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THE EUROPEAN UNION



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European  
Commission



Emergency  
Management

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# GloFAS for Global Flood Monitoring - GFM

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**European Commission Joint Research Center**



## Flood Forecasting



Predicting when and where a flood might happen



**How**



Uses data and models



Analyzes rainfall, river levels and weather patterns



**Purpose**



Warn people in advance so they can prepare

## Flood Monitoring



Keeping an eye on floods as they happen



**How**



Uses sensors, **satellites**, and other tools



Tracks the current state of a flood



**Purpose**



Provide real-time information for emergency response



# Global Flood Monitoring (GFM)



Microwave  
**satellite** imagery



Flood Map provision  
**within 8 hours**  
after data acquisition



High spatial  
resolution with  
**20-meter pixel**  
sampling



**Global** coverage  
(except poles)



Full flood archive  
**from 2015 to**  
**ongoing**



# Why Microwave Satellite imagery?



Day and night



All weather conditions



Effective to discriminate  
water on ground



# Copernicus Sentinel-1 SAR for flood mapping

- Sentinel-1 is an **active** microwave sensor
  - Day and night
  - All weather conditions
  - Effective to discriminate water on ground

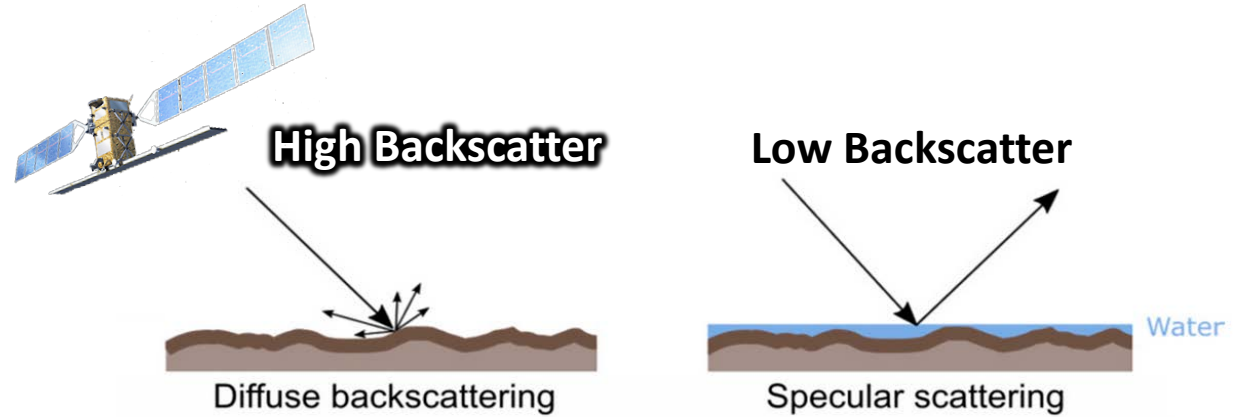
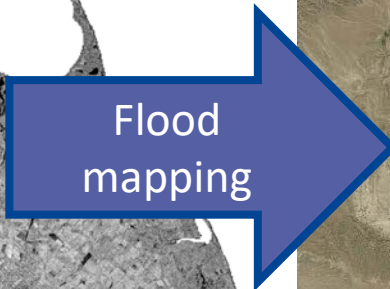
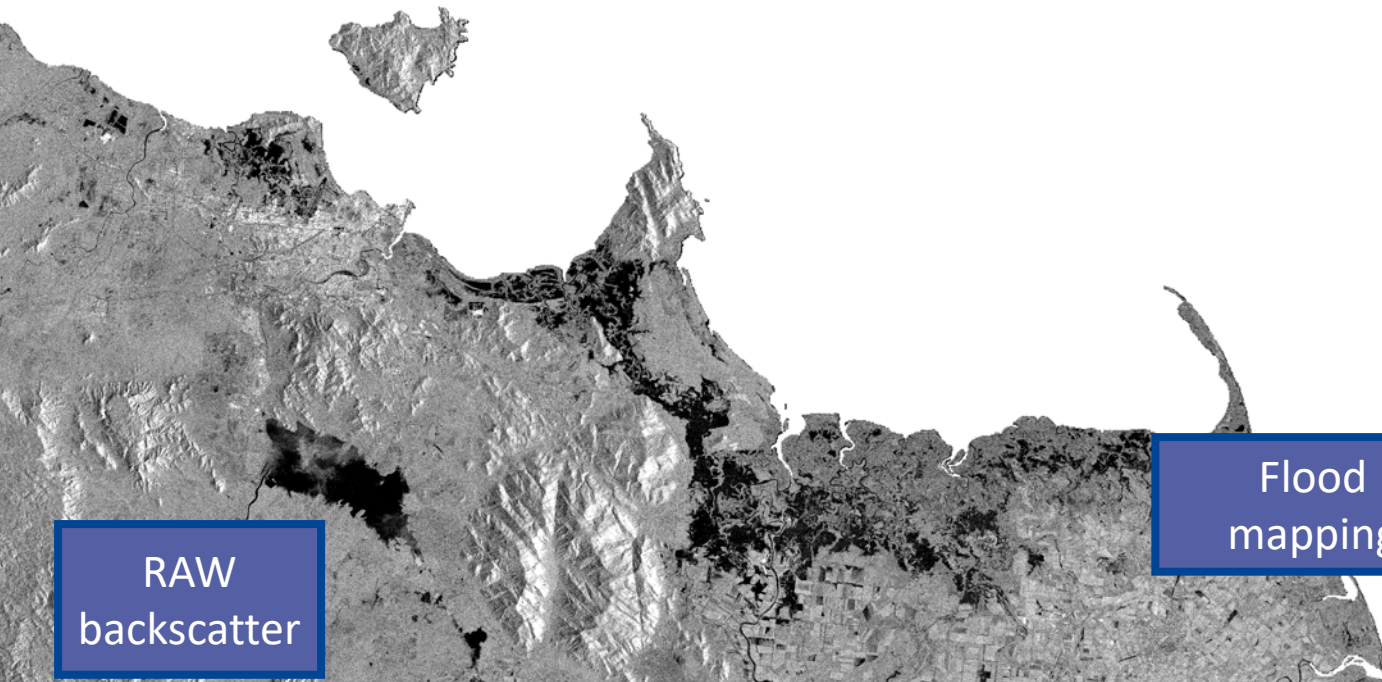


