



PROGRAMME OF  
THE EUROPEAN UNION



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European  
Commission



Emergency  
Management

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# GloFAS for Global Flood Monitoring - GFM

**Peter Salamon**  
**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

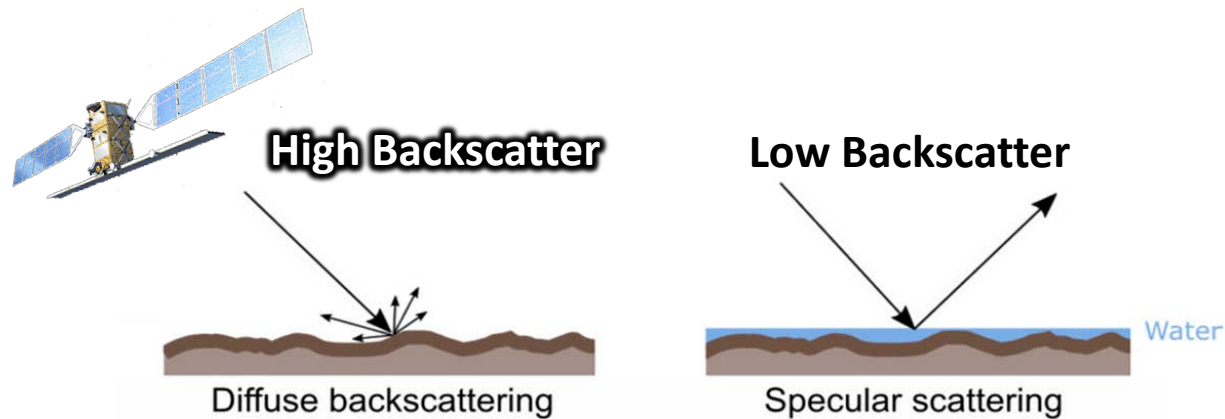
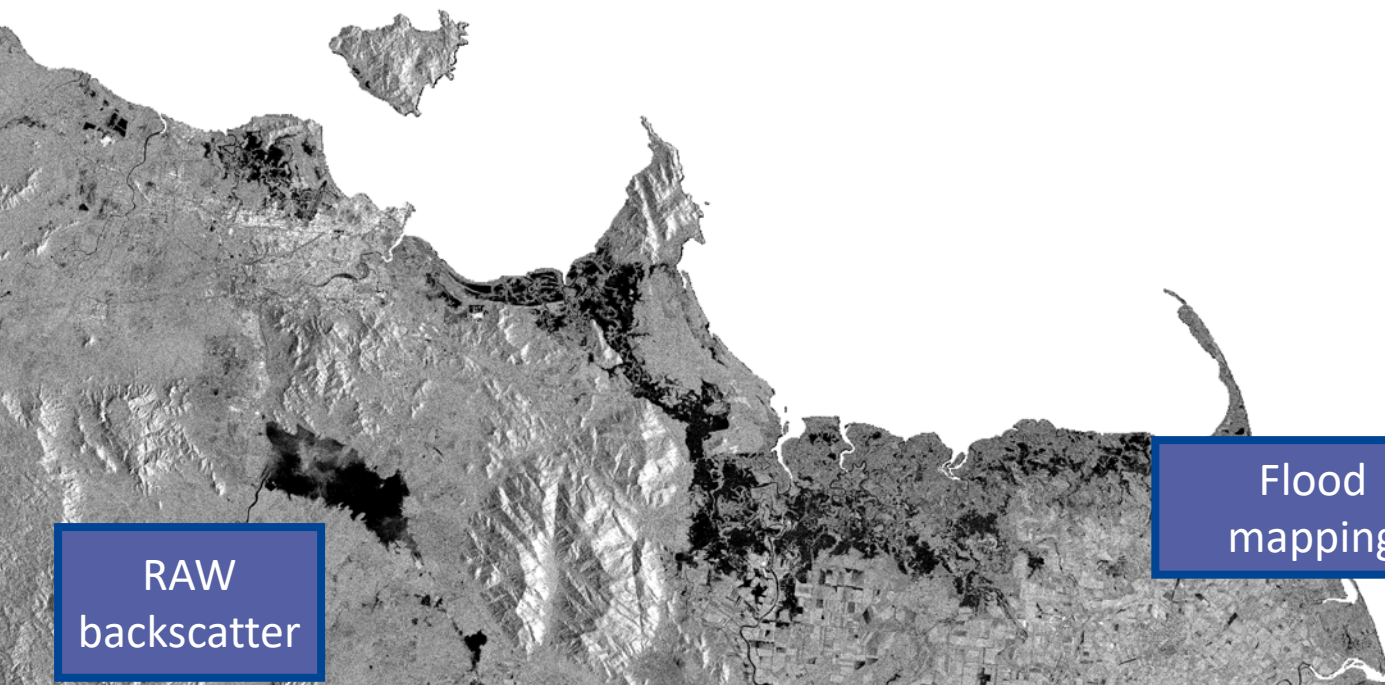


Figure modified from Ottinger and Kuenzer (2020) Spaceborne L-Band Synthetic Aperture Radar Data for Geoscientific Analyses in Coastal Land Applications: A Review, Remote Sensing, 12(14).



