



PROGRAMME OF  
THE EUROPEAN UNION

**Copernicus**  
Europe's eyes on Earth

Implemented by  
 European  
Commission

 Emergency  
Management

#EUSpace

# 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

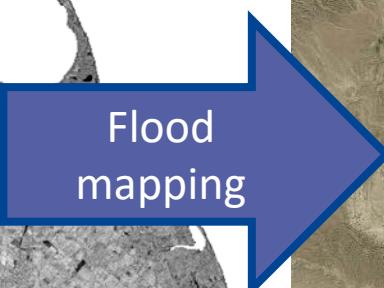
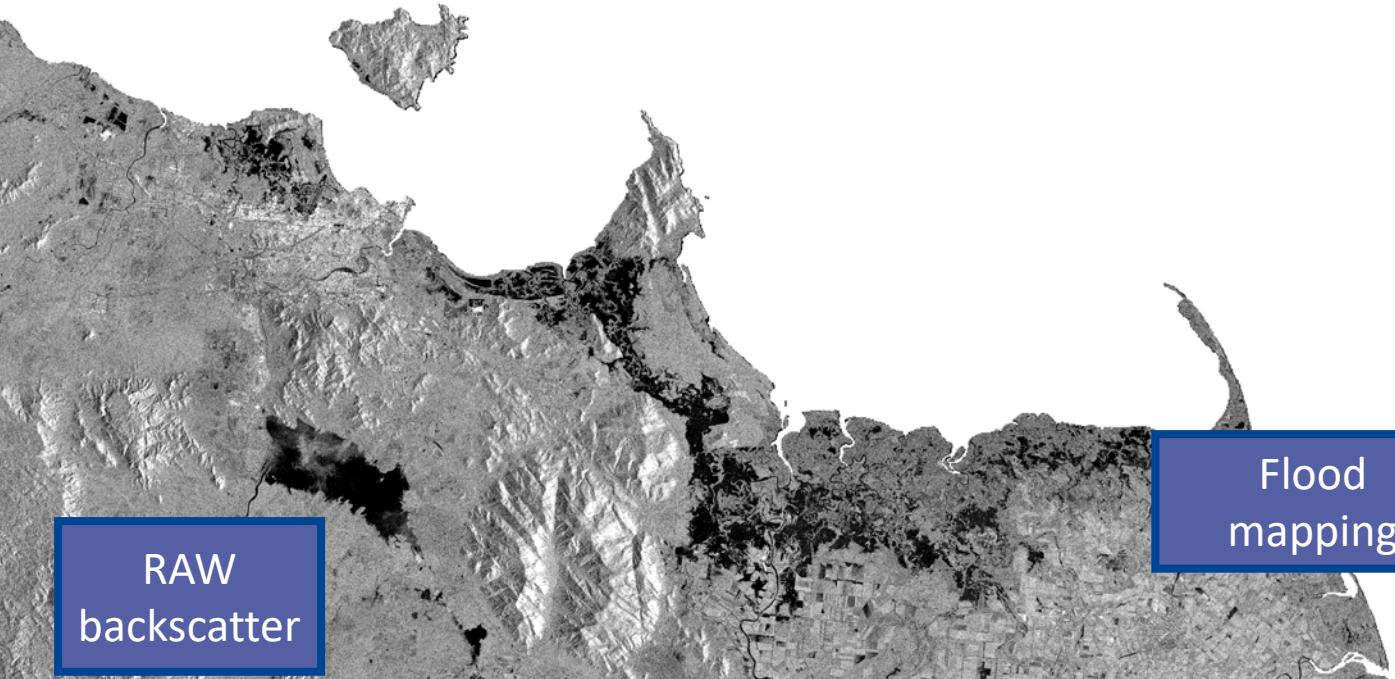
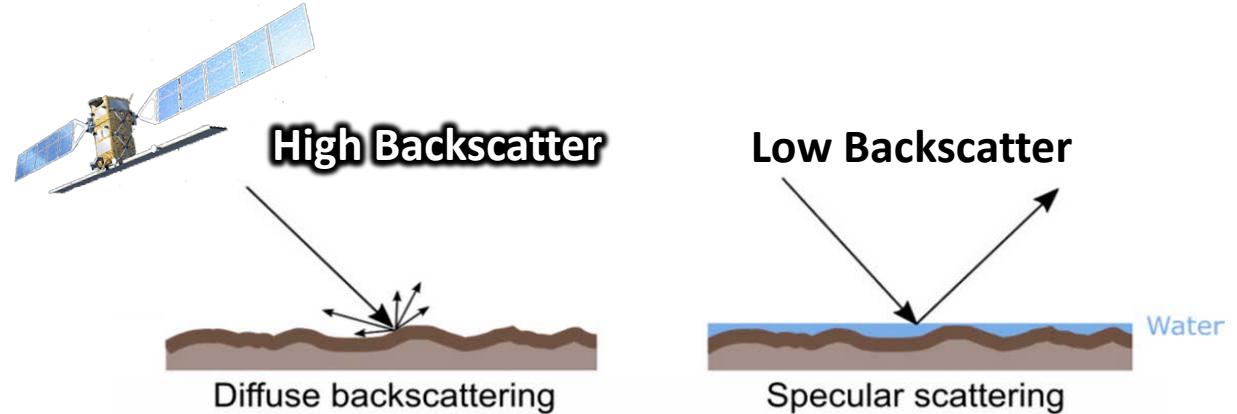


Figure modified from Ottinger and Kuenzer (2020) Spaceborne L-Band Synthetic Aperture Radar Data for Geoscientific Analyses in Coastal Land Applications: A Review, *Remote Sensing*, 12(14).