Figure modified from Ottinger and Kuenzer (2020) Spaceborne L-Band Synthetic Aperture Radar Data for Geoscientific Analyses in Coastal Land Applications: A Review, Remote Sensing, 12(14).





# Limitations

## False alarms



Very dry or sandy soils



Frozen ground



Wet snow



Flat impervious areas  
(e.g. tarmac-covered roads)

## Missed alarms



Urban areas



Densely vegetated areas



Strong winds on water surfaces



# Copernicus Sentinel-1 SAR for flood mapping





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# How to visualize GFM in GloFAS webviewer





# GFM in GloFAS



The screenshot displays the GloFAS web interface. At the top, there are navigation tabs: INITIAL CONDITIONS, METEOROLOGICAL, HYDROLOGICAL, FLOOD RISK, EVALUATION, MONITORING, and EXTERNAL WMS. The MONITORING tab is currently selected. A red rounded rectangle highlights a 'MONITORING' modal window that is open over the map. This window contains a list of monitoring layers, each with a toggle switch and a green information icon:

- Observed flood extent
- Observed water extent
- Reference water mask
- Exclusion mask
- Likelihood values
- Advisory flags
- Sentinel 1 footprint and metadata
- Sentinel 1 schedule
- Affected population
- Affected landcover

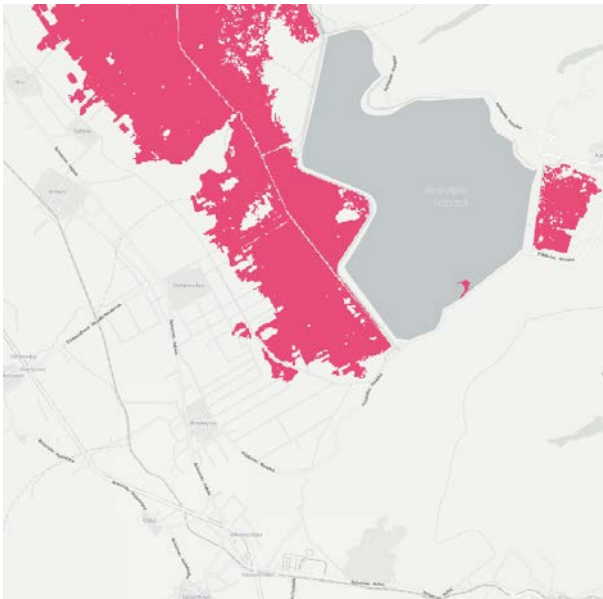
On the right side of the interface, there are several navigation buttons: HOME, MAP BACKGROUNDS, ABOUT GLOFAS, FLOOD MONITORING, and SEARCH. At the bottom left, there is a scale bar for 2000 km and coordinates 63.035 : 61.172. At the bottom right, there is a 'Disclaimer' link.



