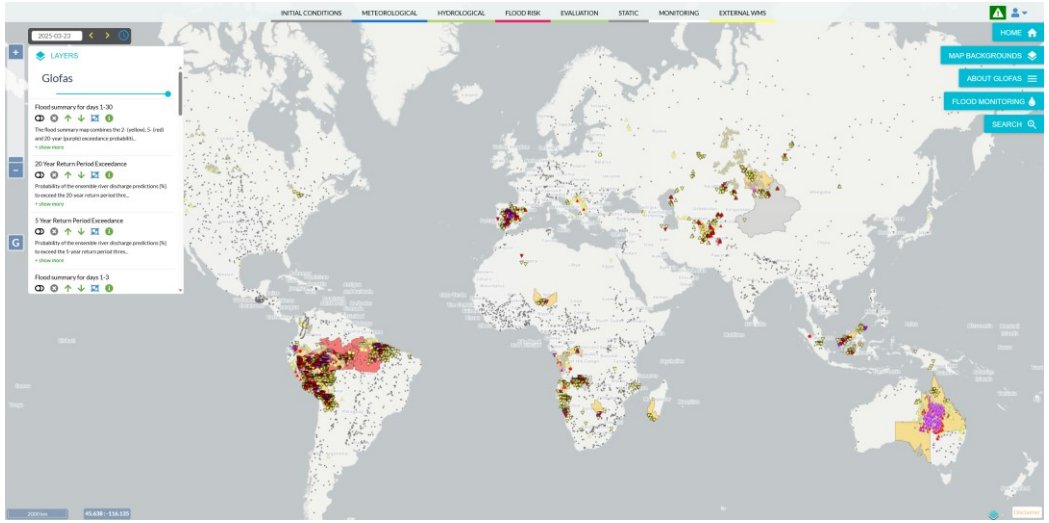
Provides real-time information

Coordinates joint European response operations

The Emergency Response Coordination Centre (ERCC)

Copernicus Europe's eyes on Earth

Emergency Management Service



GloFAS is used primarily for two activities:

1. **Monitoring flood hazards** on a global level
2. **Impact assessment**

1. GloFAS for monitoring flood hazards

Monitoring natural hazards

2. SCIENTIFIC PARTNERSHIPS

Natural hazards (ARISTOTLE)

Location of institutes

Radiological and Nuclear hazards

Chemical hazards

ANALYTICAL SERVICES TO THE ERCC

1. EARLY WARNING AND MONITORING SERVICES

Droughts and heatwaves

Wildfires

Floods

Volcanic activity, earthquakes, and tropical cyclones

3. ON-DEMAND MAPPING SERVICES

Rapid Mapping service

Risk and Recovery

2017 2022

SESA External and Security services

EMSA Maritime safety

MONITORING AND EARLY WARNING SYSTEMS

EDO/GDO

European and Global Drought Observatory (EDO and GDO)

EFFIS/GWIS

European Forest Fire (EFFIS) and Global Wildfire (GWIS) Information Systems

EFAS/GloFAS

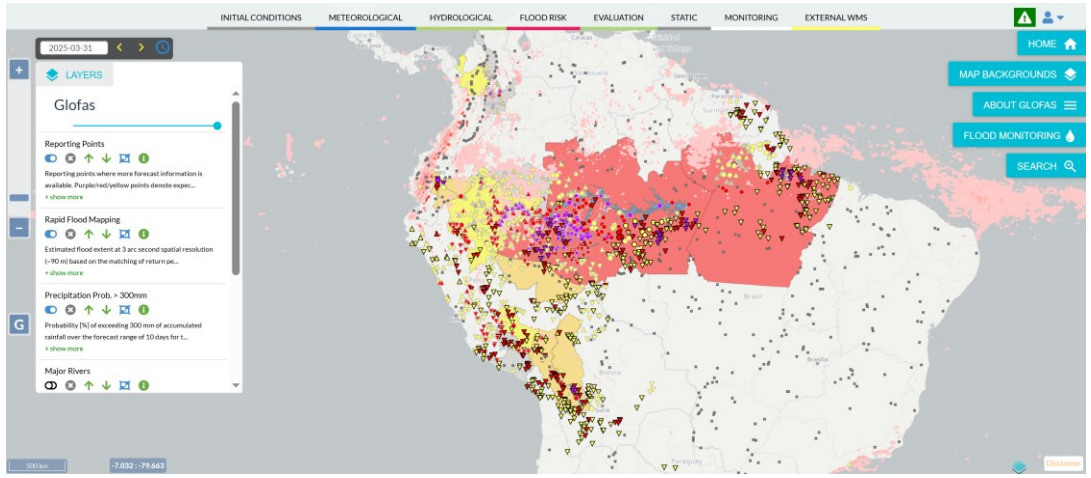
European and Global Flood Awareness Systems (GloFAS and EFAS)