# 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





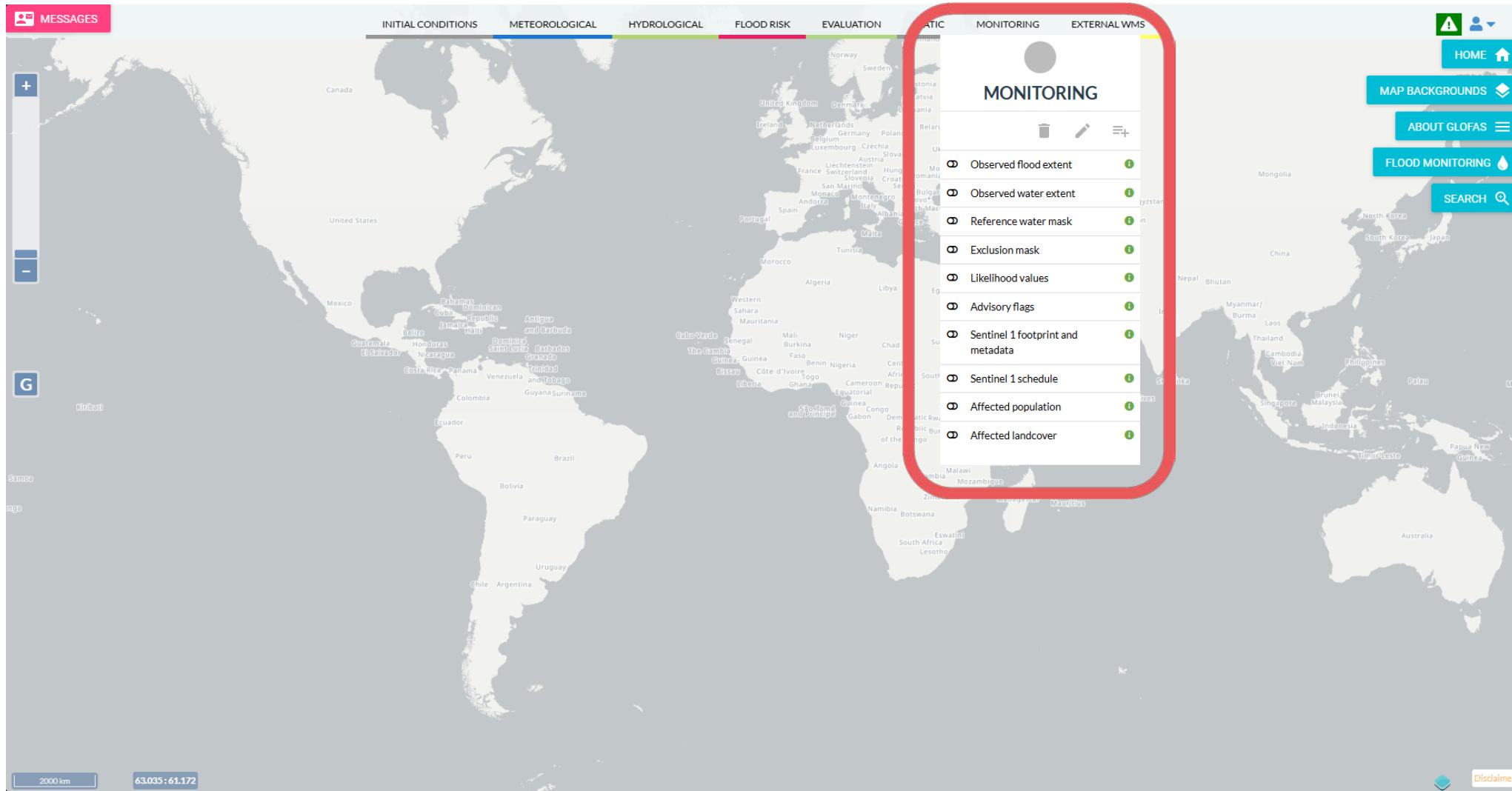
#EUSpace



# How to visualize GFM in GloFAS webviewer



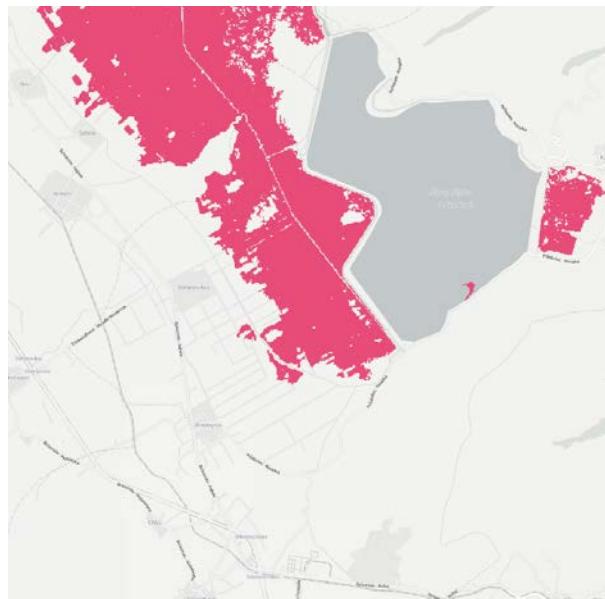
# GFM in GloFAS



# Product output layers – Water observations

## S-1 observed flood extent

Ensemble flood extent



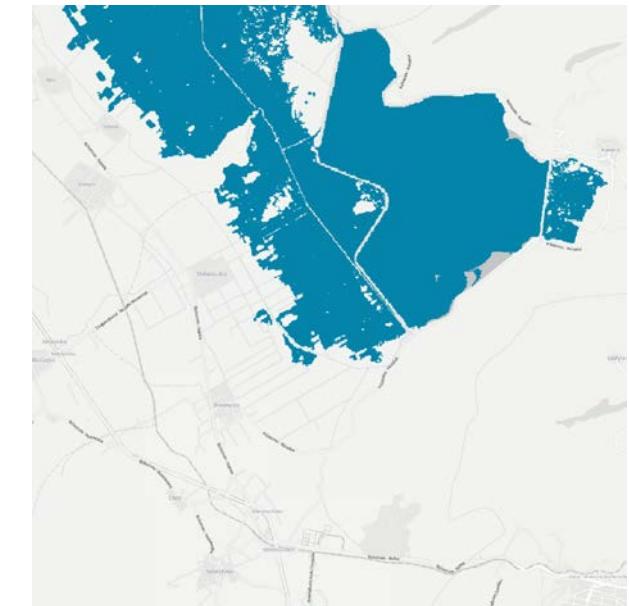
## S-1 reference water mask

Permanent & seasonal water extent



## S-1 observed water extent

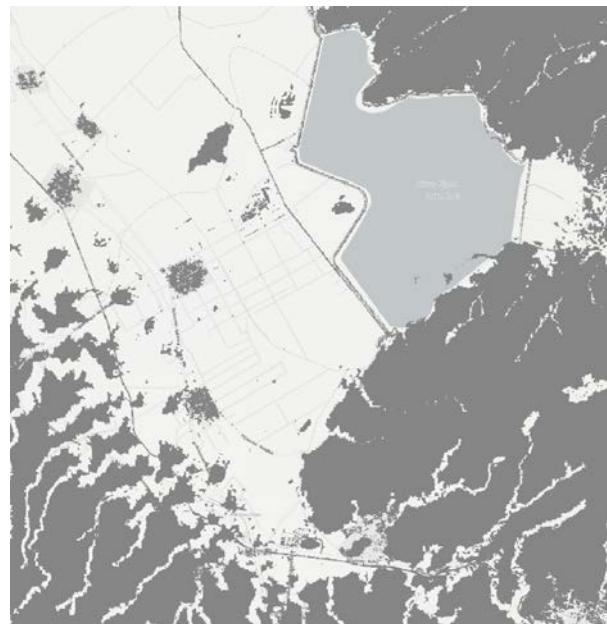
Open water extent, as combined from flood and reference waters