Flood  
mapping





# 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





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# GFM in GloFAS



The screenshot displays the GloFAS web interface. At the top, there is a navigation bar with tabs: INITIAL CONDITIONS, METEOROLOGICAL, HYDROLOGICAL, FLOOD RISK, EVALUATION, MONITORING, and EXTERNAL WMS. The MONITORING tab is currently selected. On the left side, there is a 'MESSAGES' button and a map zoom control. The main area shows a world map. On the right side, there are buttons for HOME, MAP BACKGROUNDS, ABOUT GLOFAS, FLOOD MONITORING, and a SEARCH button. A red rounded rectangle highlights the 'MONITORING' menu, which lists the following items:

- 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

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' button.

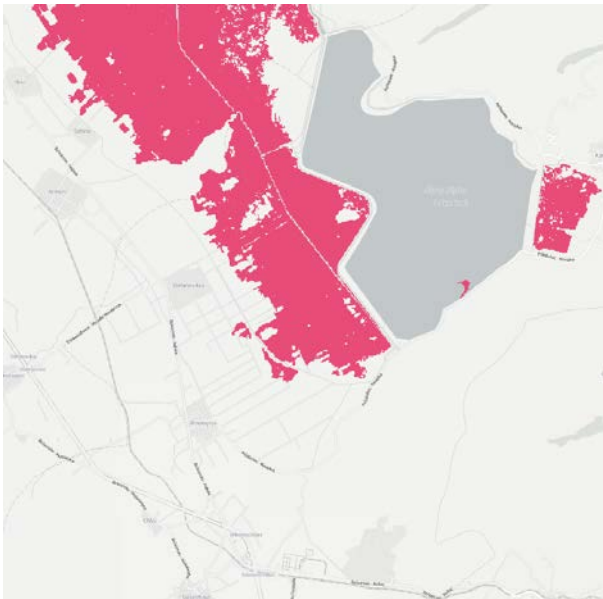




# Product output layers – Water observations

## S-1 observed flood extent

Ensemble flood extent



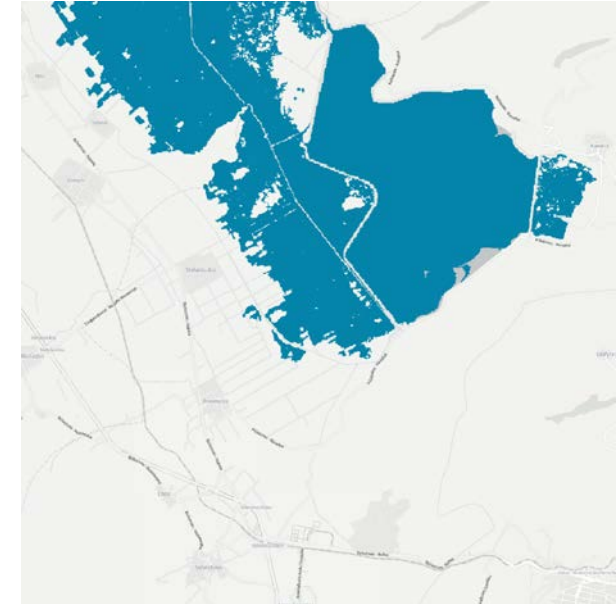
## S-1 reference water mask

Permanent & seasonal water extent



## S-1 observed water extent

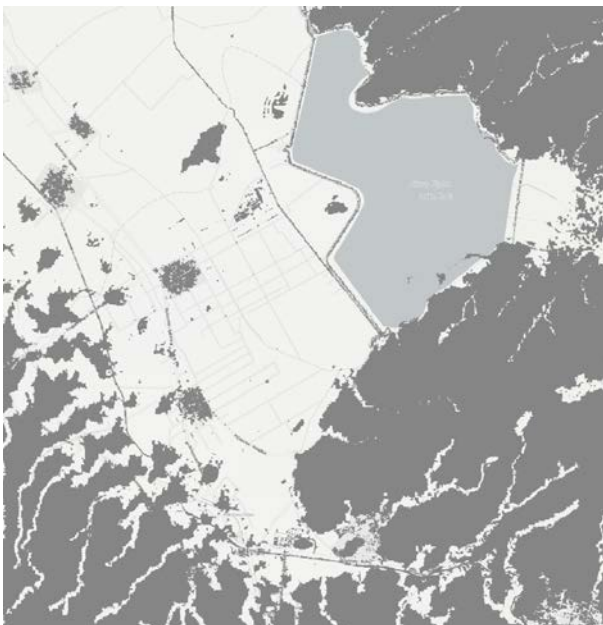
Open water extent, as combined from flood and reference waters