ALERT SYSTEM

GDACS

Global Disaster Alert and Coordination System (GDACS)

How we use GloFAS in daily operations



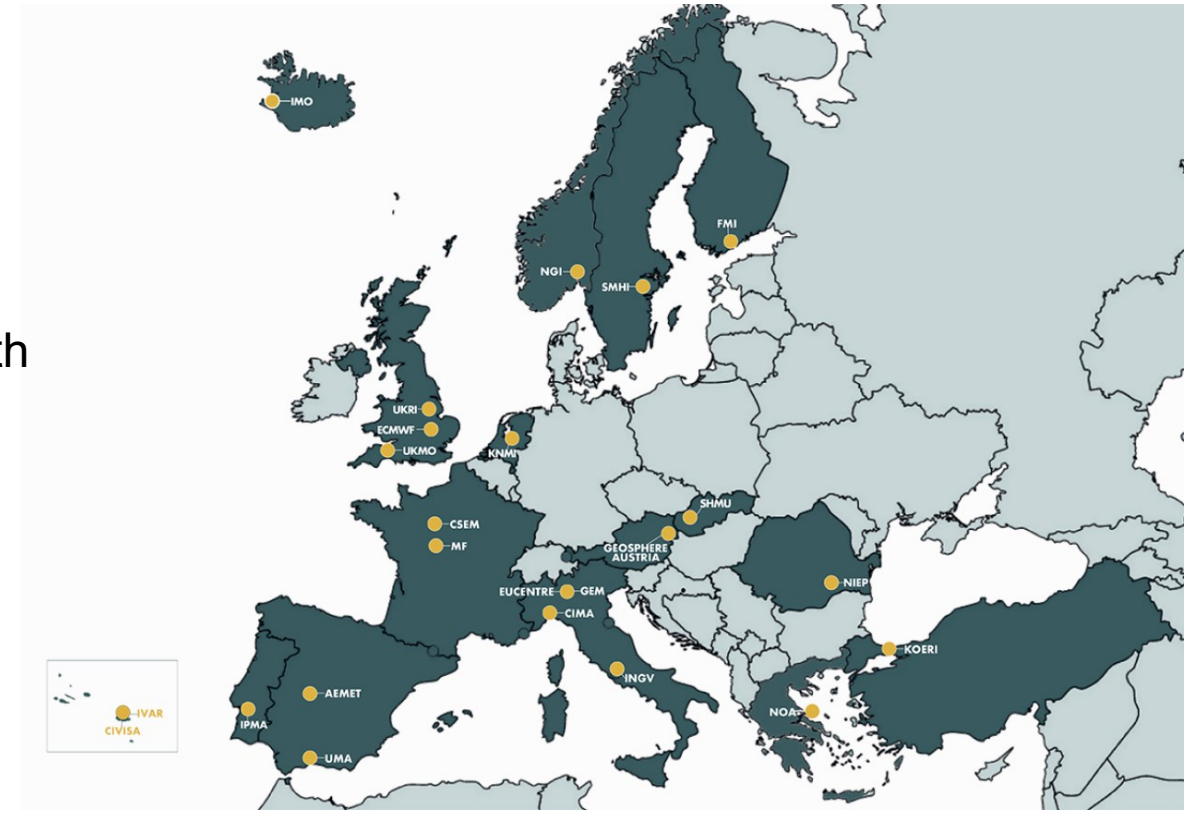
Most used layers in scanning the world

- Reporting points
  - Particularly focusing on > 20 yr exceedances
  - Any RP in vulnerable areas (e.g., recovering from event)
- Rapid impact assessment
- Rapid flood mapping
- ECMWF precipitation >150/>300 mm