# Product output layers – Contextual information

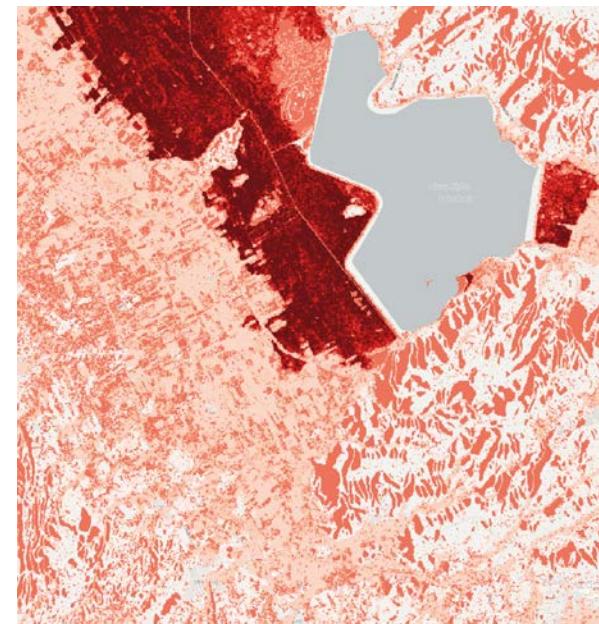
## Exclusion mask

Exclusion mask where S1 flood delineation is hampered



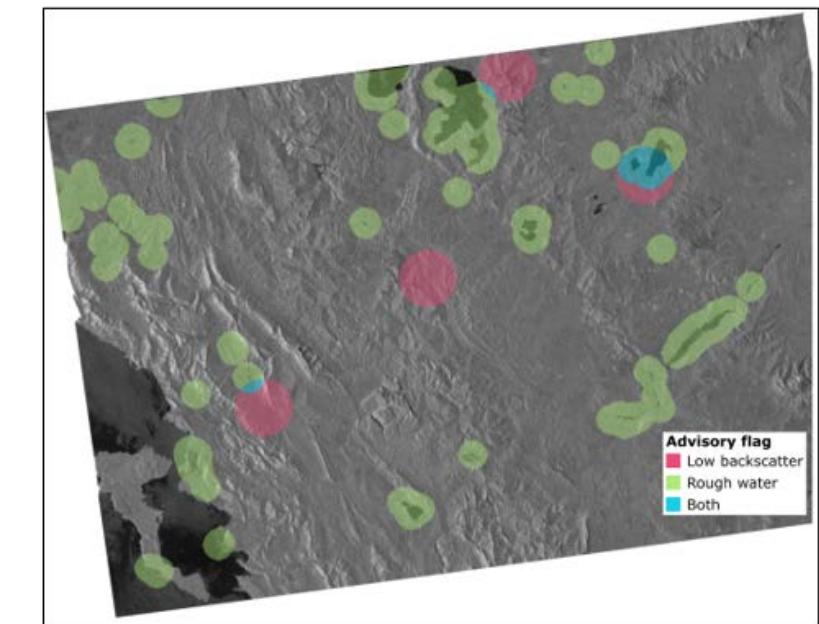
## Likelihood values

Likelihood values accounting for classification confidence



## Advisory flags

Advisory flags indicating challenging classification circumstances

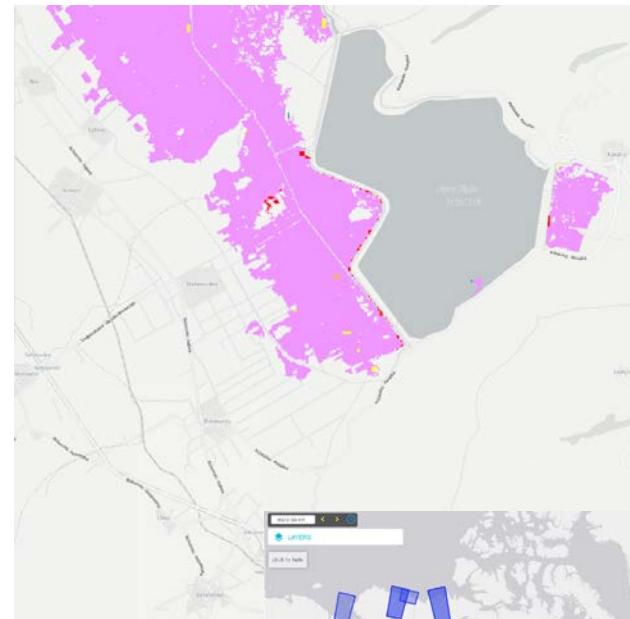




# Product output layers - Metadata & Context

## Affected Landcover/Population

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



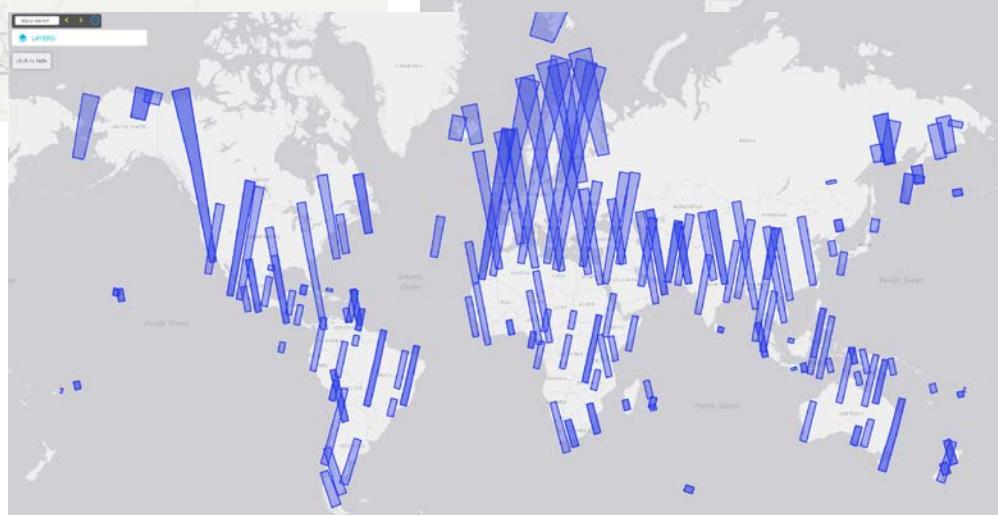
## S-1 Footprint + Metadata

S-1 orbit footprint boundary for a specific day



