EDERA
Early warning Demonstration of pan-European rainfall-induced impact forecasts

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EDERA platform

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UNIVERSITAT POLITÈCNICA DE CATALUNYA

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Real-time EDERA platform

4 groups of dynamic layers.

- Flash flood forecast summary (0-120 h)
- Storm impact (0-3 h)
- Animated flash flood nowcasting (0-6 h)
- Daily summary

Static layers

Warnings

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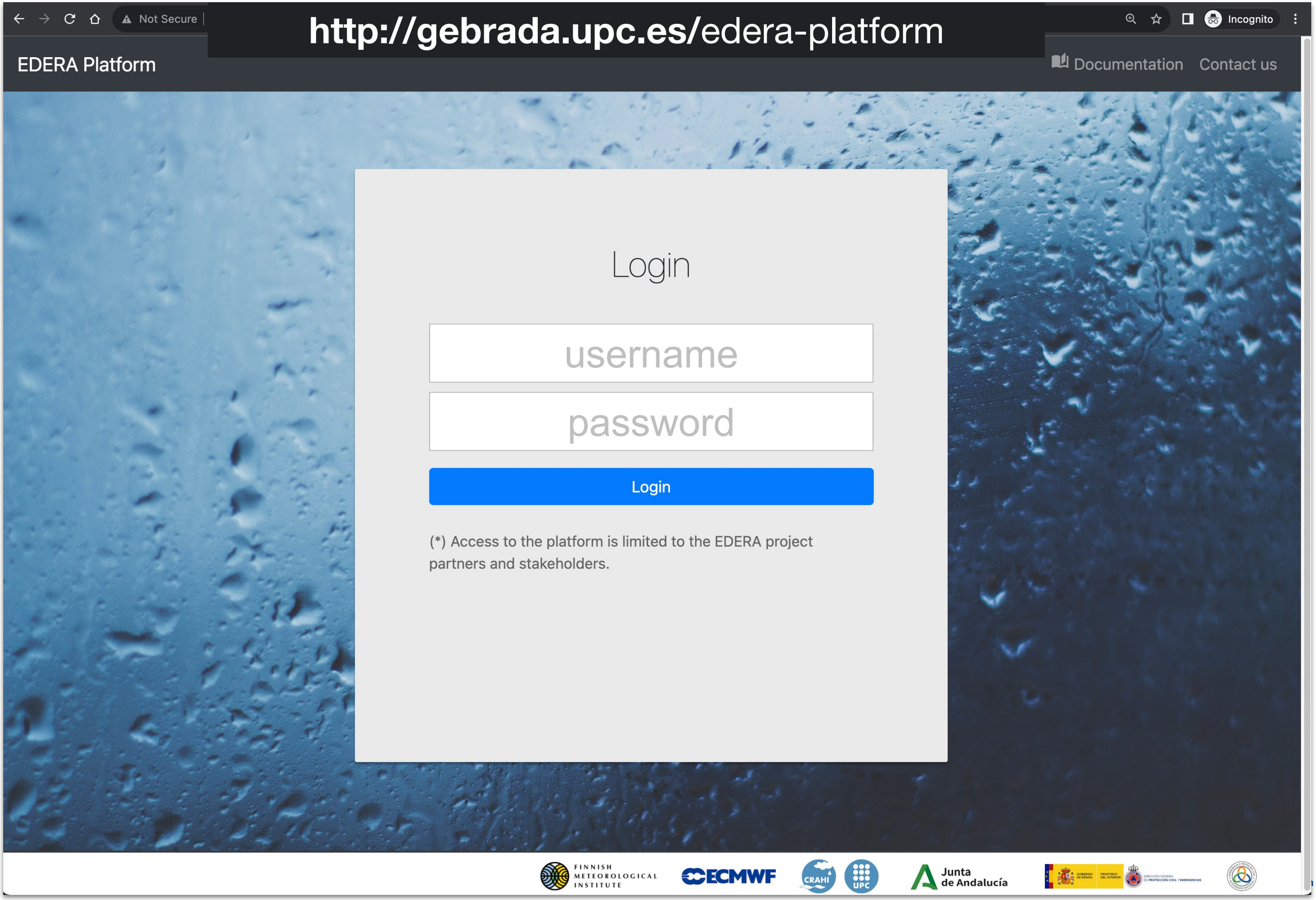
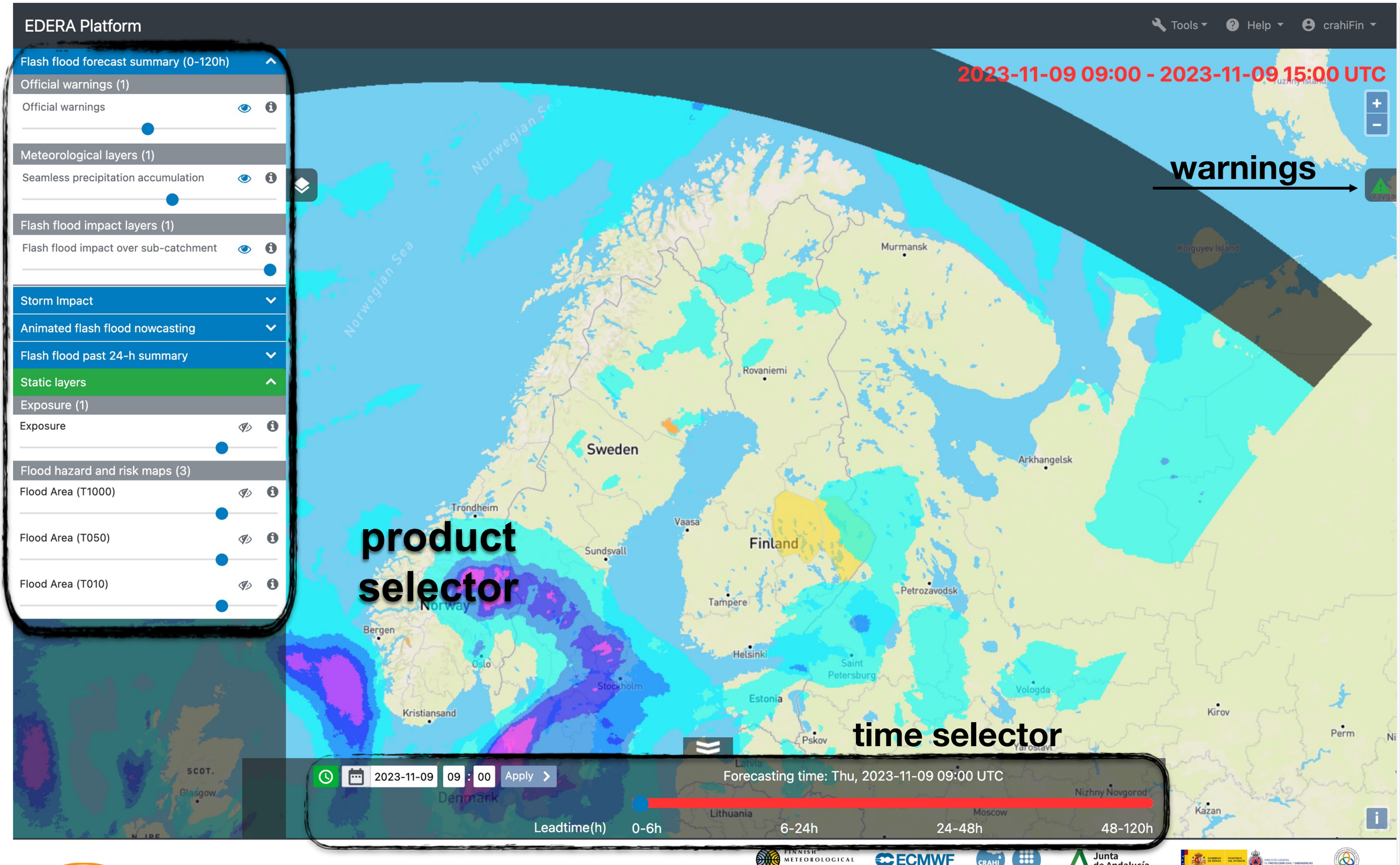
Real-time EDERA platform