# Product output layers – Water observations

## S-1 observed flood extent

Ensemble flood extent



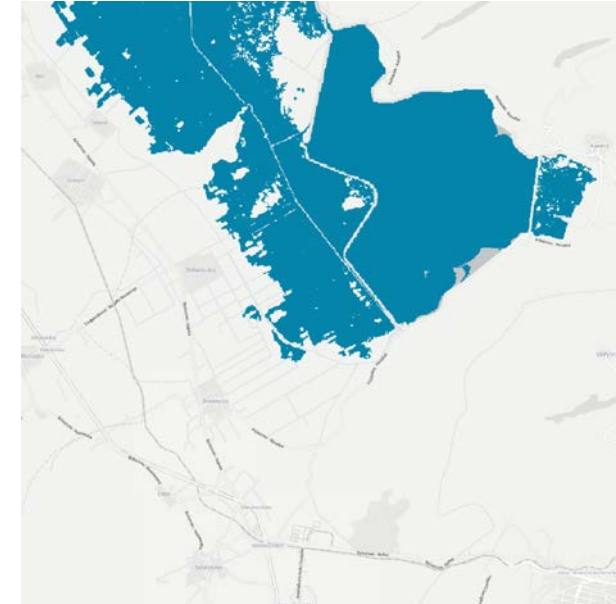
## S-1 reference water mask

Permanent & seasonal water extent



## S-1 observed water extent

Open water extent, as combined from flood and reference waters

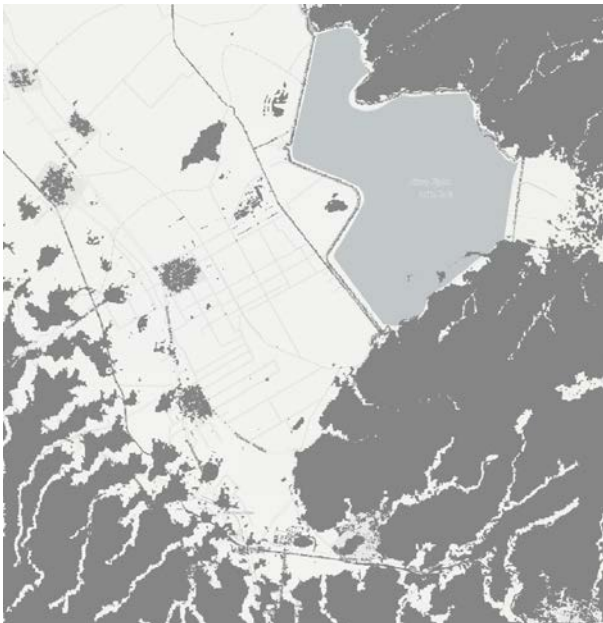




# Product output layers – Contextual information

## Exclusion mask

Exclusion mask where S1 flood delineation is hampered



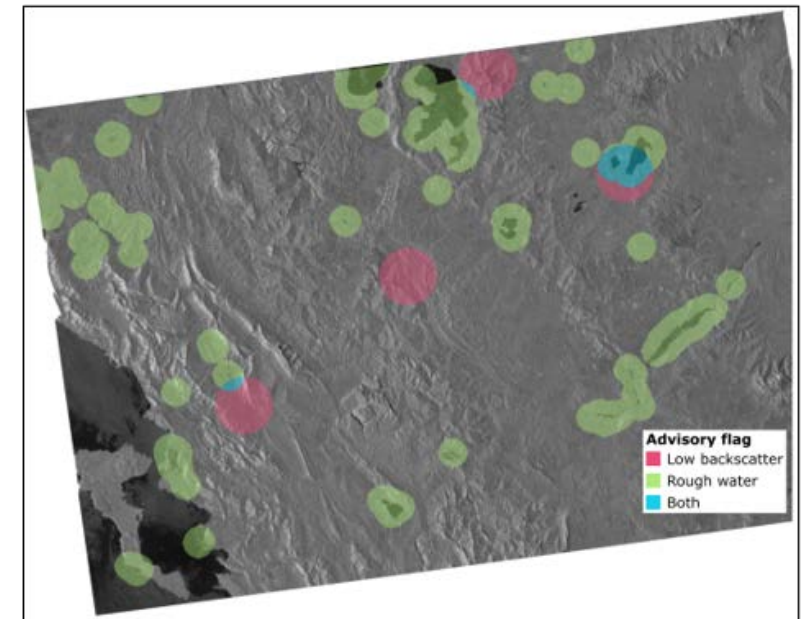
## Likelihood values

Likelihood values accounting for classification confidence



## Advisory flags

Advisory flags indicating challenging classification circumstances

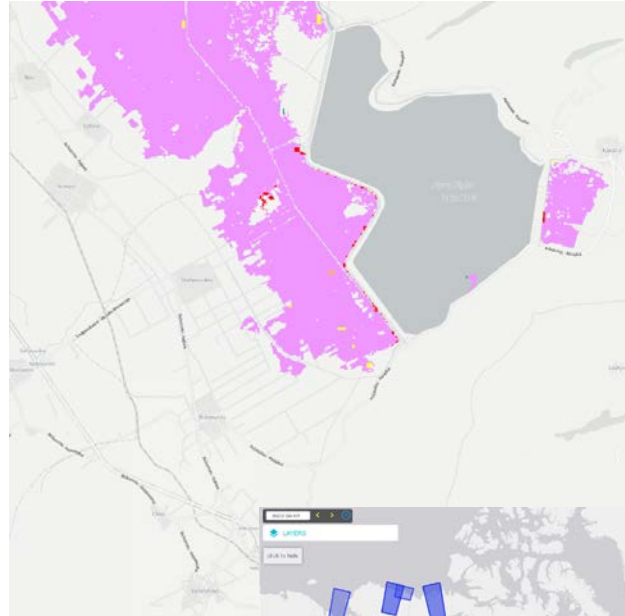




# Product output layers – Metadata & Context

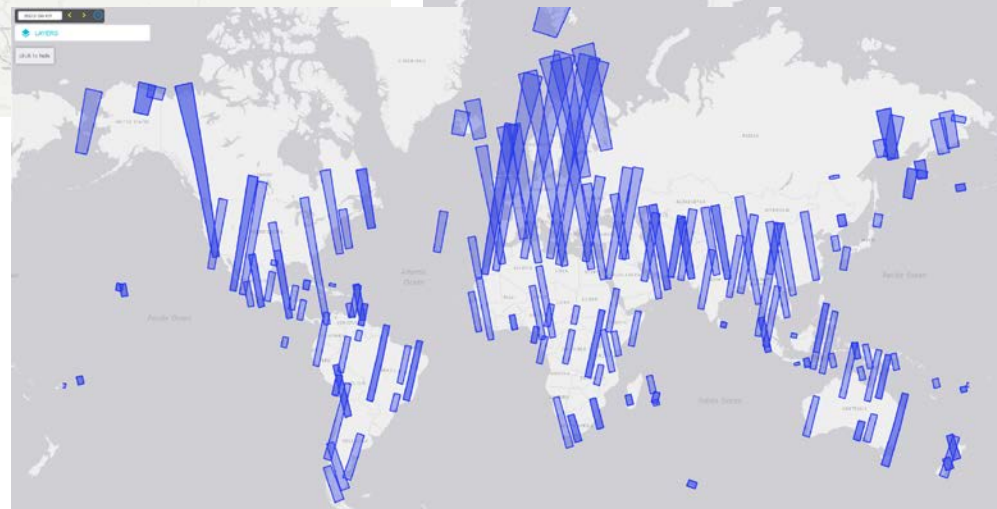
## Affected Landcover/Population

GlobCover/CORINE Land Cover  
GHSL (Global Human Settlement Layer)