## S-1 Schedule

S-1 orbit overflight boundaries for the next 3 days



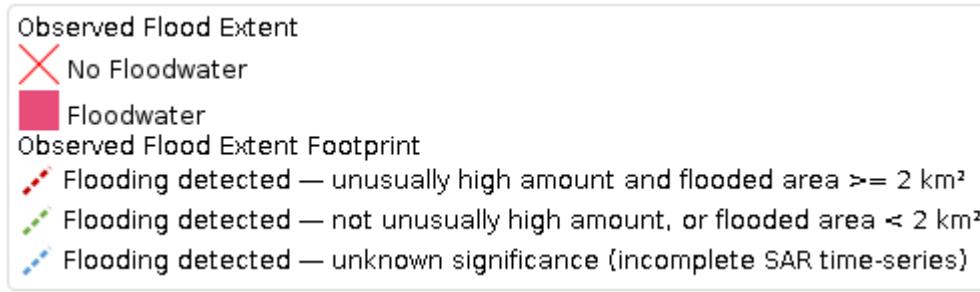


# Observe flooded areas





# Observe flooded areas



1<sup>st</sup> February 2023

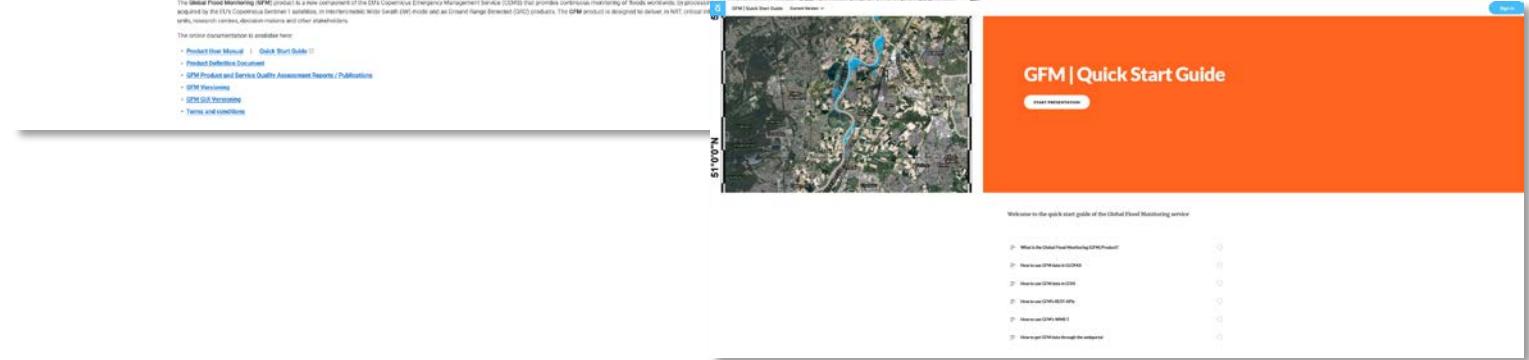


9<sup>th</sup> March 2023

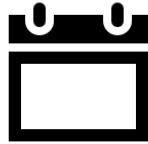


# User Support

- 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)



# Monitoring the recent floods in Sri Lanka

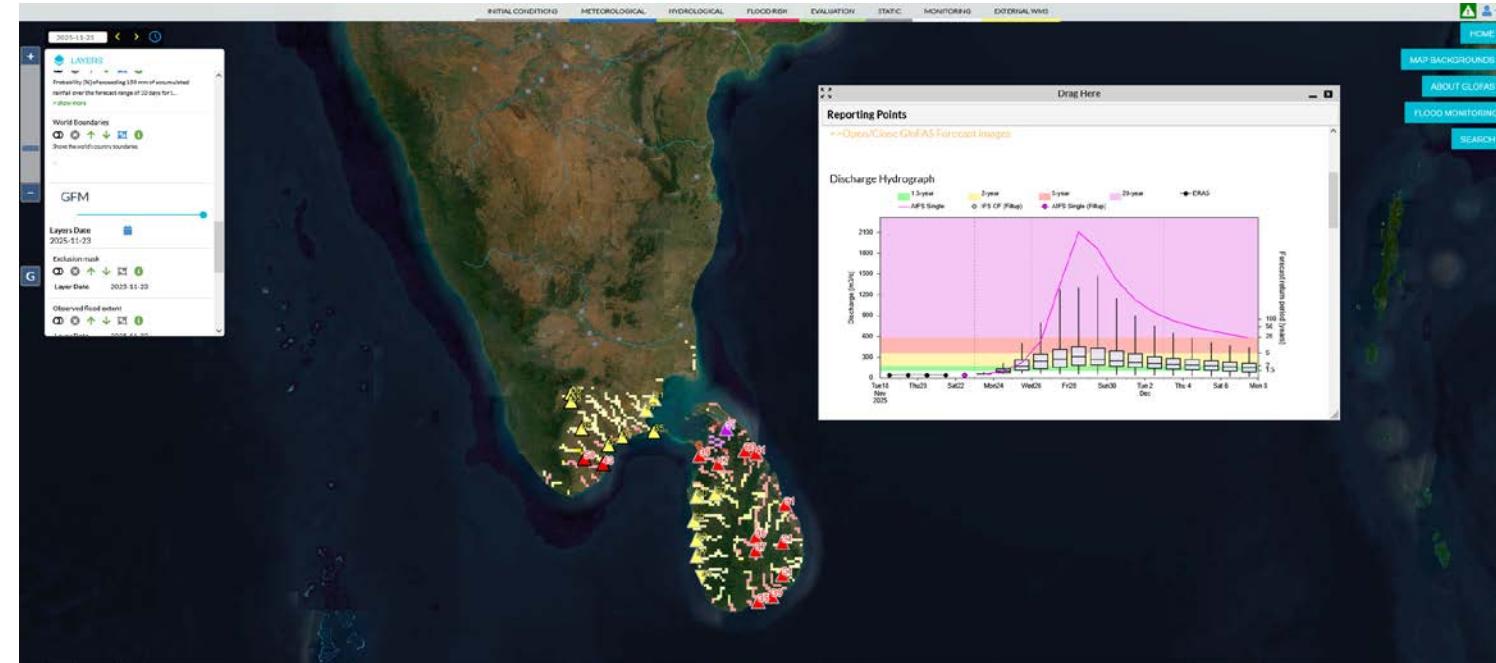


- It is the **23 of November 2025**
- You have checked the **flood forecasting**
- You identified a potentially **severe** flood forecasts

Is there already some flooding ongoing?

When will be the next satellite image available?