Real time EDERA web-based platform



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Product selector

EDERA Platform

Tools · Help · crahiFin

Flash flood forecast summary (0-120h)

Official warnings (1)

Official warnings

Meteorological layers (1)

Seamless precipitation accumulation

Flash flood impact layers (1)

Flash flood impact over sub-catchment

Storm Impact

Animated flash flood nowcasting

Flash flood past 24-h summary

Static layers

2023-11-09 09:00 - 2023-11-09 15:00 UTC

Summary of on-going situation

Storm nowcasting

FF nowcasting

Daily summary

Static layers

2023-11-09 09 : 00 Apply

Forecasting time: Thu, 2023-11-09 09:00 UTC

Leadtime(h) 0-6h 6-24h 24-48h 48-120h

Murmansk · Rovaniemi · Sweden · Arkhangelsk · Vaasa · Sundsvall · Petrozavodsk · Stockholm · Estonia · Latvia · Pskov · Vologda · Kirov · Yaroslavl · Perm · Nizhny Novgorod · Kazan · Lithuania · Moscow · Denmark · SCOT. · Glasgow · Kolguyev Island

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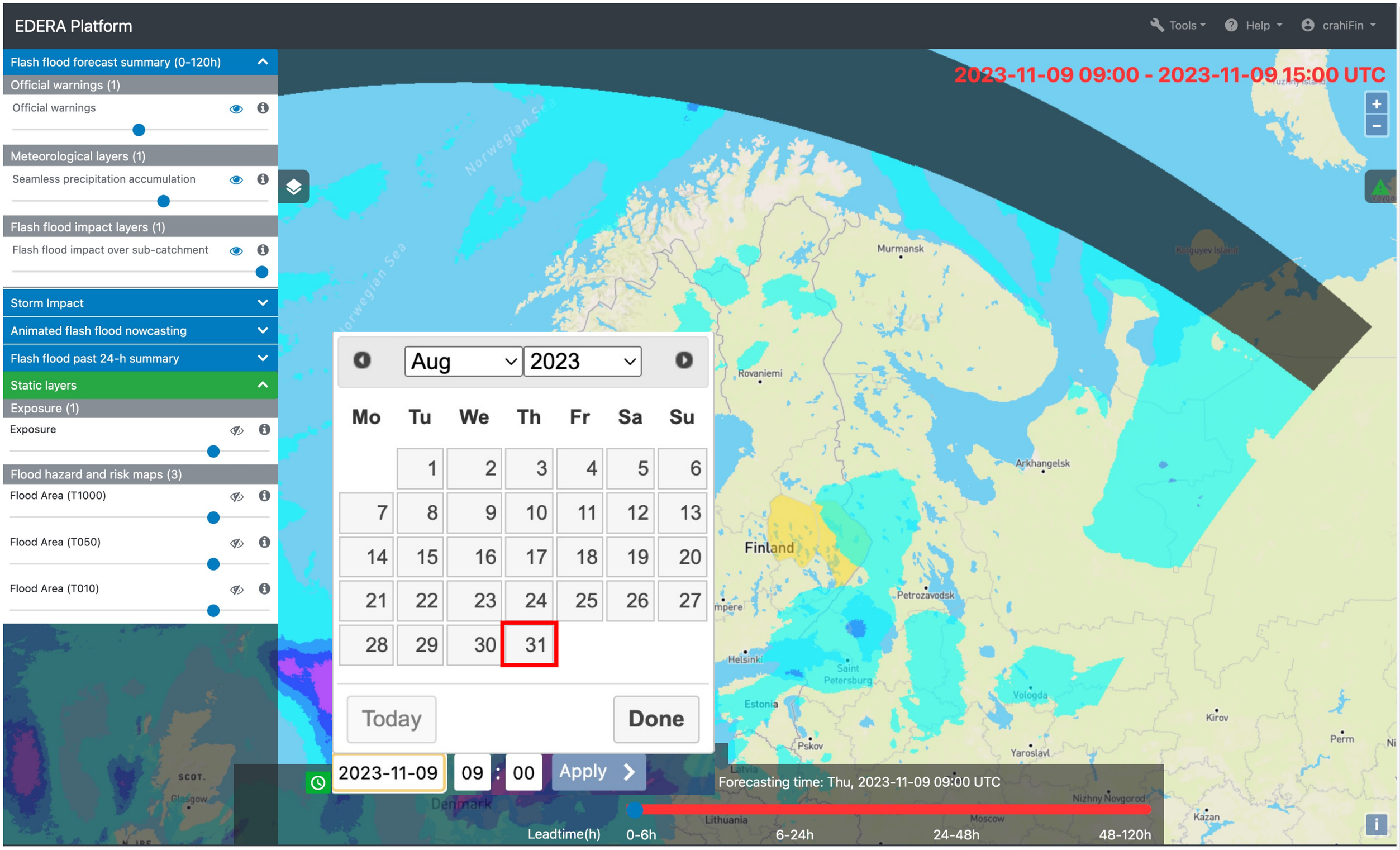
Date & time selector