## S-1 Footprint + Metadata

S-1 orbit footprint boundary for a specific day



## S-1 Schedule

S-1 orbit overflight boundaries for the next 3 days



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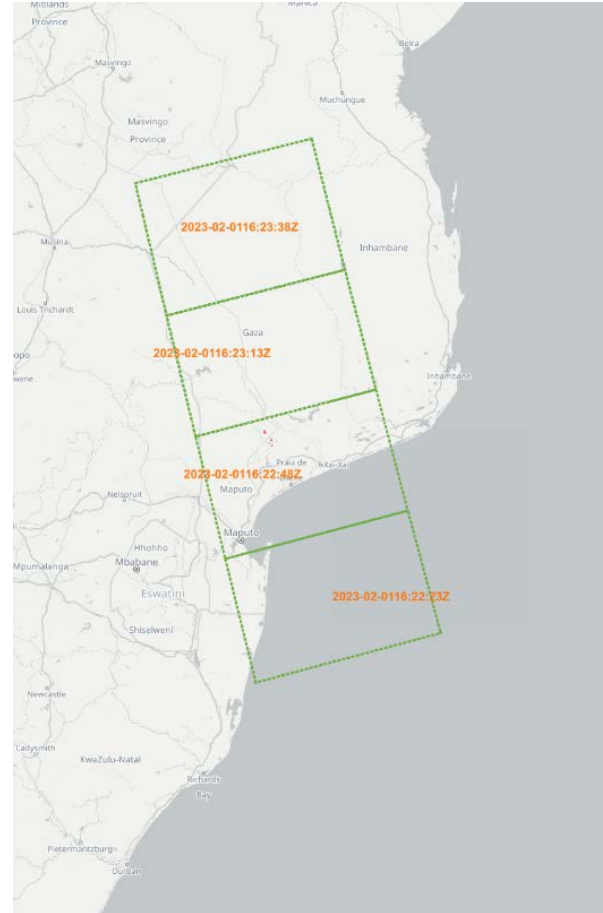
# Observe flooded areas





# Observe flooded areas

- Observed Flood Extent**
- No Floodwater
  - Floodwater
- Observed Flood Extent Footprint**
- Flooding detected — unusually high amount and flooded area  $\geq 2$  km<sup>2</sup>
  - Flooding detected — not unusually high amount, or flooded area  $< 2$  km<sup>2</sup>
  - Flooding detected — unknown significance (incomplete SAR time-series)



1<sup>st</sup> February 2023



9<sup>th</sup> March 2023



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# User Support

- GFM Wiki ([extwiki.eodc.eu/GFM](http://extwiki.eodc.eu/GFM))

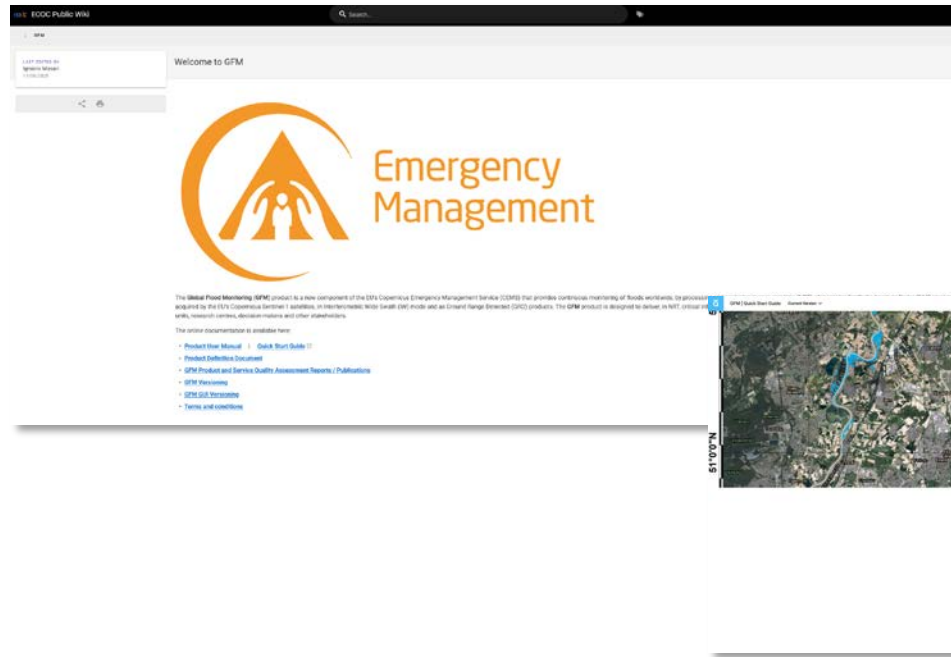
- Product User Manual
- Quick Start Guides
- Annual Product Quality Review

- GloFAS Contact Form (<https://global-flood.emergency.copernicus.eu/contact-us/>)

- Subject [Satellite-based Global Flood Monitoring]

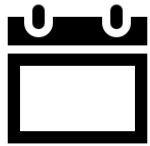
- GFM Portal

- [portal.gfm.eodc.eu](http://portal.gfm.eodc.eu)