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





# Thank you



© European Union 2025

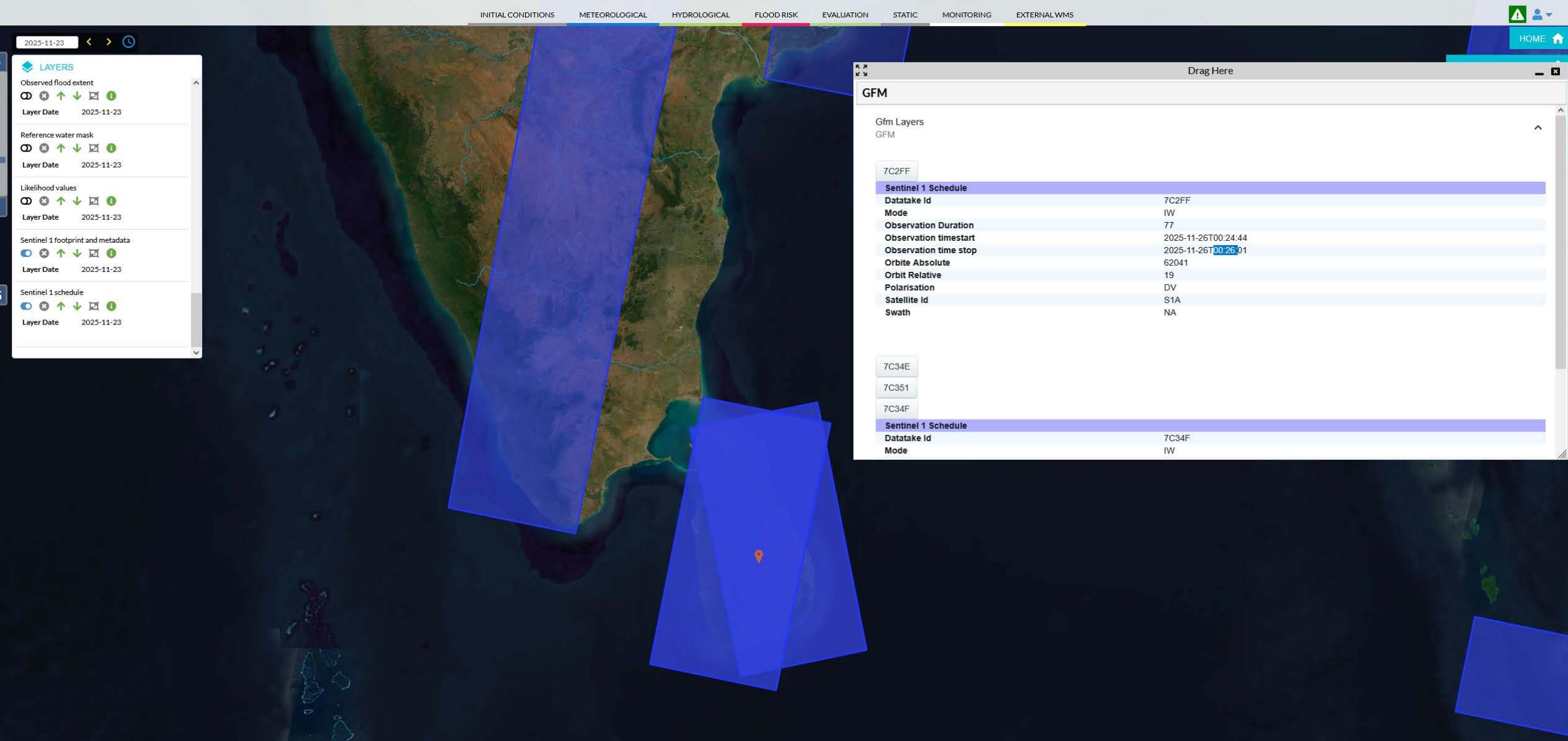
Unless otherwise noted the reuse of this presentation is authorised under the [CC BY 4.0](#) license. For any use or reproduction of elements that are not owned by the EU, permission may need to be sought directly from the respective right holders.