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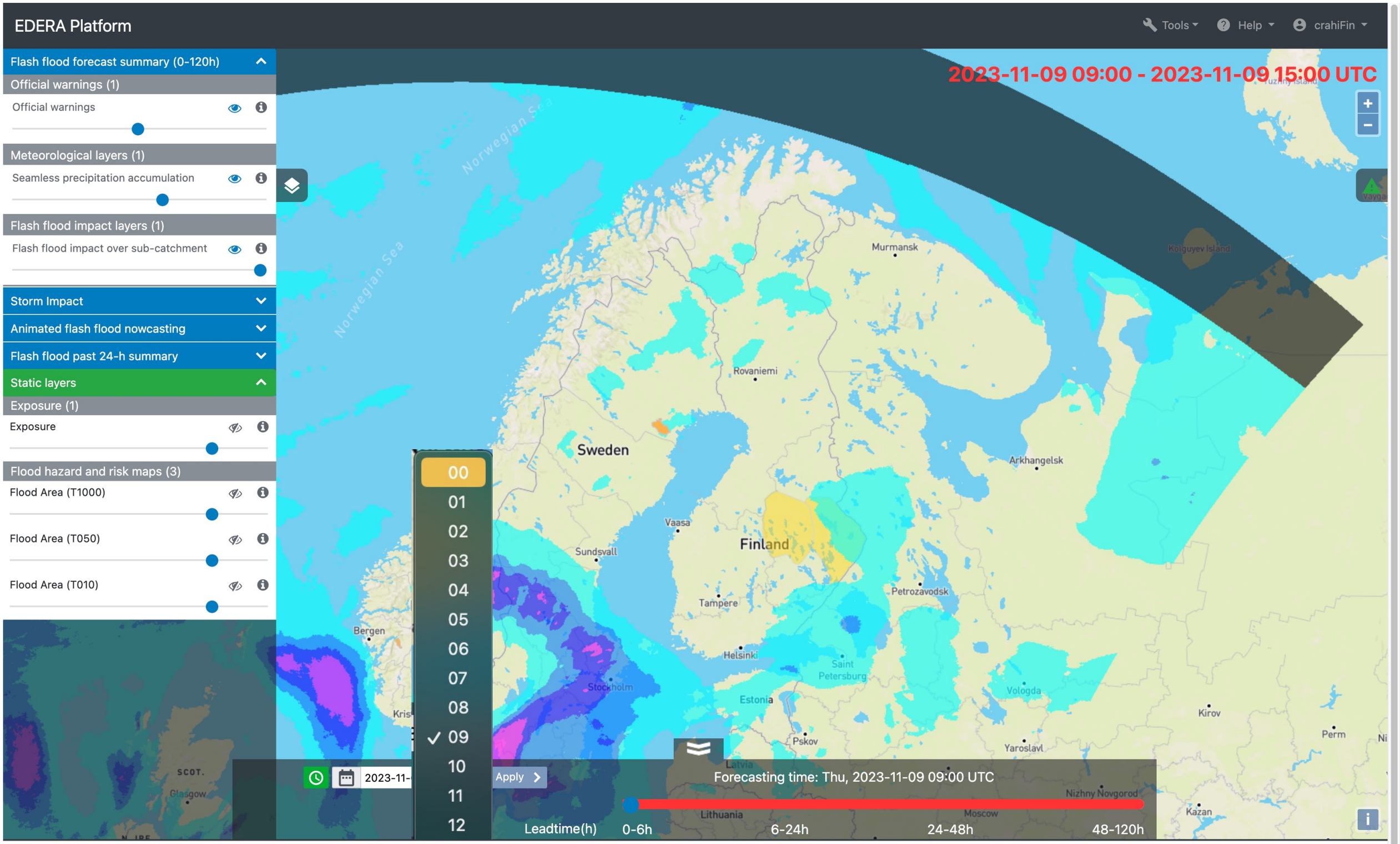
Date & time selector



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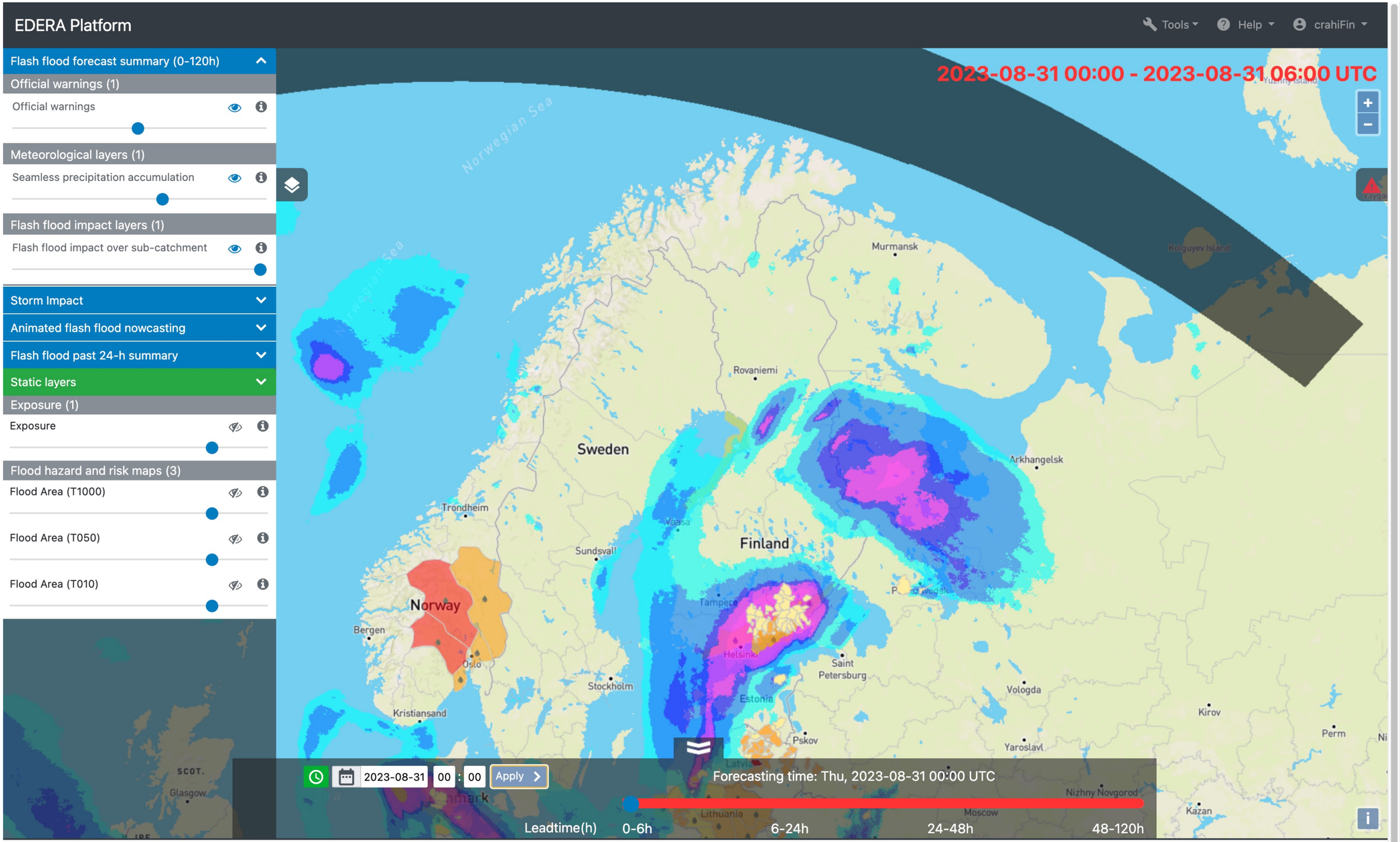
Flash flood forecast summary (0-120h)