European Natural Hazard Scientific Partnership (ENHSP) *"ARISTOTLE"*

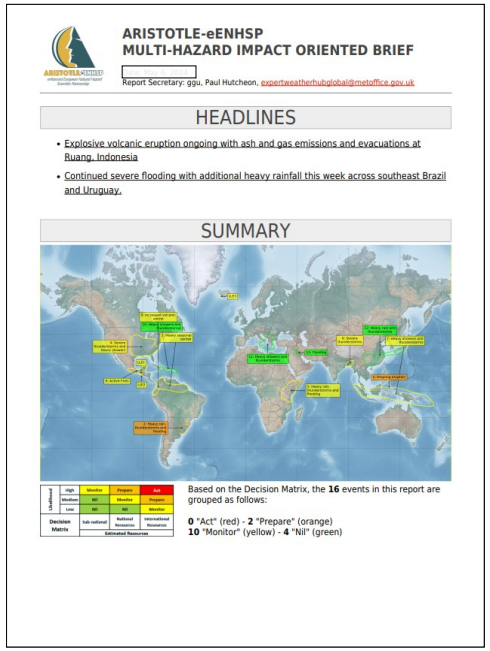
ARISTOTLE ENHSP
enhanced European Natural Hazard Scientific Partnership

- **24/7** expert scientific advice service for the ERCC
- **23 organisations**, most of which with a national early warning mandate
- Covers **severe weather and floods** (next to e.g., earthquakes, volcanic activity, wildfires)



INGV · IPMA · KANDILLI RASATHANESI VE DEPREM ARASTIRMA ENSTITUSU · cima RESEARCH FOUNDATION · Royal Netherlands Meteorological Institute Ministry of Infrastructure and Water Management · GEM GLOBAL EARTHQUAKE MODEL working together to assess risk · Icelandic Met Office · SMHI · UNIVERSIDAD DE MÁLAGA · INFP · METEO FRANCE · GeoSphere Austria · ECMWF · EUCENTRE FOR YOUR SAFETY · NGI · ILMATIETEEN LAITOS METEOROLOGISKA INSTITUTET FINNISH METEOROLOGICAL INSTITUTE · AEMet Agencia Estatal de Meteorología · csem emsc · CIVISA · UAc UNIVERSIDADE DOS AÇORES · SHMU

European Natural Hazard Scientific Partnership (ENHSP) *"ARISTOTLE"*



ARISTOTLE-eENHSP
MULTI-HAZARD IMPACT ORIENTED BRIEF

Report Secretary: ggu, Paul Hutcheon, expertweatherhubglobal@metoffice.gov.uk

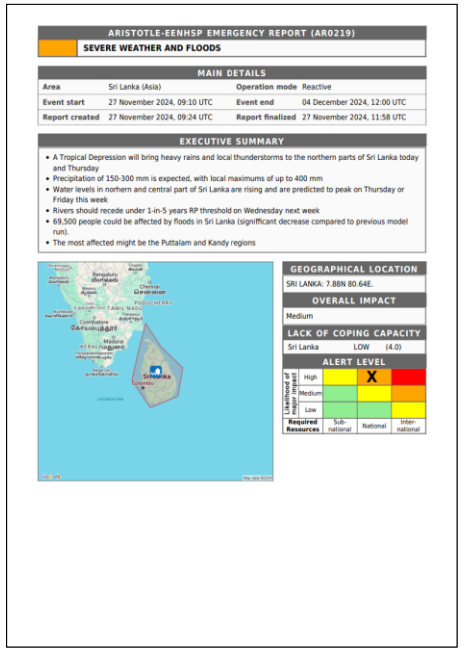
HEADLINES

- Explosive volcanic eruption ongoing with ash and gas emissions and evacuations at Ruang, Indonesia
- Continued severe flooding with additional heavy rainfall this week across southeast Brazil and Uruguay.