# Product output layers – Contextual information

## Exclusion mask

Exclusion mask where S1 flood delineation is hampered



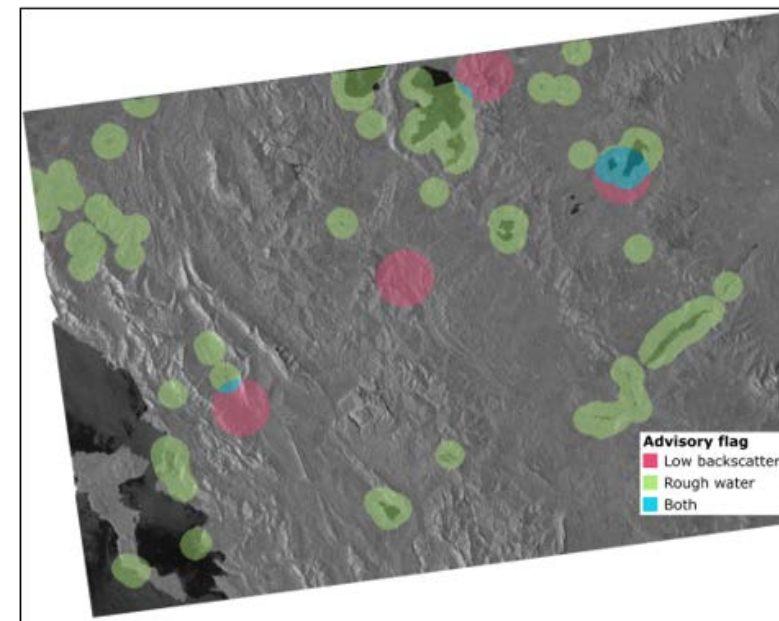
## Likelihood values

Likelihood values accounting for classification confidence



## Advisory flags

Advisory flags indicating challenging classification circumstances



# Product output layers – Metadata & Context

## Affected Landcover/Population

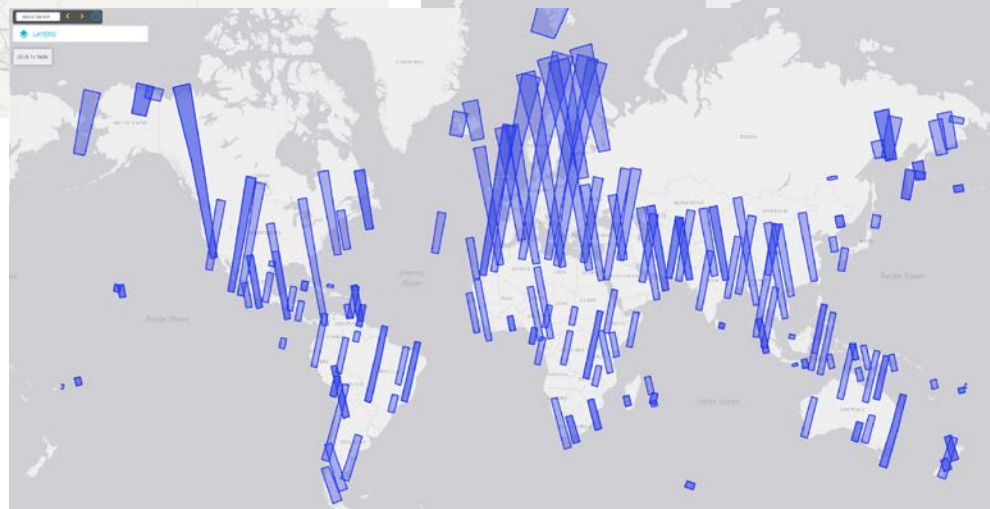
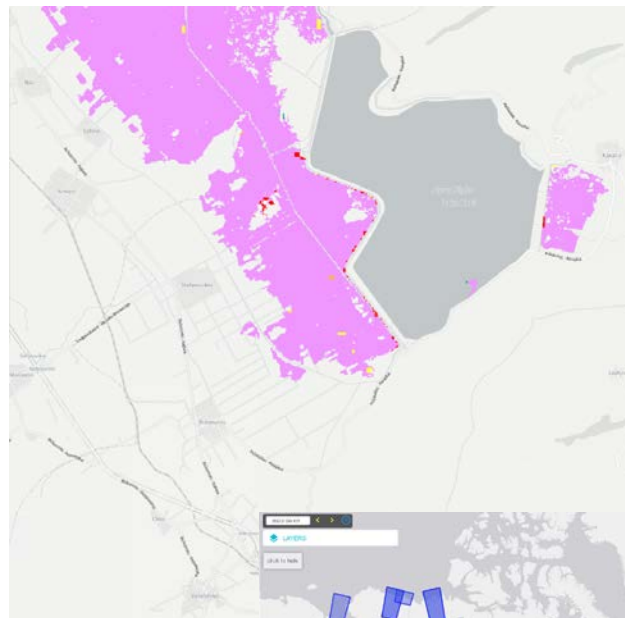
GlobCover/CORINE Land Cover  
GHSL (Global Human Settlement Layer)

## 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

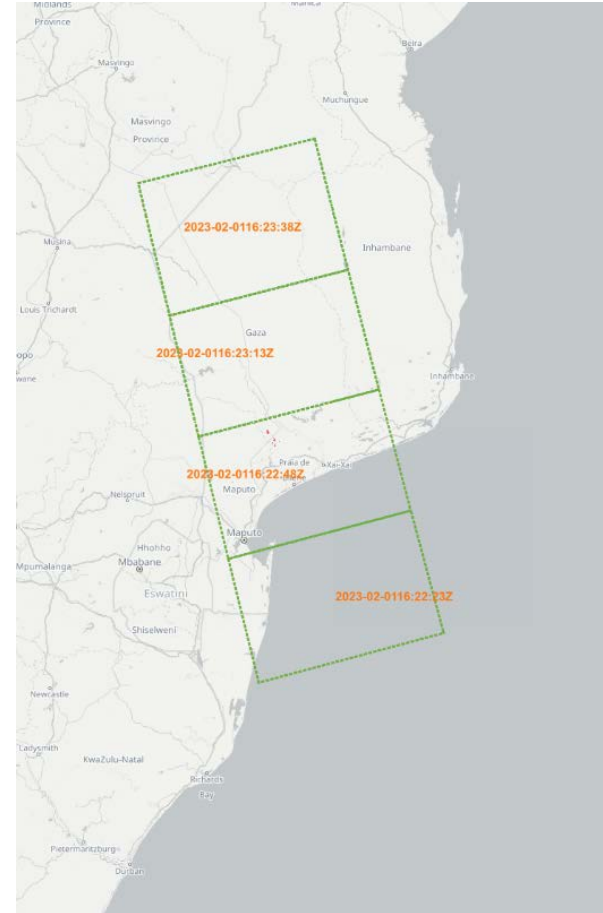
■ Floodwater

## Observed Flood Extent Footprint

⋯ Flooding detected — unusually high amount and flooded area  $\geq 2 \text{ km}^2$