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EDERA Flash Flood Forecast Summary Products

An Introduction

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Flash flood forecast summary products

EDERA Platform

Tools Help ECMWF

Flash flood forecast summary (0-120h)

Official warnings (1)

Official warnings

Meteorological layers (1)

Seamless precipitation accumulation

Flash flood impact layers (1)

Flash flood impact over sub-catchment

Storm Impact

Animated flash flood nowcasting

Flash flood past 24-h summary

Static layers

Exposure (1)

Exposure

Flood hazard and risk maps (3)

Flood Area (T1000)

Flood Area (T050)

Flood Area (T010)

MeteoAlarm

2023-08-31 00:00 - 2023-08-31 06:00 UTC

Selected feature information

Official Warnings

Thunderstorm in Eastern Gulf of Finland

Time & Duration

From: 2023-08-30 21:09:14+00 UTC

To: 2023-08-31 03:00:00+00 UTC

Strong wind advisory: thunderstorm wind gusts.

2023-08-31 00 : 00 Apply

Forecasting time: Thu, 2023-08-31 00:00 UTC

Leadtime(h) 0-6h 6-24h 24-48h 48-120h

Use time slider to see warnings at different lead times

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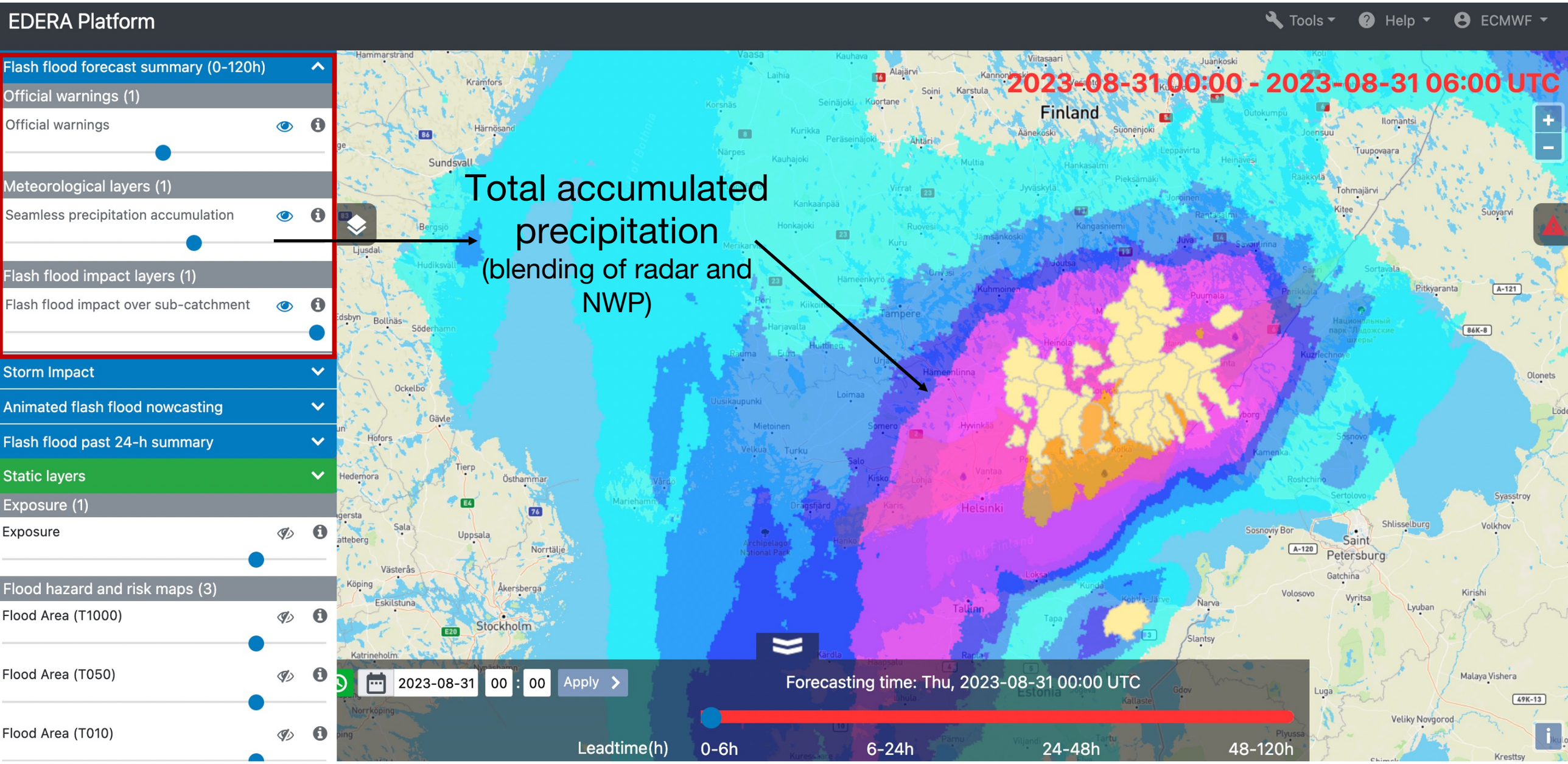
Flash flood forecast summary products