# Monitoring the recent floods in Sri Lanka

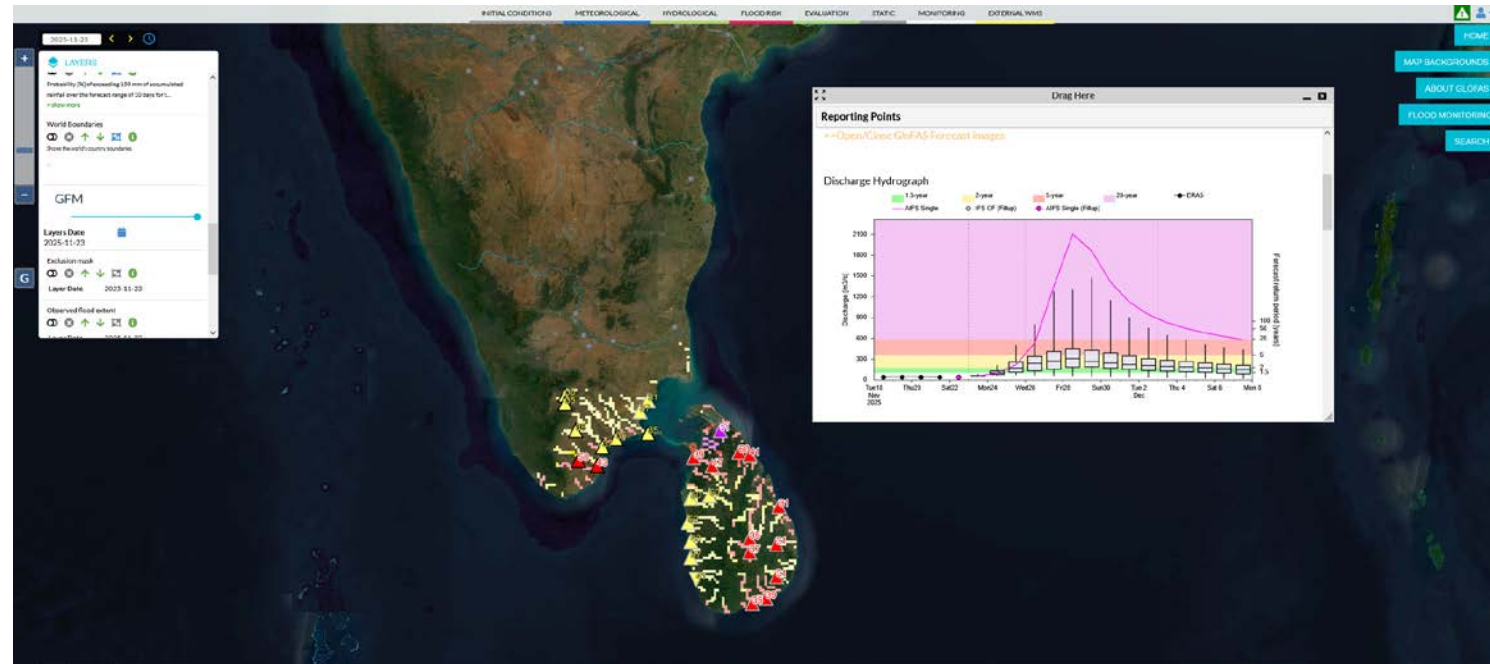


- It is the **23 of November 2025**
- You have checked the **flood forecasting**
- You identified a potentially **severe** flood forecasts

Is there already some flooding ongoing?

When will be the next satellite image available?

Did **GFM** observe flooded areas throughout the event?





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# Thank you



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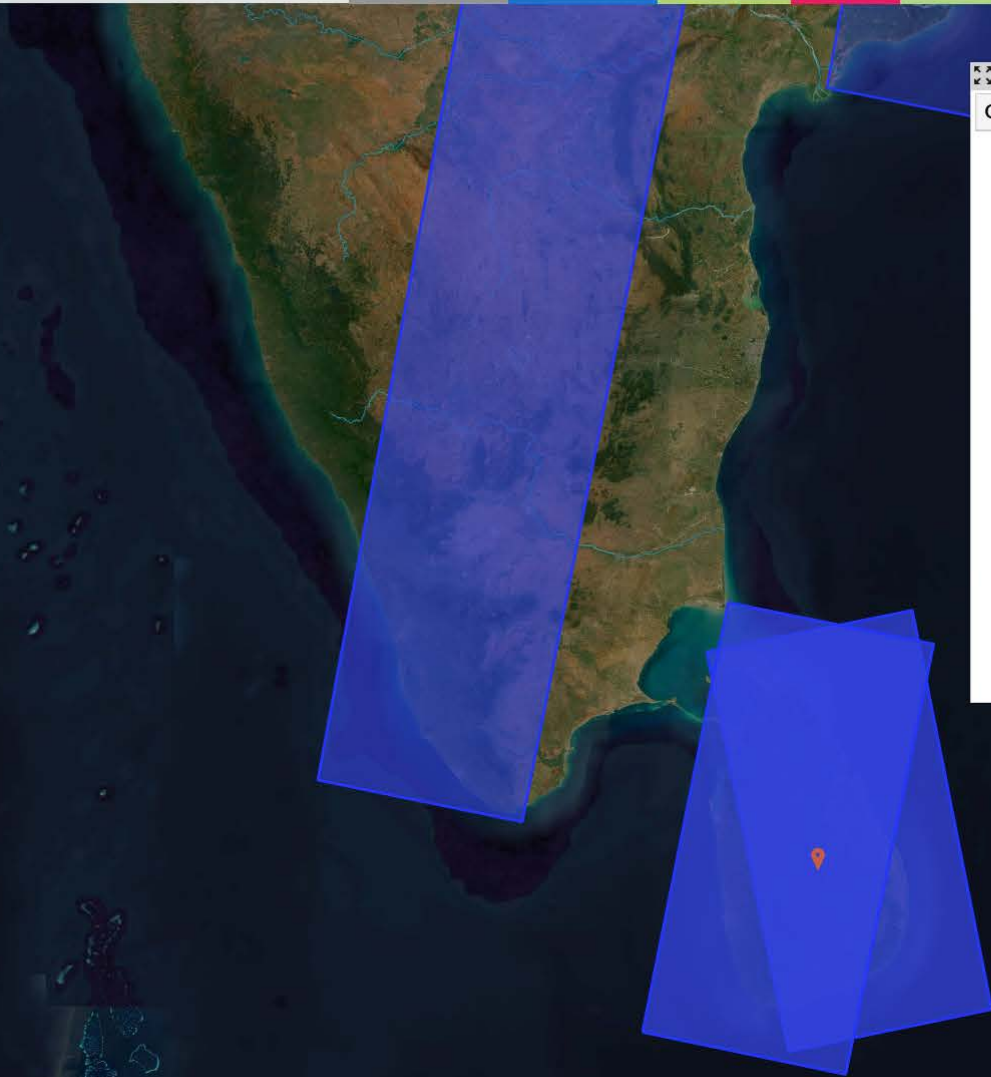
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2025-11-23