SUMMARY

Based on the Decision Matrix, the **16** events in this report are grouped as follows:

0 "Act" (red) - **2** "Prepare" (orange)
10 "Monitor" (yellow) - **4** "Nil" (green)



ARISTOTLE-EENHSP EMERGENCY REPORT (AR0219)

SEVERE WEATHER AND FLOODS

MAIN DETAILS

Area	Sri Lanka (Asia)	Operation mode	Reactive
Event start	27 November 2024, 09:10 UTC	Event end	04 December 2024, 12:00 UTC
Report created	27 November 2024, 09:24 UTC	Report finalized	27 November 2024, 11:58 UTC

EXECUTIVE SUMMARY

- A Tropical Depression will bring heavy rains and local thunderstorms to the northern parts of Sri Lanka today and Thursday
- Precipitation of 150-300 mm is expected, with local maximums of up to 400 mm
- Water levels in northern and central part of Sri Lanka are rising and are predicted to peak on Thursday or Friday this week
- Rivers should recede under 1-in-5 years RP threshold on Wednesday next week
- 69,500 people could be affected by floods in Sri Lanka (signifficant decrease compared to previous model run).
- The most affected might be the Puttalam and Kandy regions

GEOGRAPHICAL LOCATION

SRI LANKA: 7.88N 80.64E.

OVERALL IMPACT

Medium

LACK OF COPING CAPACITY

Sri Lanka LOW (4.0)

ALERT LEVEL

- **Monitoring report** 3 times a week
- **Emergency report** upon request, covering multi-hazard risk assessment for a specific event
- On floods outside of Europe forecast is largely based on GloFAS and complemented by data from relevant national hydromet services.

2. GloFAS for impact assessments

Large flooding event → *How severe?*

© Adobe Stock

1. Using credible sources (internal, government, UN OCHA, IMO etc.) to obtain **reported impact numbers**

2. Using GloFAS/GFM flood extent layer to calculate **flood exposure numbers**

→ Could be used as triangulation

Example: Tropical Cyclone JUDE – March 2025

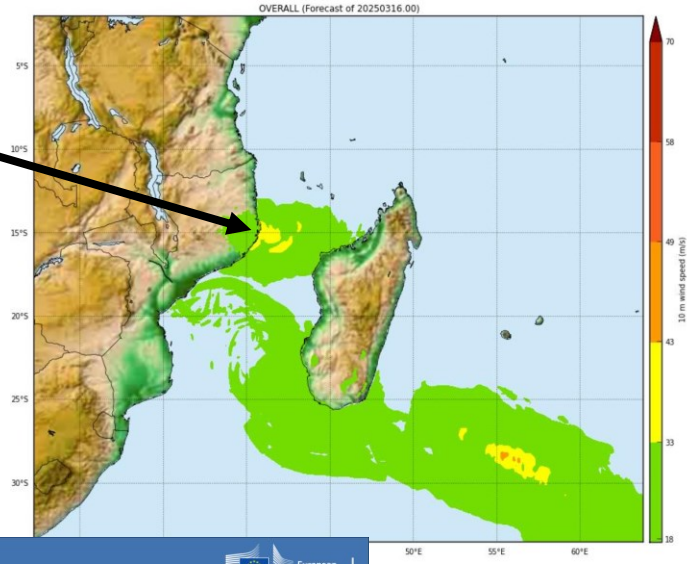
- TC JUDE made landfall on 10 March 2025 in Mozambique, resulting in
  - 302 000 people affected
  - > 70 000 houses (partially) destroyed

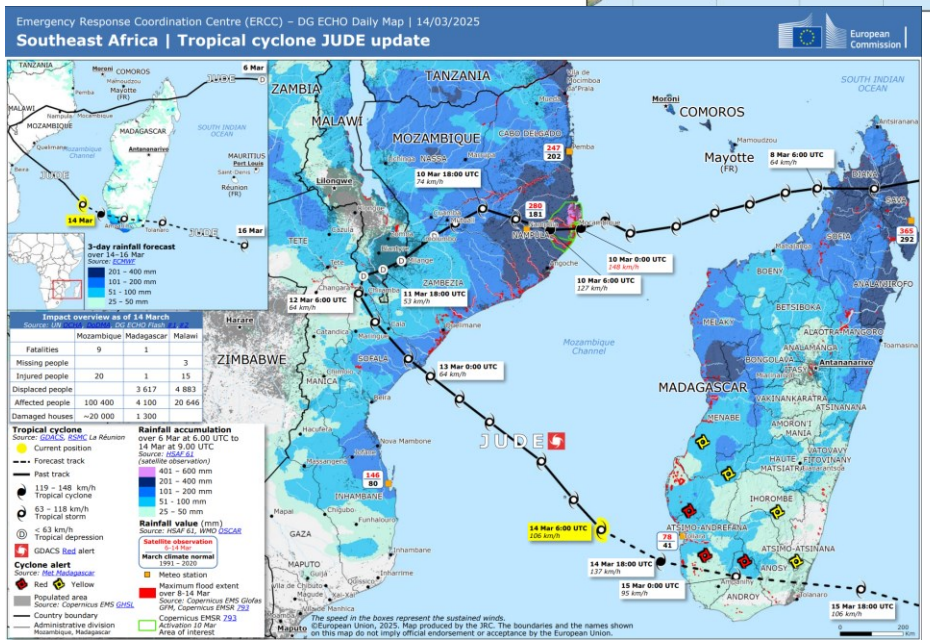
(OCHA Flash, 18 March)