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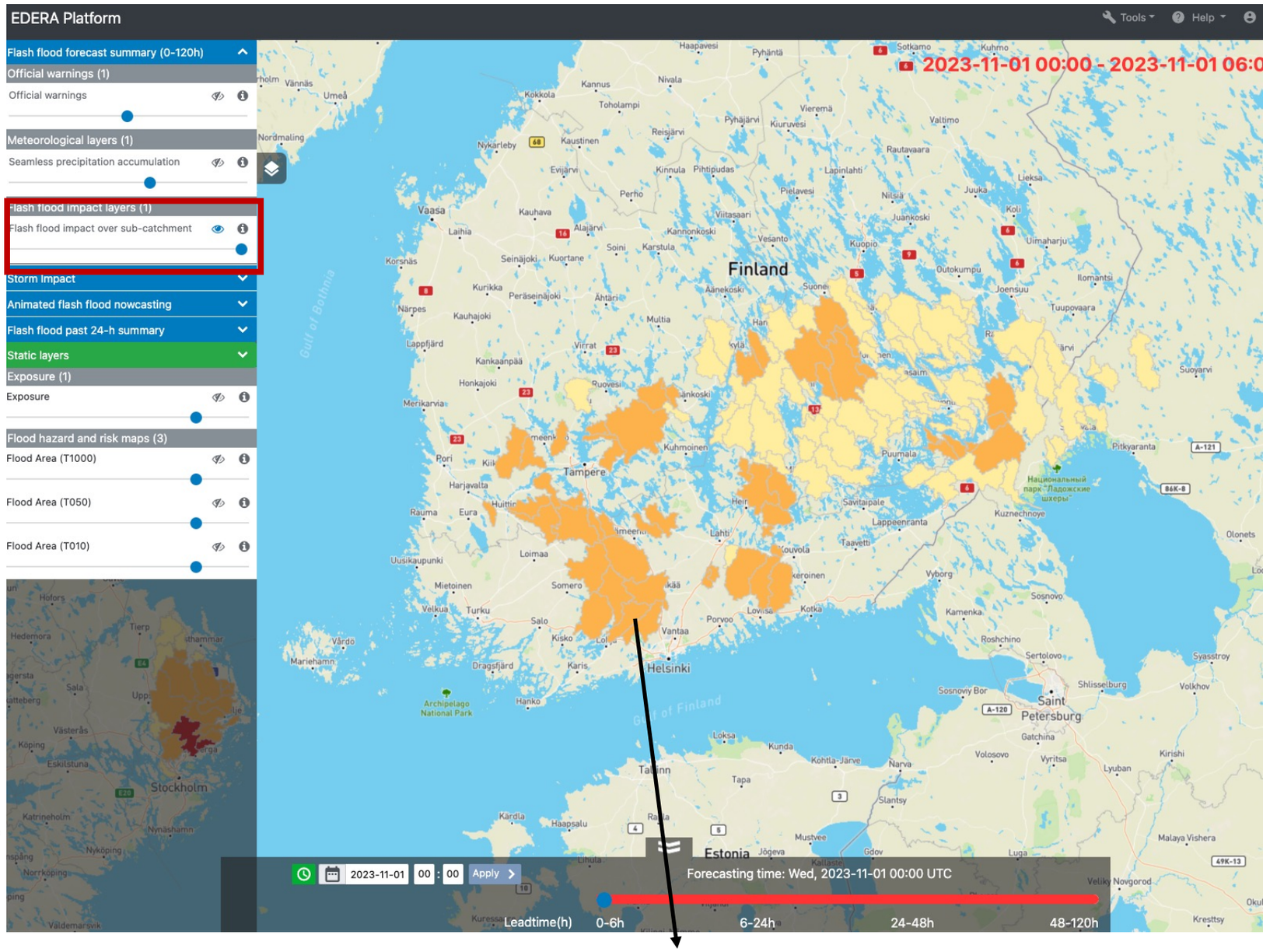
Flash flood forecast summary - Flash flood impact over sub-catchment

Update, time range and timestep:

- Hourly update
- 4 decision making periods
  - 0-6h nowcasting
  - 6-24h sub-daily
  - 24-48h short range
  - 48h-5d medium range

Maximum impact within lead time (across 90th percentile of catchment)