### LAYERS

- Observed flood extent  
Layer Date: 2025-11-23
- Reference water mask  
Layer Date: 2025-11-23
- Likelihood values  
Layer Date: 2025-11-23
- Sentinel 1 footprint and metadata  
Layer Date: 2025-11-23
- Sentinel 1 schedule  
Layer Date: 2025-11-23



### GFM

Drag Here

Gfm Layers  
GFM

7C2FF

**Sentinel 1 Schedule**

Dataake Id	7C2FF
Mode	IW
Observation Duration	77
Observation timestart	2025-11-26T00:24:44
Observation time stop	2025-11-26T00:26:01
Orbite Absolute	62041
Orbit Relative	19
Polarisation	DV
Satellite Id	S1A
Swath	NA

7C34E

7C351

7C34F

**Sentinel 1 Schedule**

Dataake Id	7C34F
Mode	IW



2025-11-26

**LAYERS** next GloFAS forecast

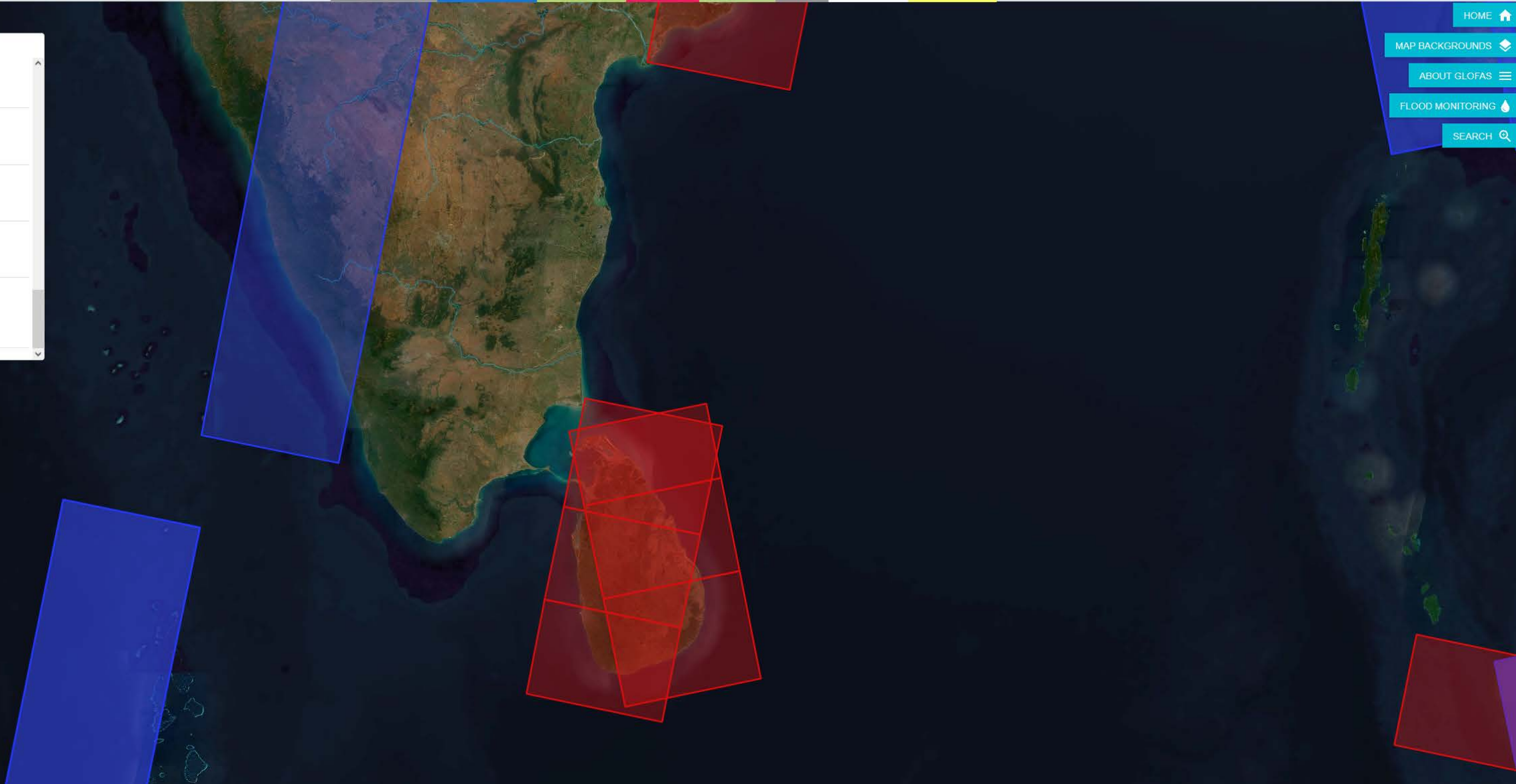
Observed flood extent  
Layer Date: 2025-11-26