⋯ Flooding detected — not unusually high amount, or flooded area  $< 2 \text{ km}^2$

⋯ Flooding detected — unknown significance (incomplete SAR time-series)



1<sup>st</sup> February 2023



9<sup>th</sup> March 2023





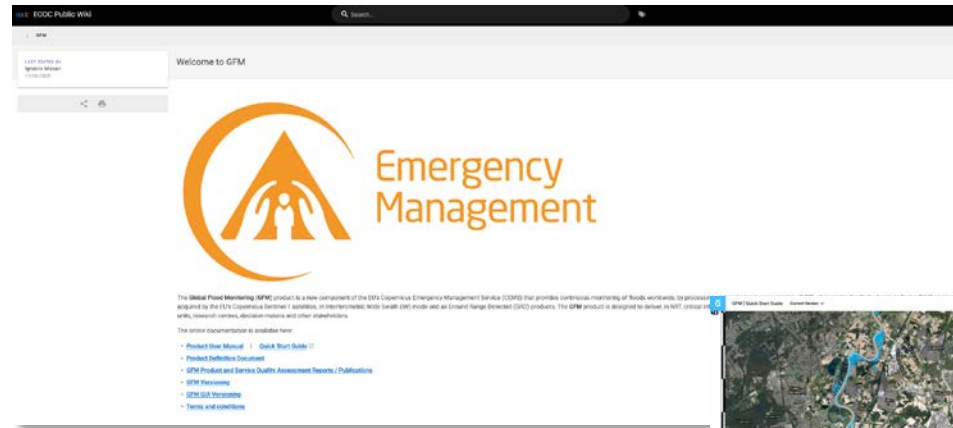
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# User Support

- GFM Wiki ([extwiki.eodc.eu/GFM](https://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](https://portal.gfm.eodc.eu)



ISBN 1831-9424

## Global Flood Monitoring - Annual Product and Service Quality Assessment Report 2024

Senoussi, M., Pook, A., Godey, C., Trumbach, F., Bittner, M., Wernke, C., Stach, T., Klotz, H., Moosmann, N., Salomon, P.

2025

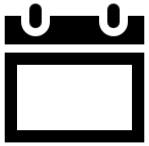
Copernicus Emergency Management Service



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# Monitoring the recent floods in Sri Lanka