4 impact categories



Impact matrix

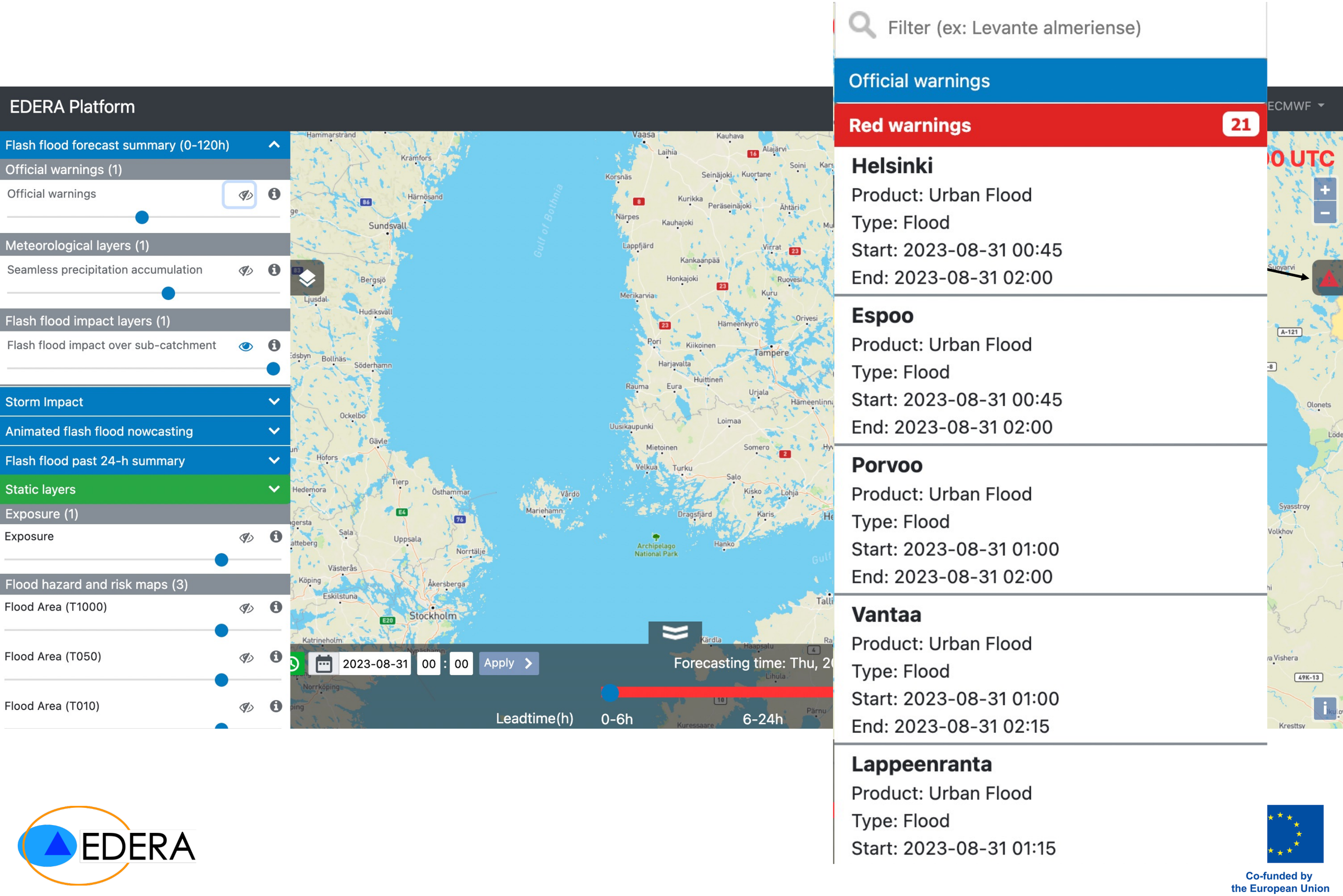
	Low Exposure	Medium Exposure	High Exposure
High Likelihood			
Medium Likelihood			
Low Likelihood			✓

Pop-out window

Exposure information

	#
Total population affected	**880**
Education facilities affected	**3**
Health facilities affected	
Energy generation facilities affected	**1**
Time of the event peak	**2023/11/01 00:00:00**

Flash flood forecast summary - Notifications



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Storm impact nowcasting (0-3h)

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Flash flood forecast summary (0-120h)

Storm Impact

Meteorological layers (2)

Radar reflectivity OPERA

Hourly precipitaton - radar nowcasting

Storm impact layers (6)

Storm Hazard

Hail Hazard

Wind Hazard

Precipitation Hazard

Lightning Hazard

Storm Impact

Flash flood impact layers (1)

Pluvial flood hazard in urban areas

Animated flash flood nowcasting

Flash flood past 24-h summary

Static layers

Exposure (1)

Exposure

Flood hazard and risk maps (3)

Flood Area (T1000)

2023-08-31 00:00 UTC

Norwegian Sea

Murmansk

Kolguyev Island

Rovaniemi

Sweden

Arkhangelsk

Trondheim

Vaasa

Sundsvall

Finland

Petrozavodsk

Norway

Tampere

Bergen

Oslo

Stockholm

Vologda

Kristiansand

Kirov

Perm

Yaroslavl

Latvia

Tver

Nizhny Novgorod

Lithuania

Moscow

Kazan

2023-08-31 00 : 00 Apply

Thu, 2023-08-31 00:00 UTC

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EDERA Convective Hazard and Impact Nowcast Products

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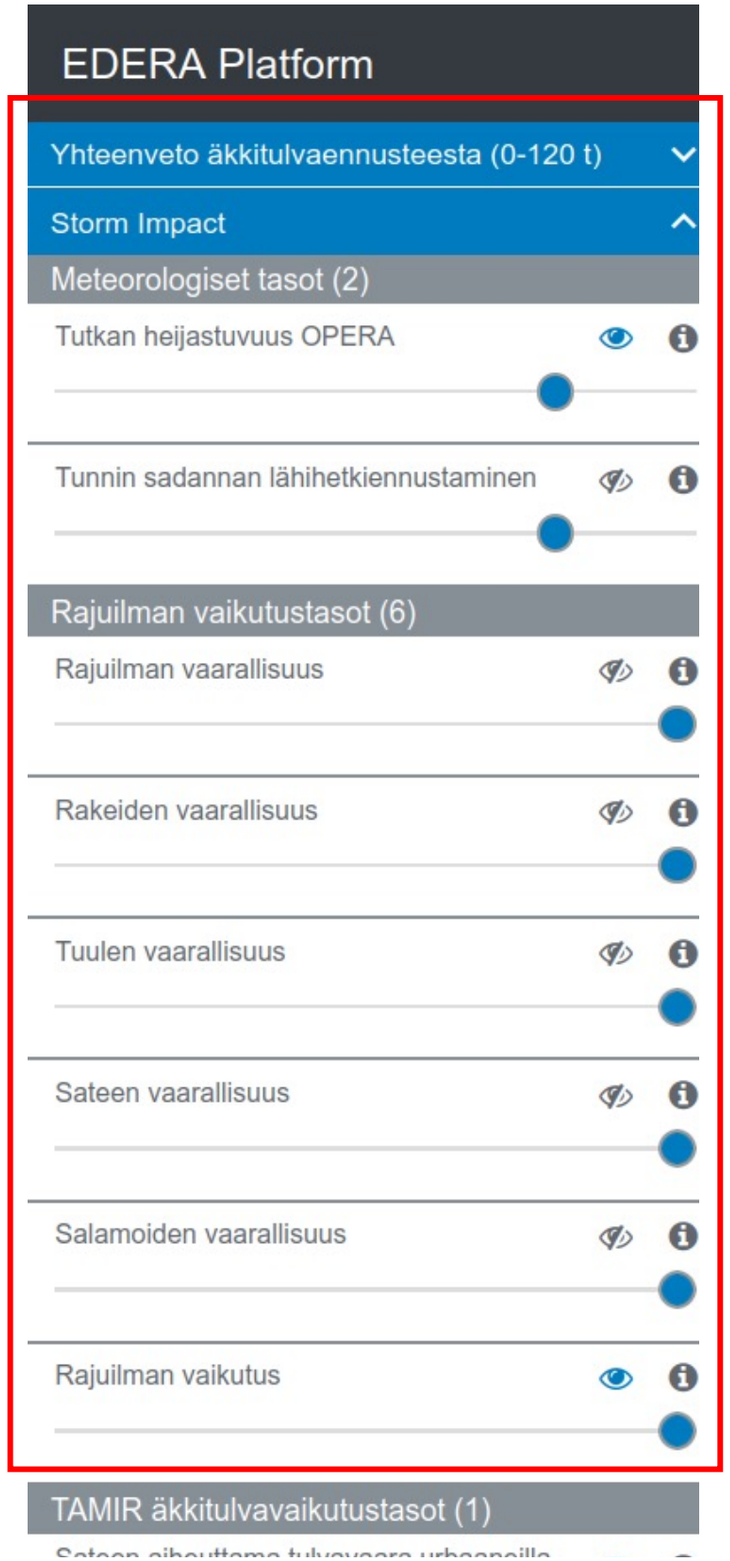
EDERA Convective Layers