#EUSpace



23 November

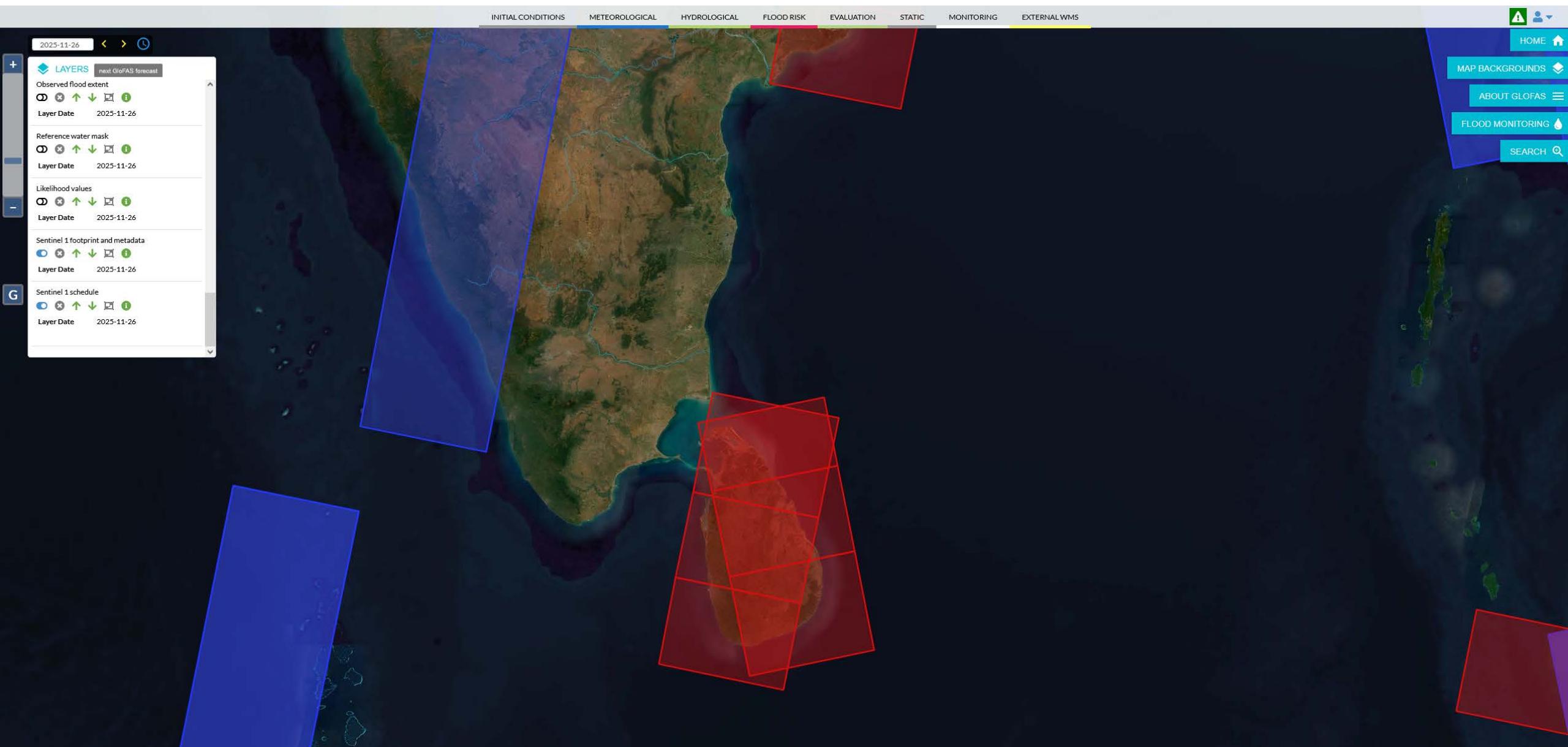




#EUSpace



26 November

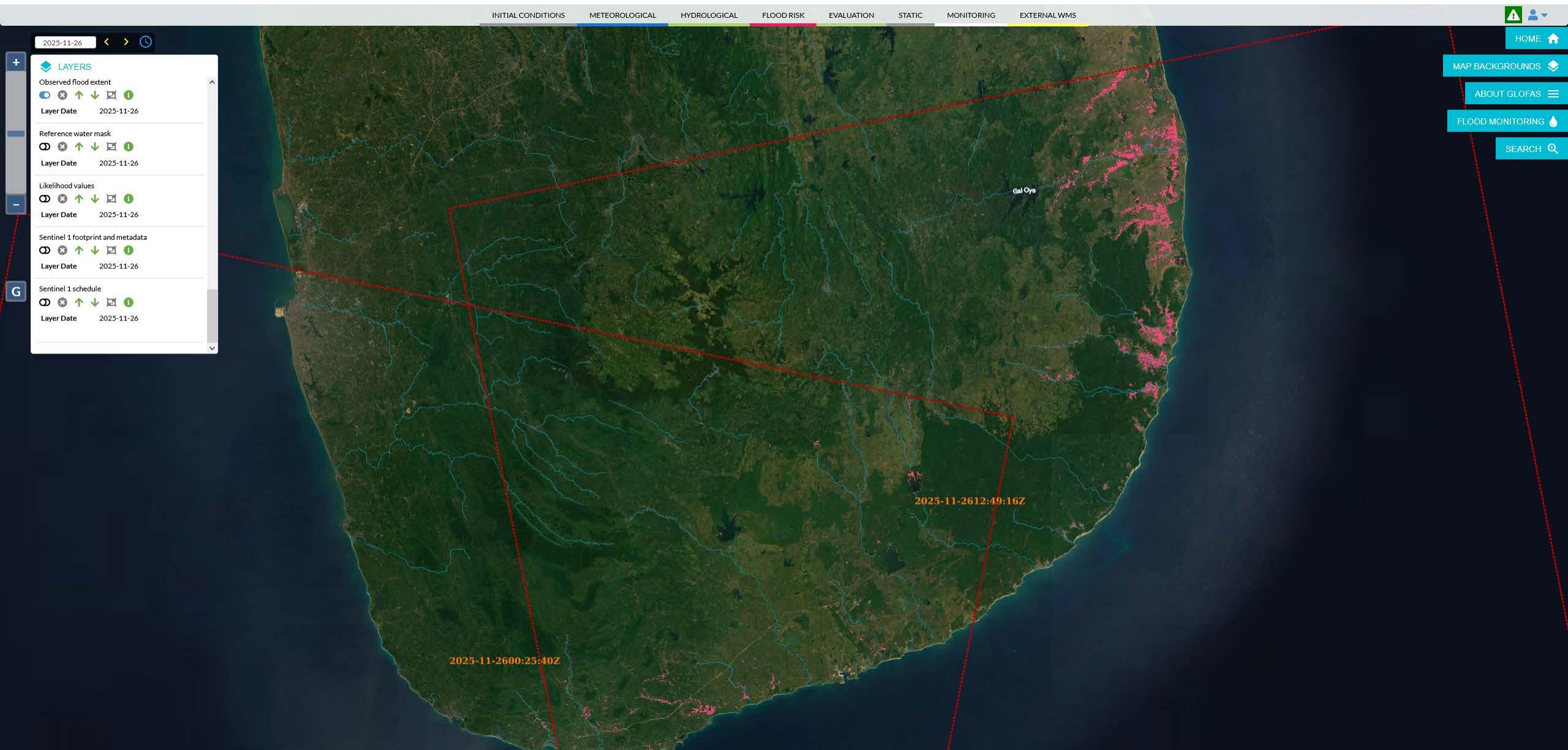




#EUSpace



26 November



2025-11-26



## LAYER

Observed flood extent



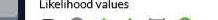
Layer Date 2025-11-26

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

INITIAL CONDITIONS

METEOROLOGICAL