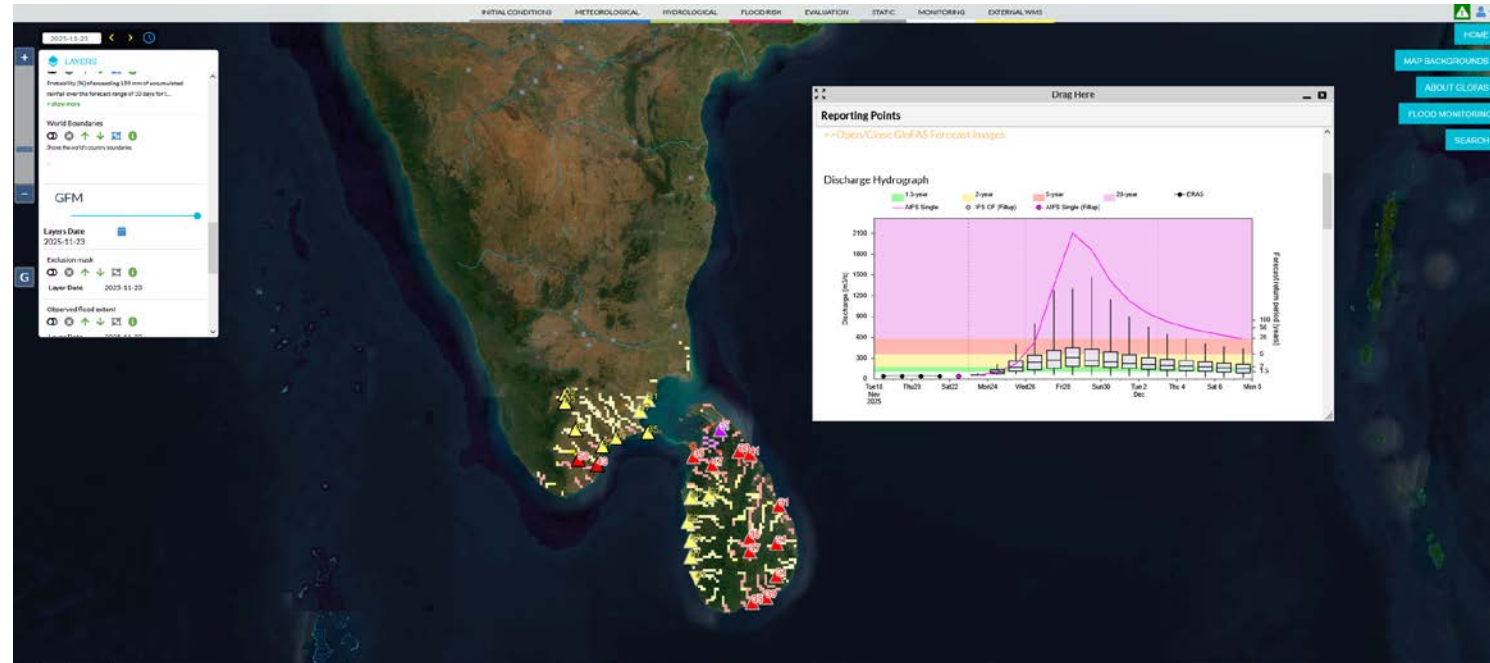


- It is the **23 of November 2025**
- You have checked the **flood forecasting**
- You identified a potentially **severe** flood forecasts

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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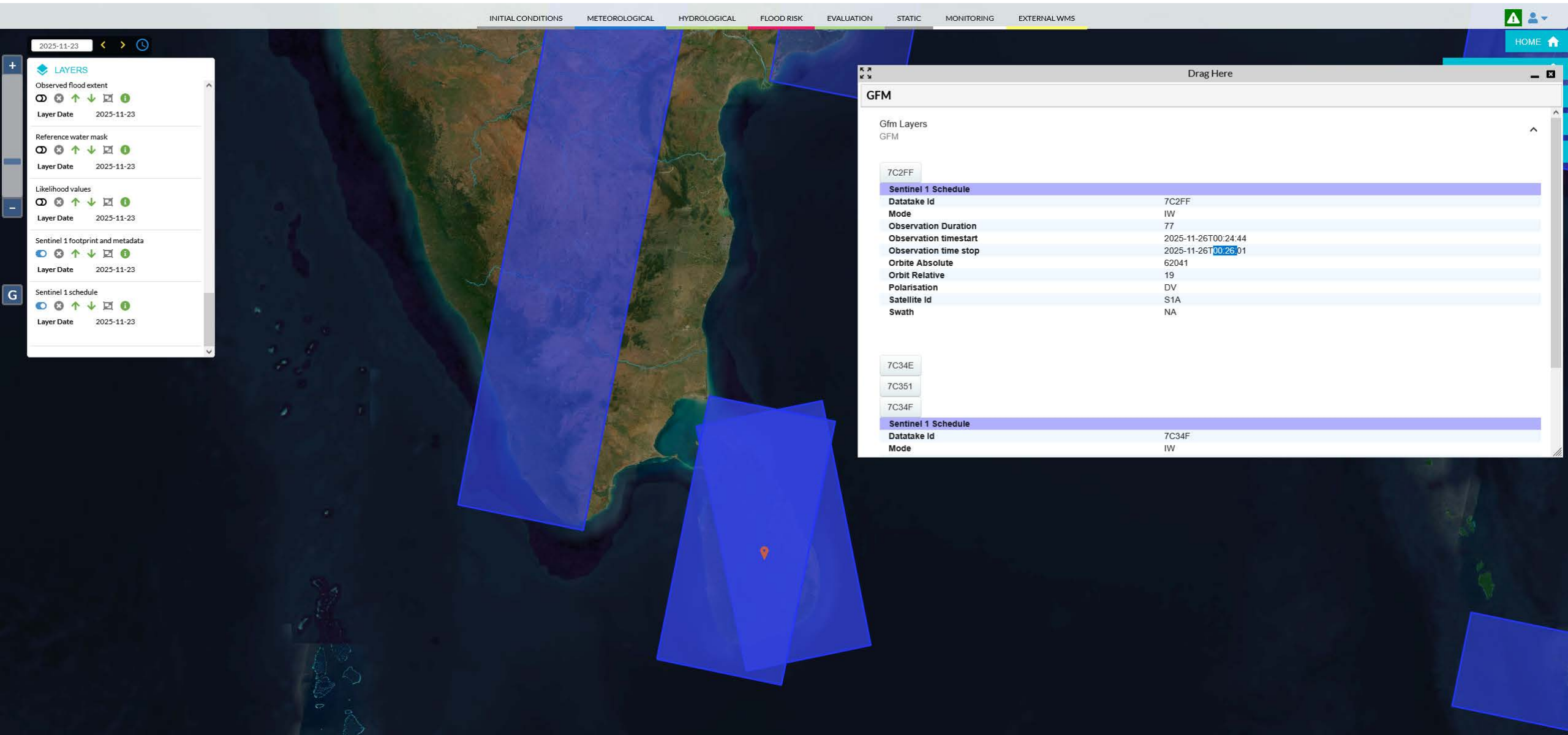