Reference water mask  
Layer Date: 2025-11-26

Likelihood values  
Layer Date: 2025-11-26

Sentinel 1 footprint and metadata  
Layer Date: 2025-11-26

Sentinel 1 schedule  
Layer Date: 2025-11-26



HOME

MAP BACKGROUNDS

ABOUT GLOFAS

FLOOD MONITORING

SEARCH



2025-11-26 < > 🕒

**LAYERS**

Observed flood extent  
🔍 ⌕ ⬆️ ⬇️ 📄 ⓘ  
Layer Date 2025-11-26

Reference water mask  
🔍 ⌕ ⬆️ ⬇️ 📄 ⓘ  
Layer Date 2025-11-26

Likelihood values  
🔍 ⌕ ⬆️ ⬇️ 📄 ⓘ  
Layer Date 2025-11-26

Sentinel 1 footprint and metadata  
🔍 ⌕ ⬆️ ⬇️ 📄 ⓘ  
Layer Date 2025-11-26

Sentinel 1 schedule  
🔍 ⌕ ⬆️ ⬇️ 📄 ⓘ  
Layer Date 2025-11-26



2025-11-2600:25:40Z

2025-11-2612:49:16Z

Gal Oya



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# 26 November



INITIAL CONDITIONS METEOROLOGICAL HYDROLOGICAL FLOOD RISK EVALUATION STATIC MONITORING EXTERNAL WMS

2025-11-26

**LAYERS**

GFM

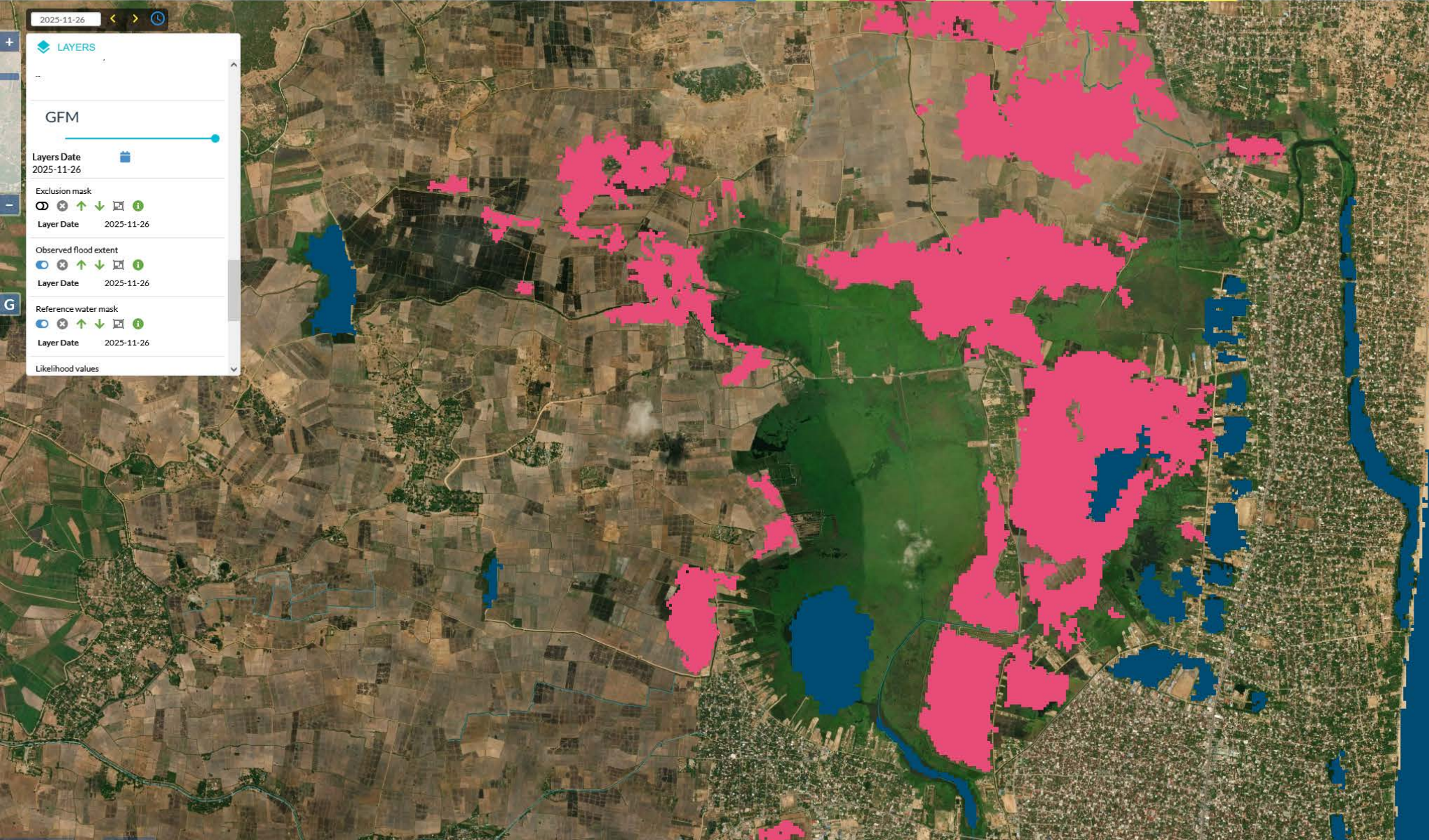
Layers Date 2025-11-26

Exclusion mask  
Layer Date 2025-11-26

Observed flood extent  
Layer Date 2025-11-26

Reference water mask  
Layer Date 2025-11-26

Likelihood values



HOME

MAP BACKGROUNDS

ABOUT GLOFAS

FLOOD MONITORING

SEARCH





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# 2 December