HYDROLOGICAL

FLOOD RISK

EVALUATION

STATIC

MONITORING

EXTERNAL WMS



HOME

MAP BACKGROUNDS

ABOUT GLOFAS

FLOOD MONITORING

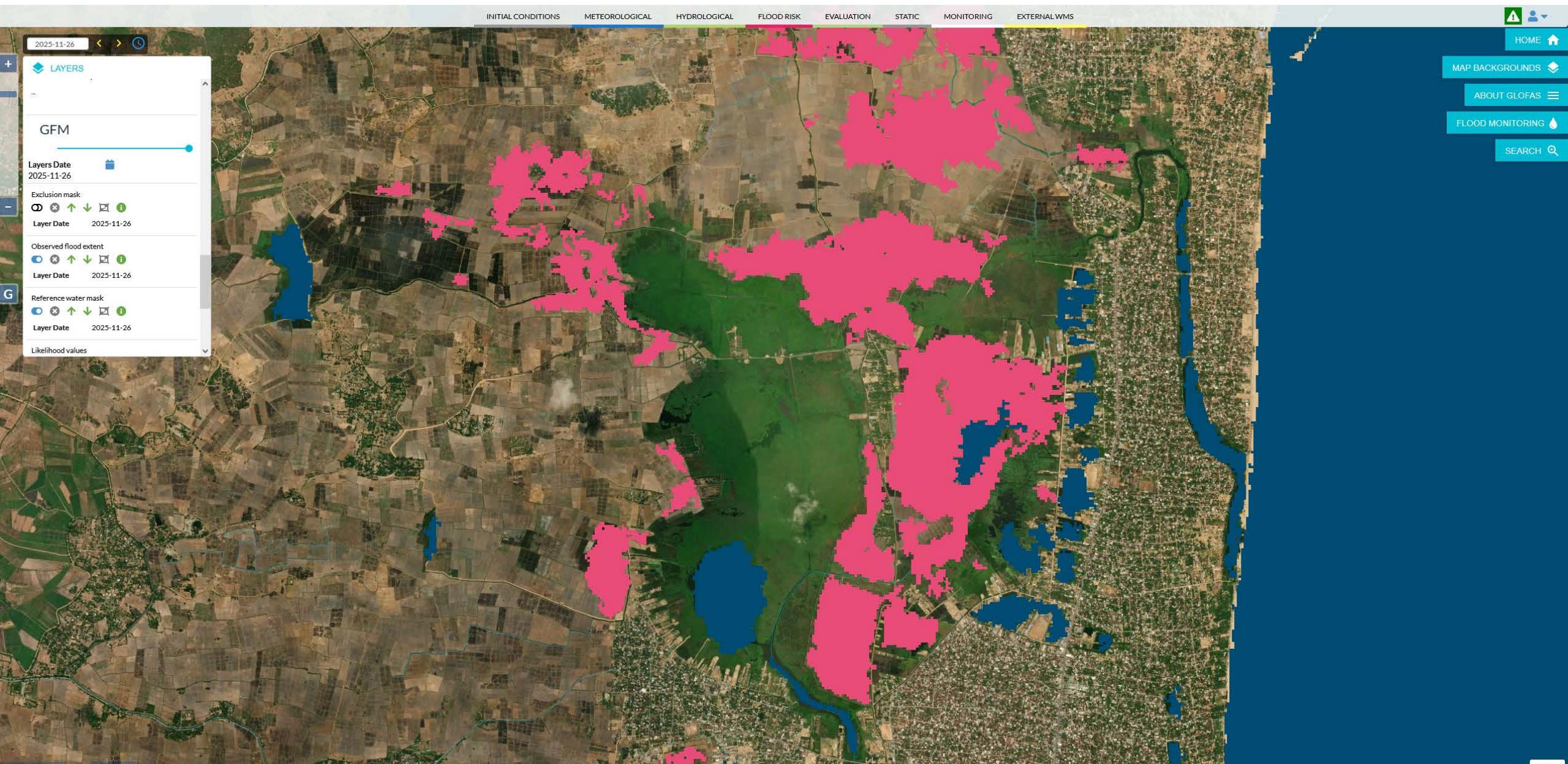
SEARCH



#EUSpace



26 November

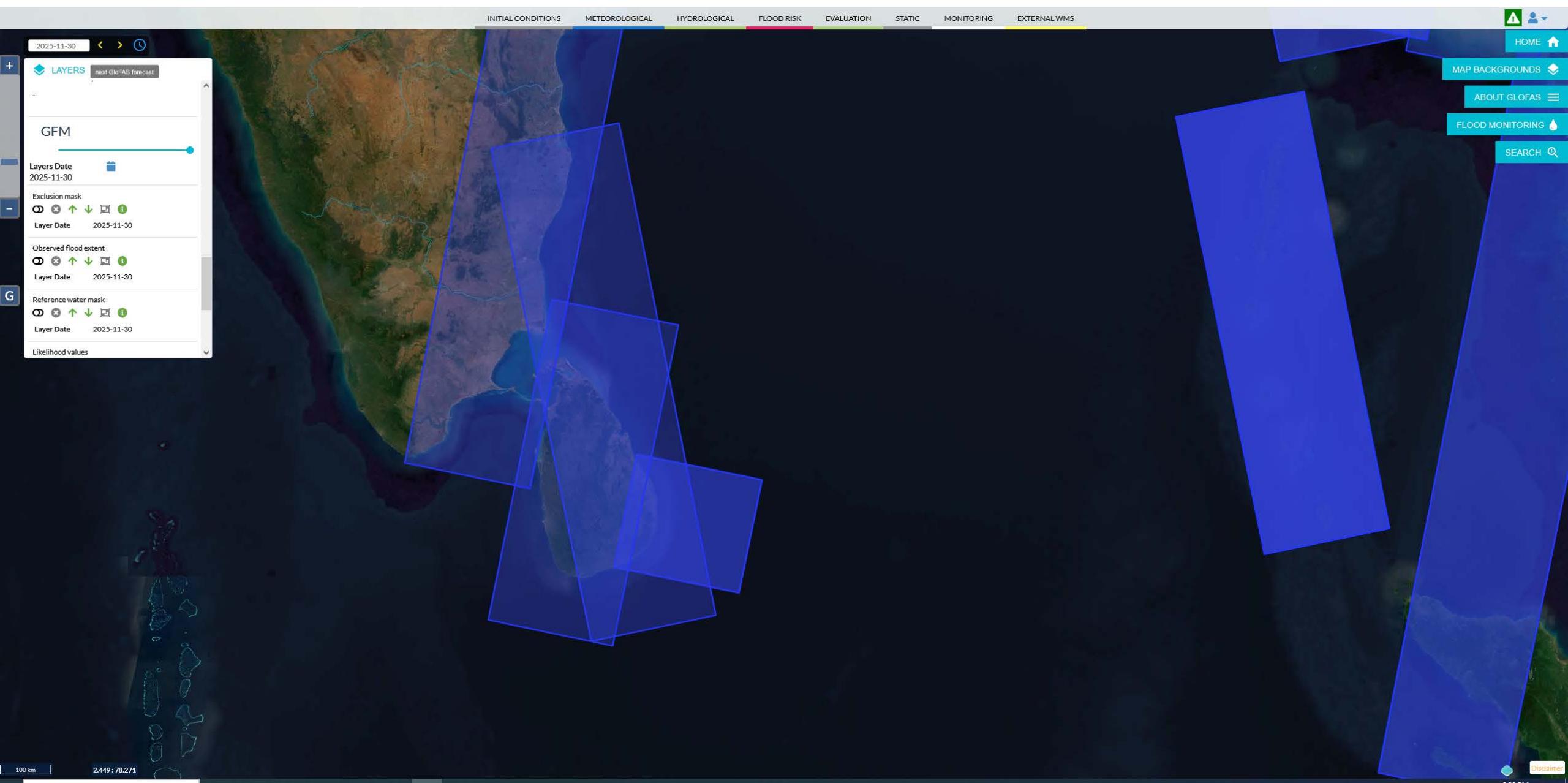




#EUSpace



30 November

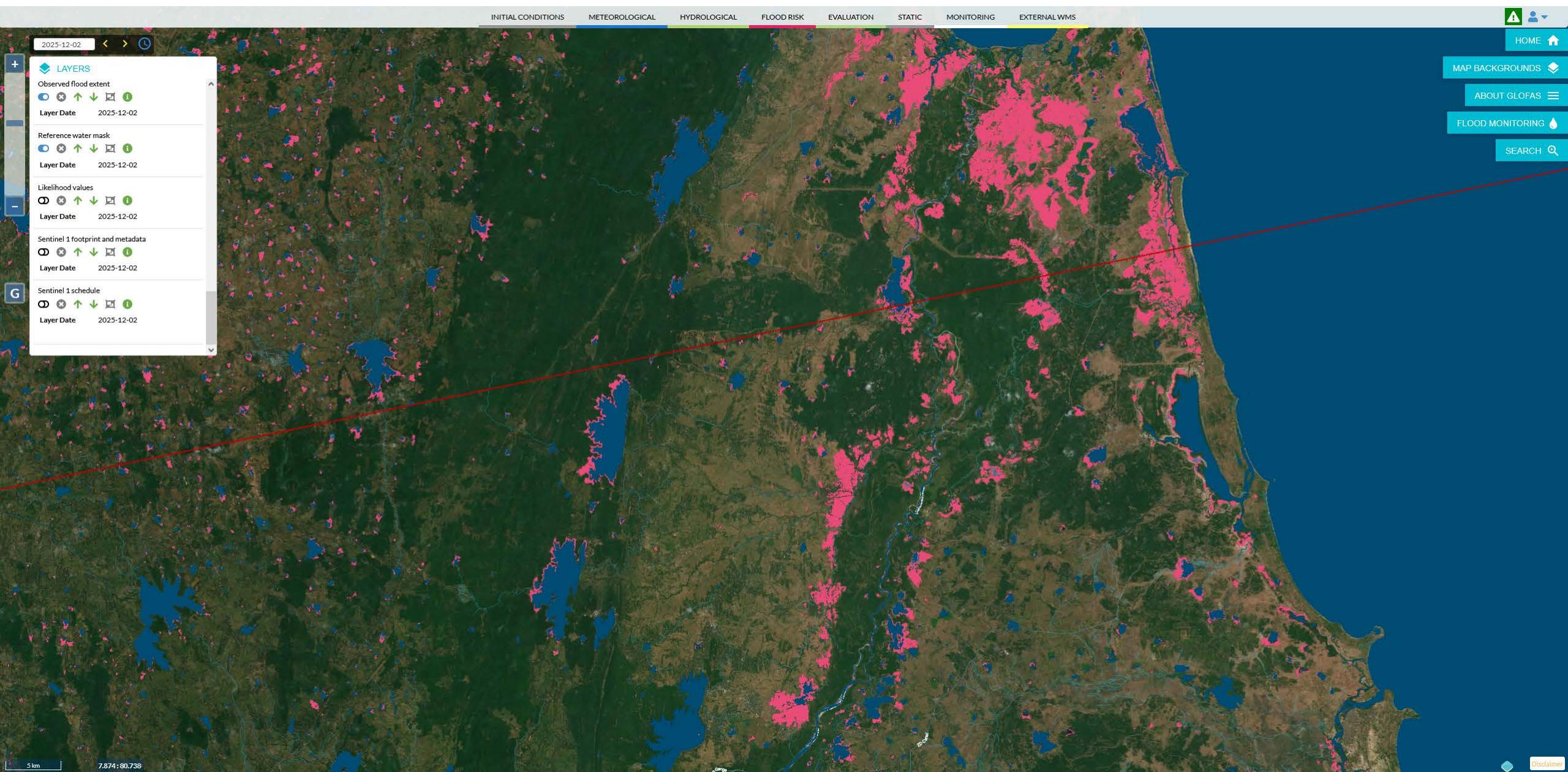




#EUSpace



2 December