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# 23 November

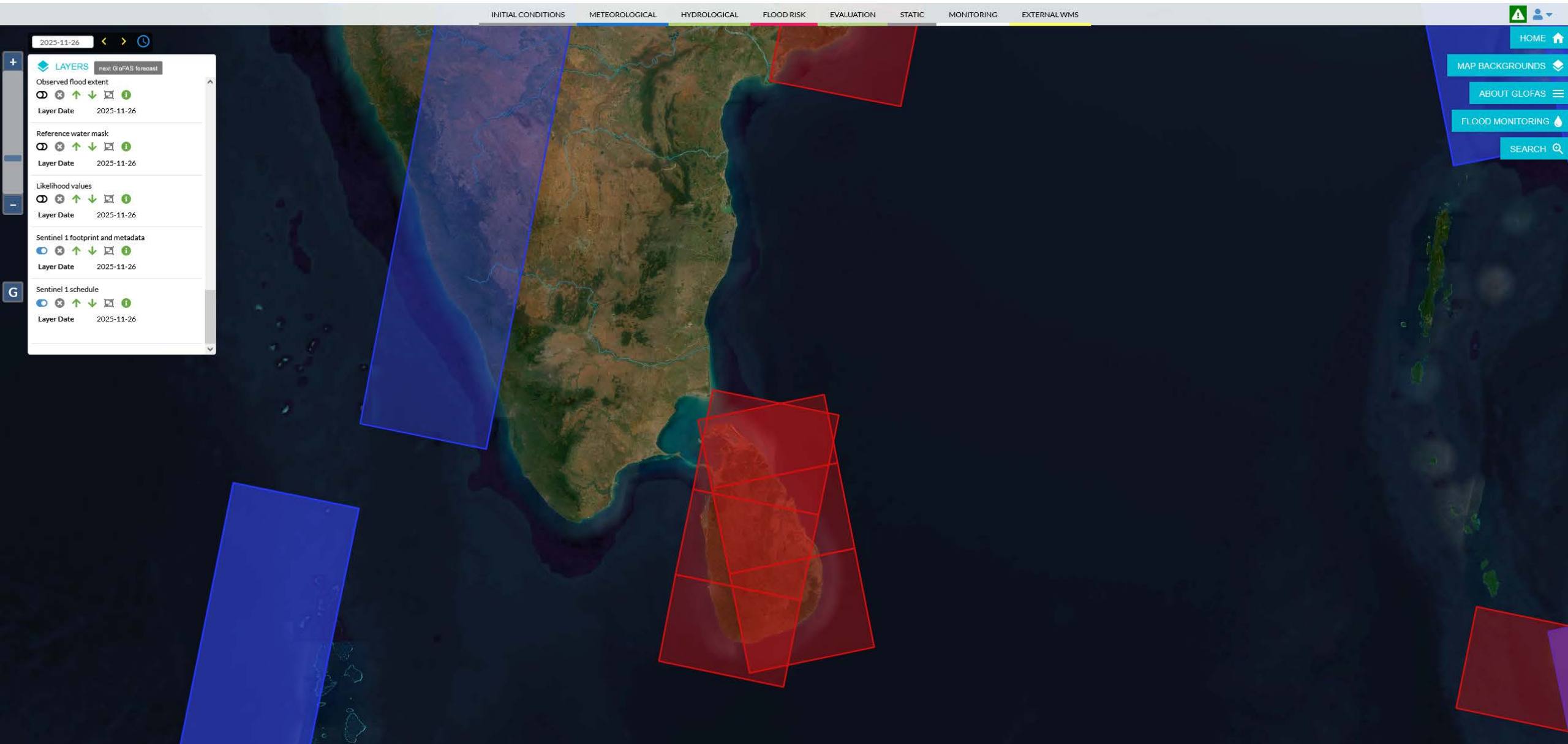




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# 26 November







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# 26 November



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



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

Gal Oya

2025-11-2612:49:16Z

2025-11-2600:25:40Z

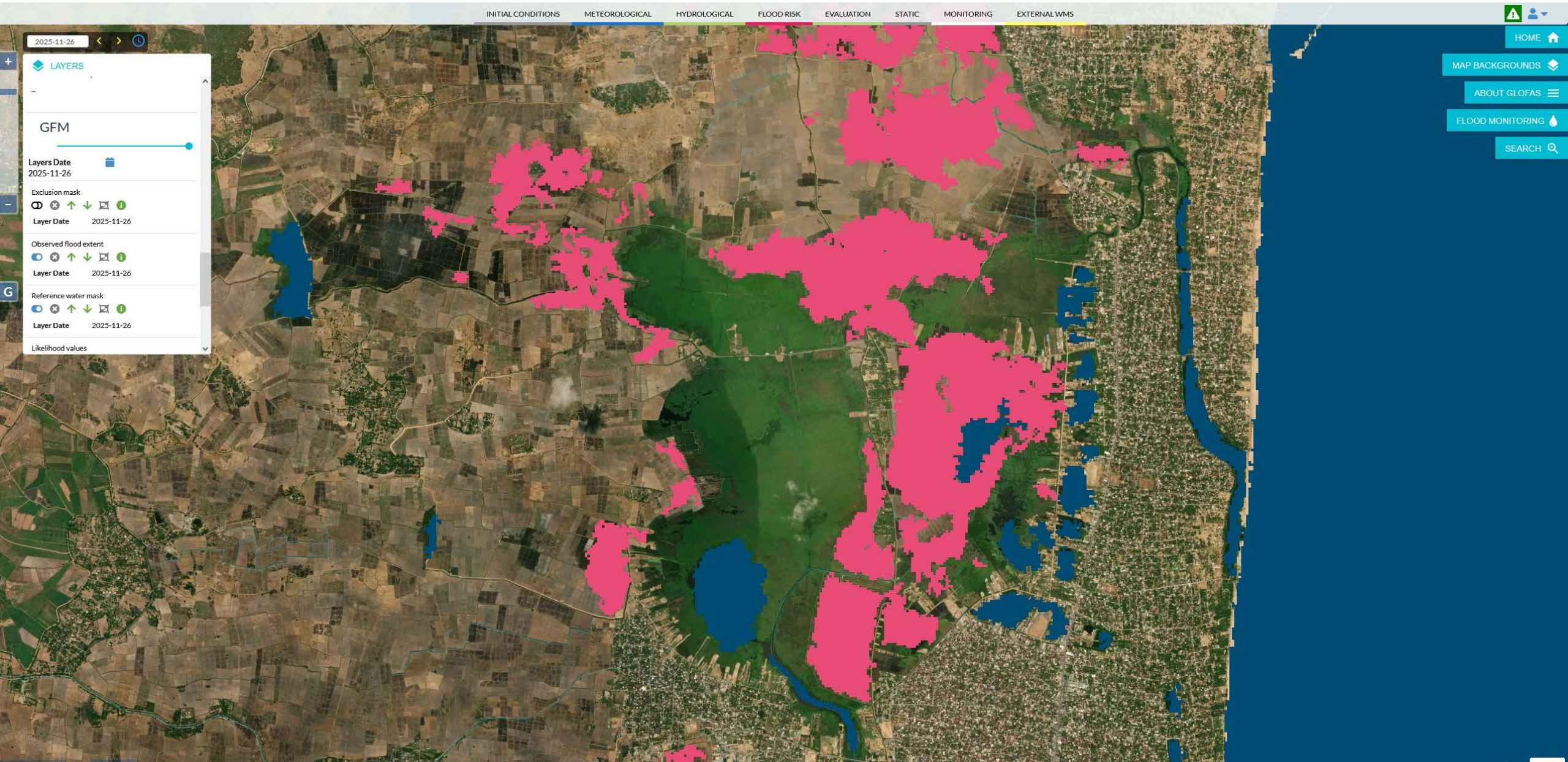




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# 26 November







#EUSpace