INITIAL CONDITIONS   METEOROLOGICAL   HYDROLOGICAL   **FLOOD RISK**   EVALUATION   STATIC   MONITORING   EXTERNAL WMS



HOME

MAP BACKGROUNDS

ABOUT GLOFAS

FLOOD MONITORING

SEARCH

2025-12-02

**LAYERS**

Observed flood extent

Layer Date 2025-12-02

---

Reference water mask

Layer Date 2025-12-02

---

Likelihood values

Layer Date 2025-12-02

---

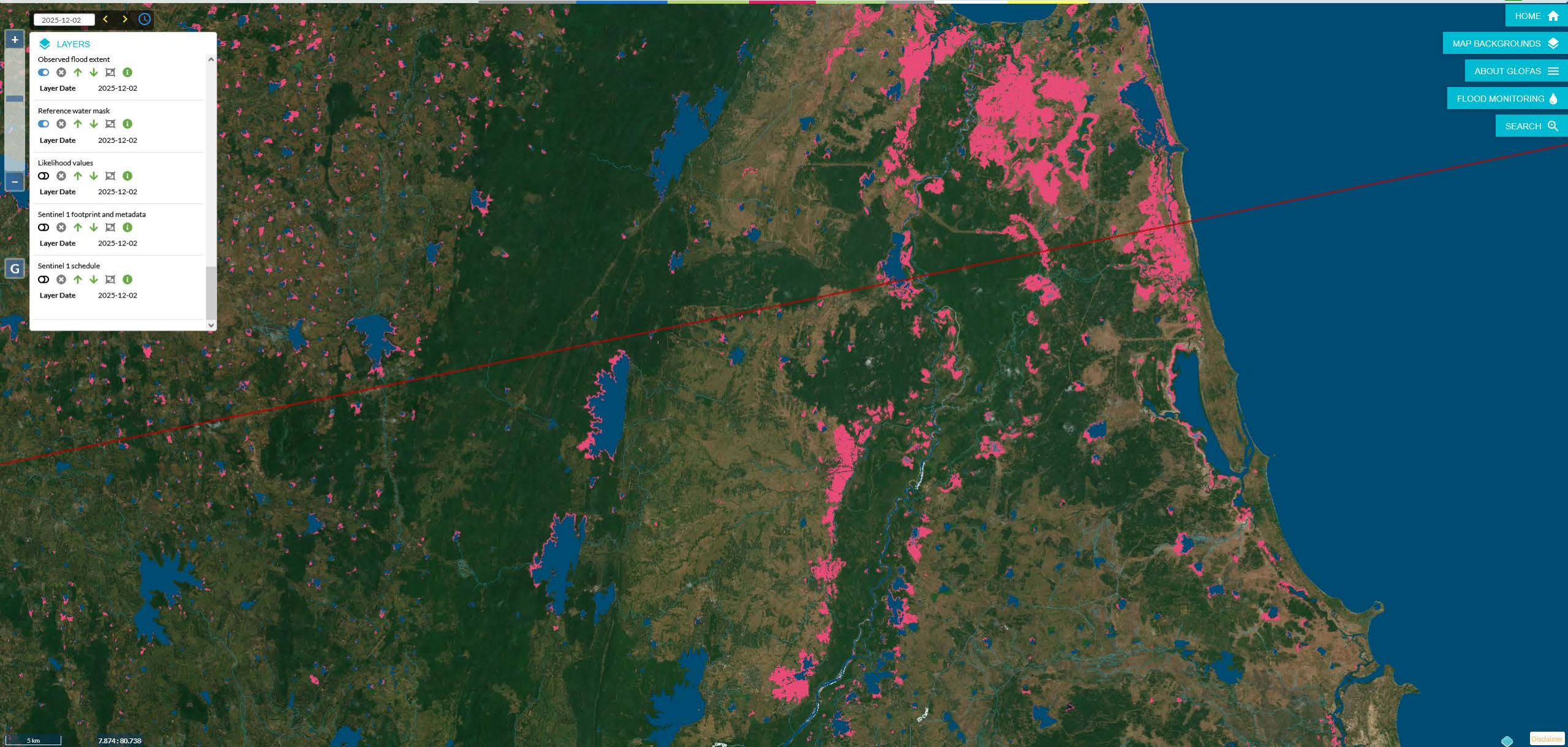
Sentinel 1 footprint and metadata

Layer Date 2025-12-02

---

Sentinel 1 schedule

Layer Date 2025-12-02





# GFM download



## PRODUCTS

Area of Interest (AOI)  
Sri Lanka Test

Filter options ⓘ  
**Load products**

Number of products: 10  
Sort products: Sort products by date descending (default)

Download all products (for user-selected layers) ...  
Download maximum flood extent

- 2025-12-03**  
Sri Lanka Test  
2025-12-03T00:17:08  
[Latest products](#)
- 2025-12-02**  
Sri Lanka Test  
2025-12-02T12:49:22
- 2025-12-02**  
Sri Lanka Test  
2025-12-02T12:48:57
- 2025-12-02**  
Sri Lanka Test  
2025-12-02T12:48:32
- 2025-12-02**  
Sri Lanka Test  
2025-12-02T12:48:02
- 2025-12-02**  
Sri Lanka Test  
2025-12-02T00:24:29
- 2025-12-02**  
Sri Lanka Test  
2025-12-02T00:24:04