# GFM download

Emergency Management AOI Products Notification Manager

GloFAS Portal EFAS Portal

+

-

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

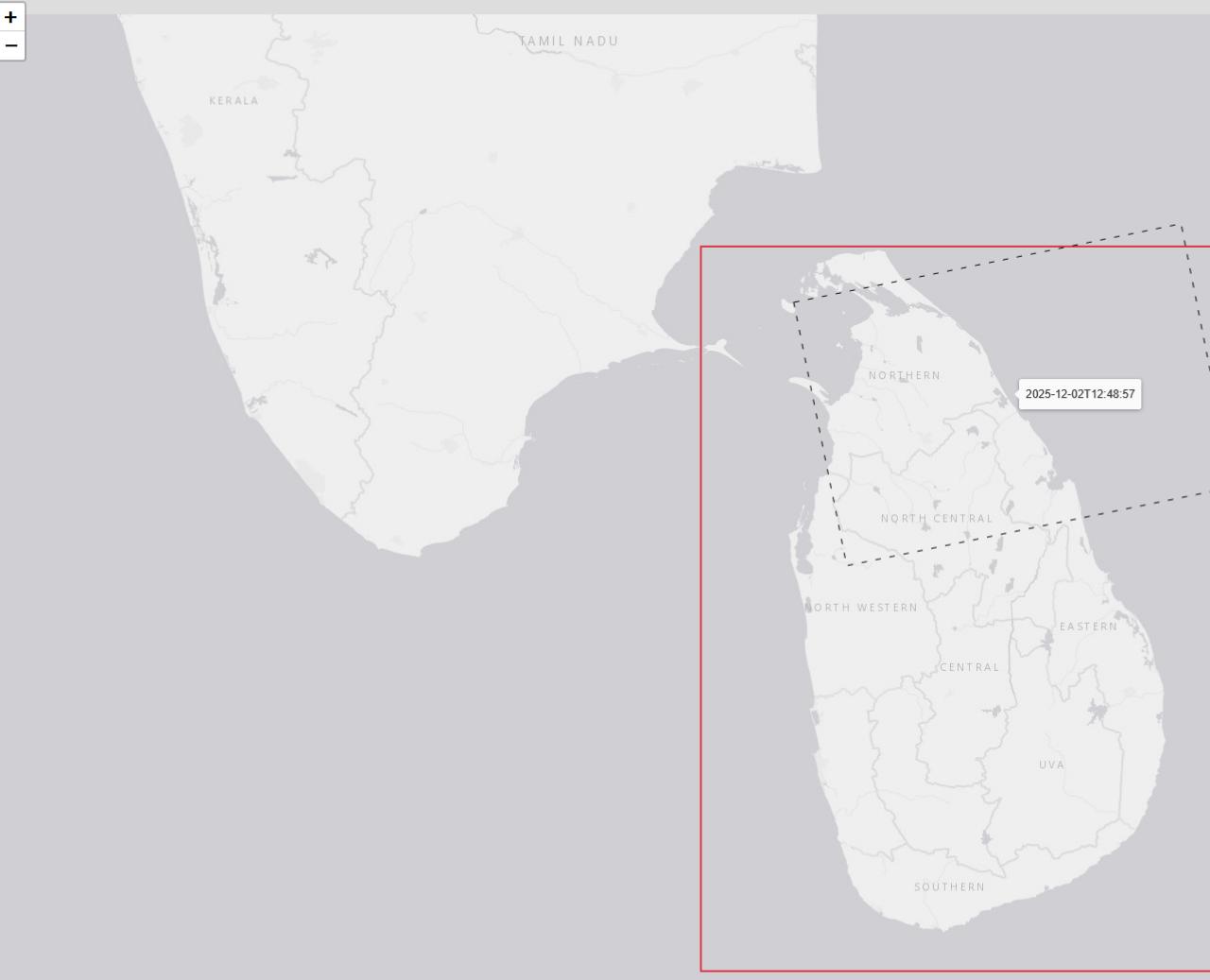
2025-12-02

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

2025-12-02

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

50 km  
30 mi



Leaflet © Esri - Esri, Delorme, NAVTEQ