Meteorological layers:

- Radar reflectivity (OPERA)
- Hourly rainfall accumulation nowcast

Purpose: give information about instantaneous rain rate and future accumulated rainfall

Hazard nowcast layers:

- Overall storm hazard category
- Hazard category for each subtype: hail, wind, precipitation, lightning

Purpose: give information about hazard potential of storm cells

Storm impact layer

Purpose: give the above information weighted by exposure

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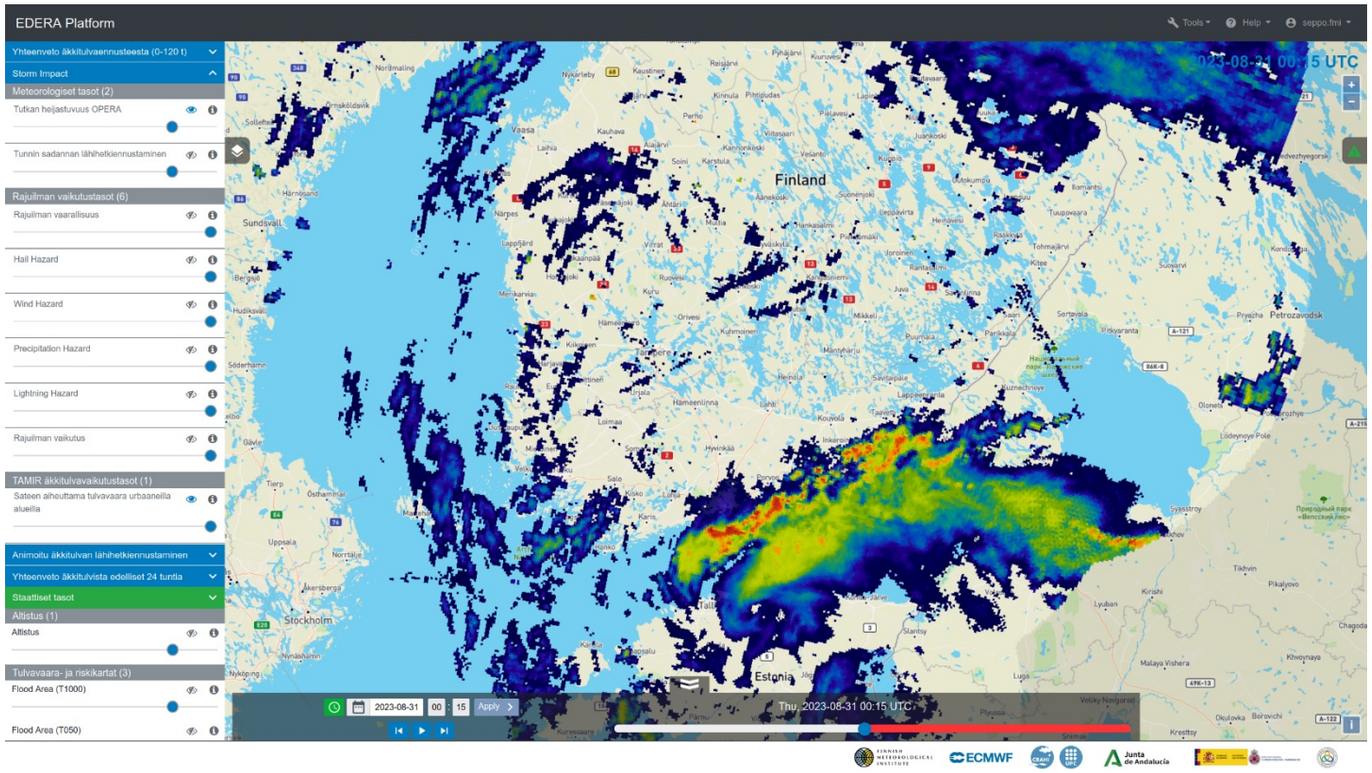
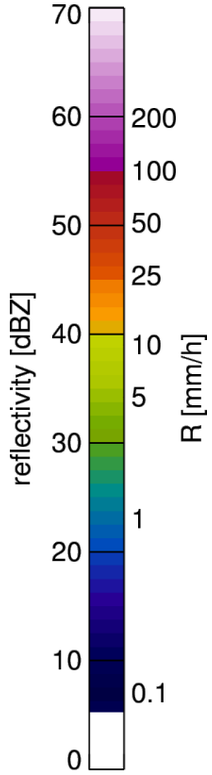
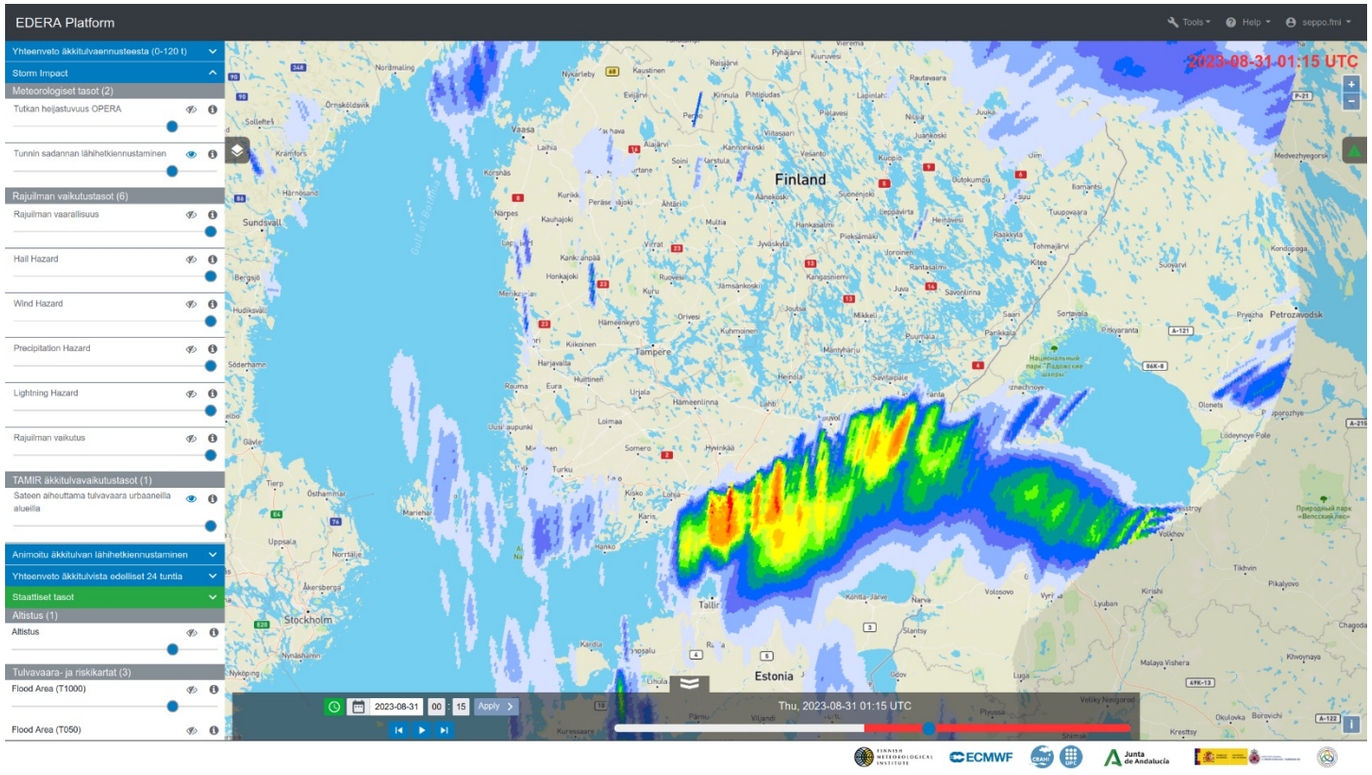
Precipitation Layers