# 30 November



INITIAL CONDITIONS   METEOROLOGICAL   HYDROLOGICAL   FLOOD RISK   EVALUATION   STATIC   MONITORING   EXTERNAL WMS

2025-11-30

LAYERS

next GloFAS forecast

GFM

Layers Date

2025-11-30

Exclusion mask

Layer Date 2025-11-30

Observed flood extent

Layer Date 2025-11-30

Reference water mask

Layer Date 2025-11-30

Likelihood values



HOME

MAP BACKGROUNDS

ABOUT GLOFAS

FLOOD MONITORING

SEARCH



Disclaimer





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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

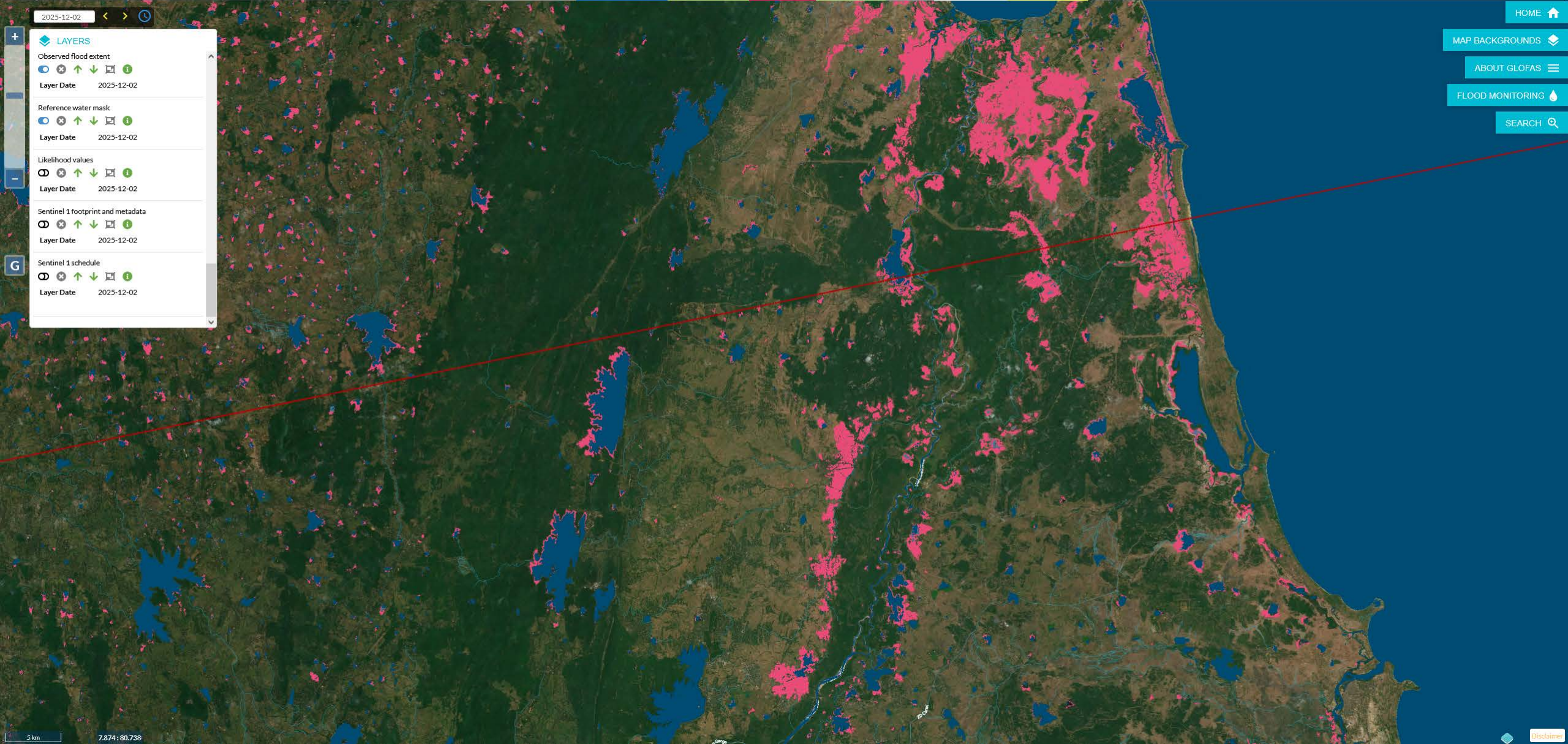
Observed flood extent  
 Layer Date 2025-12-02