- Request to perform an independent impact assessment based on our analytical capacities

Example: Tropical Cyclone JUDE – March 2025

Category 1 SSA
(very localised)



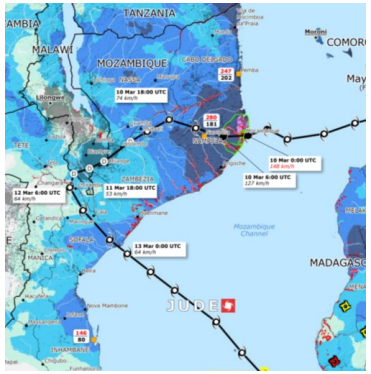


© UNICEF Mozambique

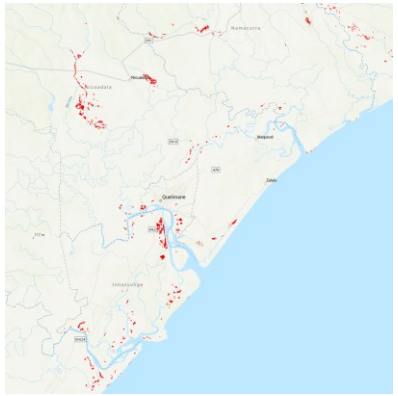
- There were very strong winds upon landfall, but *very localised*
- Highest impact due to the **very heavy rainfall and flooding** within the radius of the TC JUDE trajectory
- GloFAS/GFM most suitable to conduct impact assessment

Example: Tropical Cyclone JUDE – March 2025
Using GFM

- Flooding event during the days following 10 March (date of landfall)

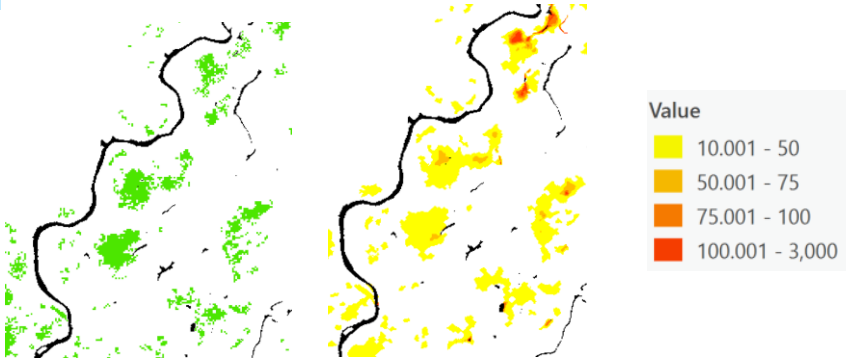


Signal on 13 March



- Testing out FLEXTH algorithm *(based on flood extent and digital elevation model)*
→ water depth + more accurate flood extent estimation