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





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# GFM download



AOI

Products

Notification Manager

GloFAS Portal

EFAS Portal



## 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

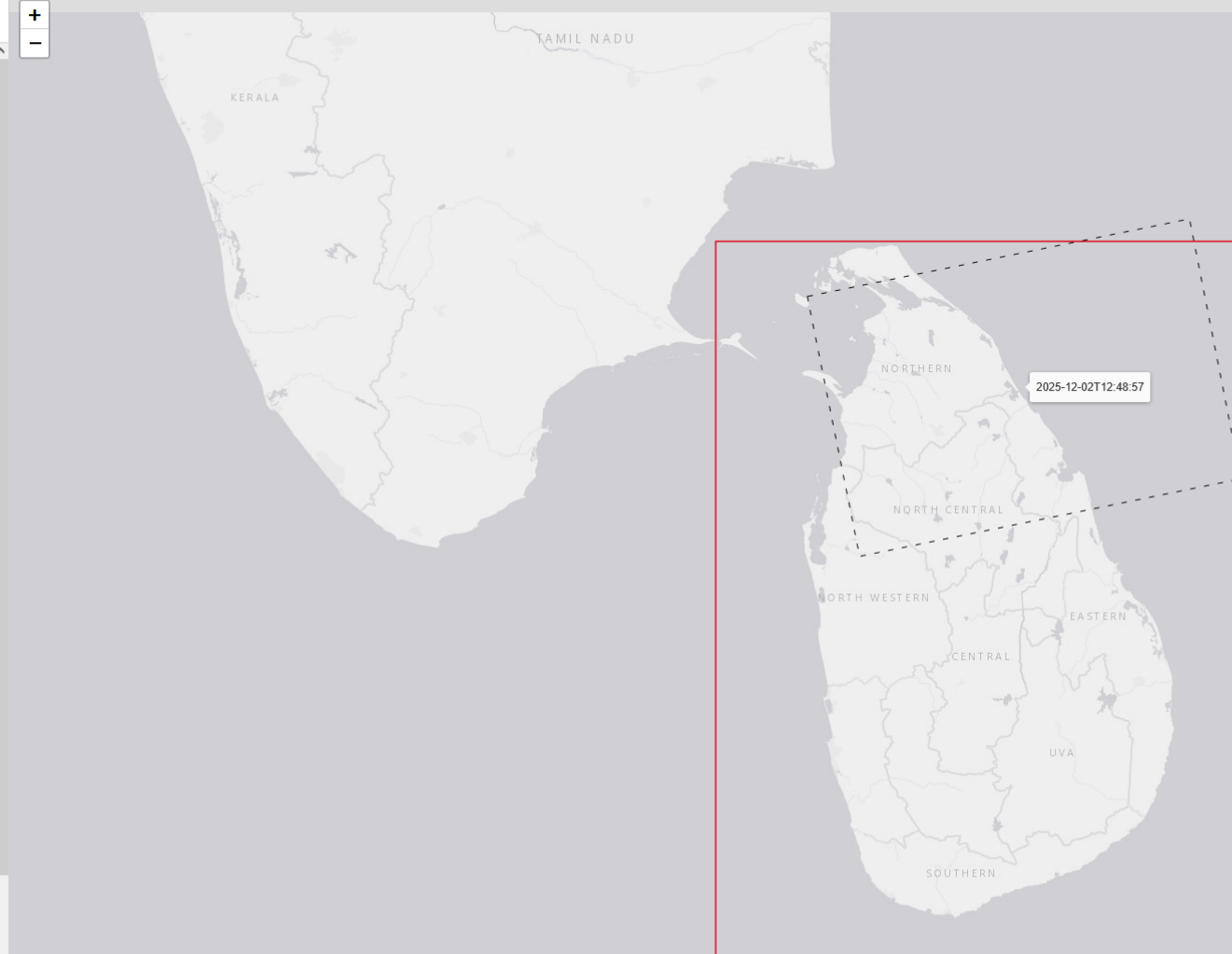
Sri Lanka Test  
2025-12-02T12:48:02

2025-12-02

Sri Lanka Test  
2025-12-02T00:24:29

2025-12-02

Sri Lanka Test  
2025-12-02T00:24:04



50 km  
30 mi