- Drawback of GFM: signal of flood extent generally low

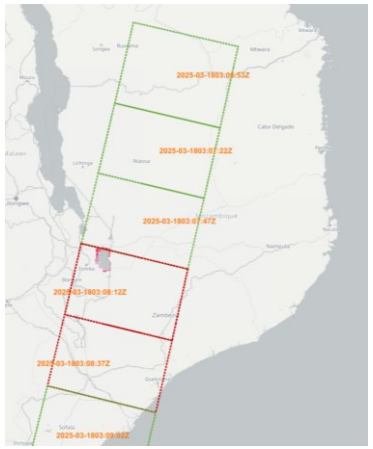


Observed flood extent after running FLEXTH

Example: Tropical Cyclone JUDE – March 2025
Using GFM

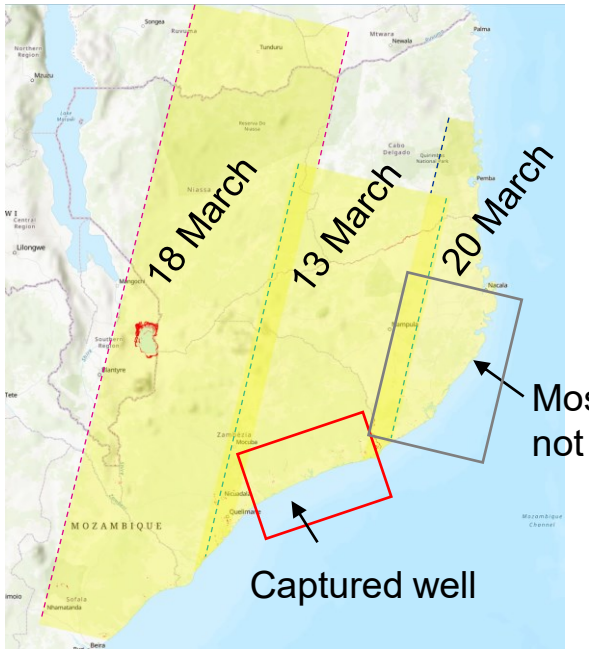
- Flooding event during the days following 10 March (date of landfall)
- 2nd Drawback: Time resolution often limits full coverage of area of interest

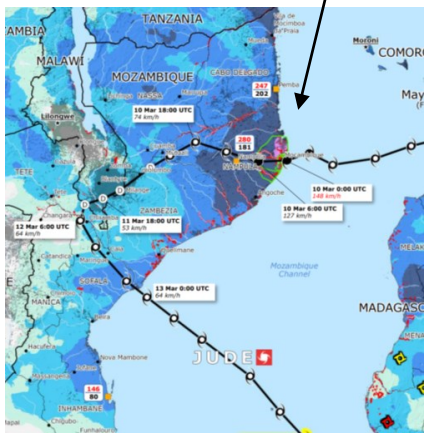
13 March



18 March

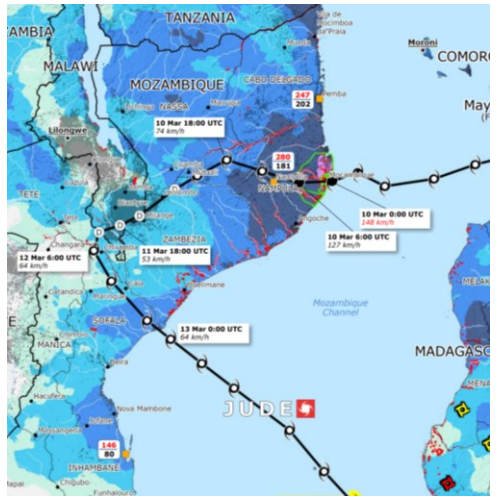
20 March

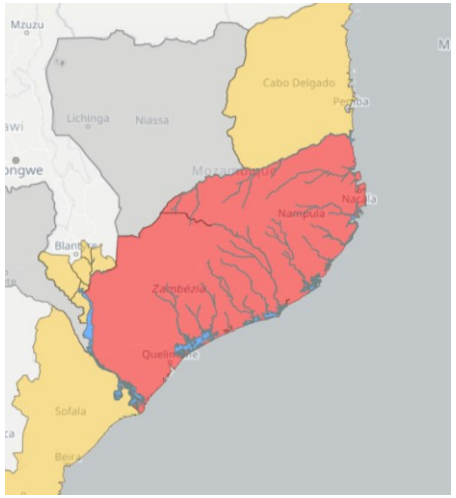




Example: Tropical Cyclone JUDE – March 2025
Using GloFAS

- **Rapid Flood Mapping** allows us to estimate flood extent in areas where GFM does not capture floods well, including
  - More reliable
  - Coverage of urban areas
  - Allows for anticipation
- Drawbacks:
  - Overestimation due to low water depth threshold[1, 2]
  - Some model-specific characteristics requiring to apply nuance on calculated numbers





[1]Manawongcharoen and Panbamrungkij (2021)
[2]Rossi et al. (2024)

Thank you!