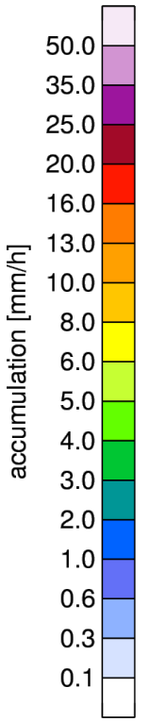




Composite of radar-measured reflectivity values

- Reflectivity is converted to rain rate (mm/h)
- Spatial resolution of 2 km
- Generated every 15 minutes





Nowcast of hourly rainfall accumulation

- Generated by extrapolation of radar images
- Every 15 minutes to next 4 hours
- Spatial resolution of 2 km

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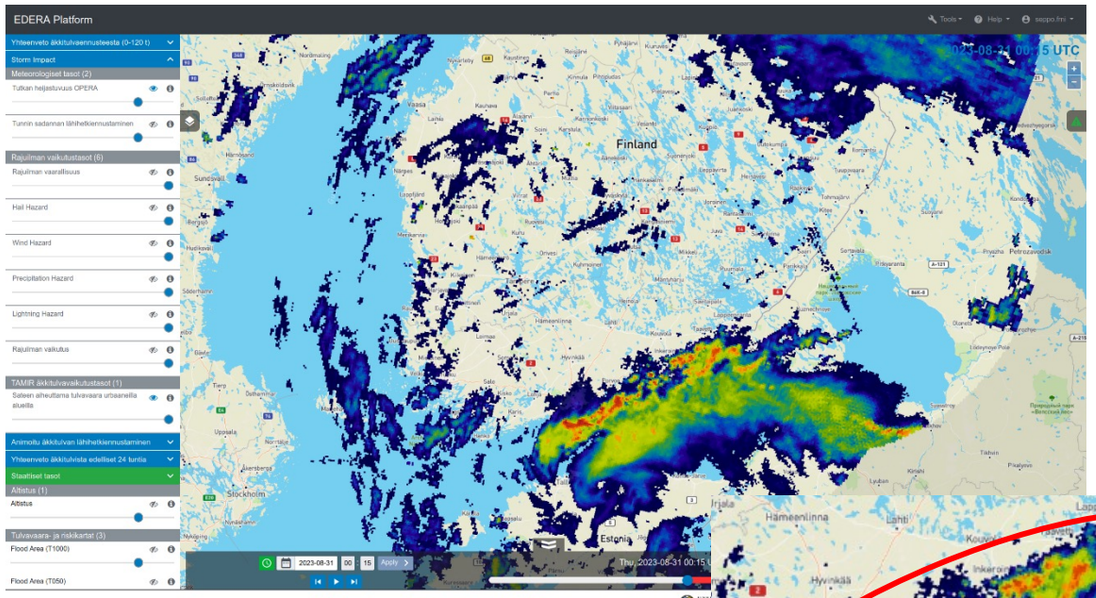
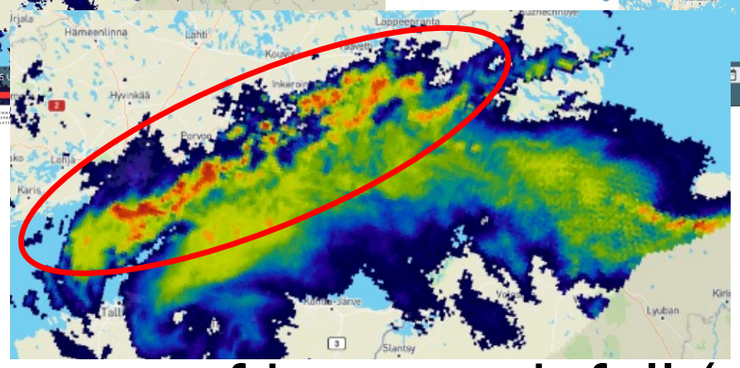
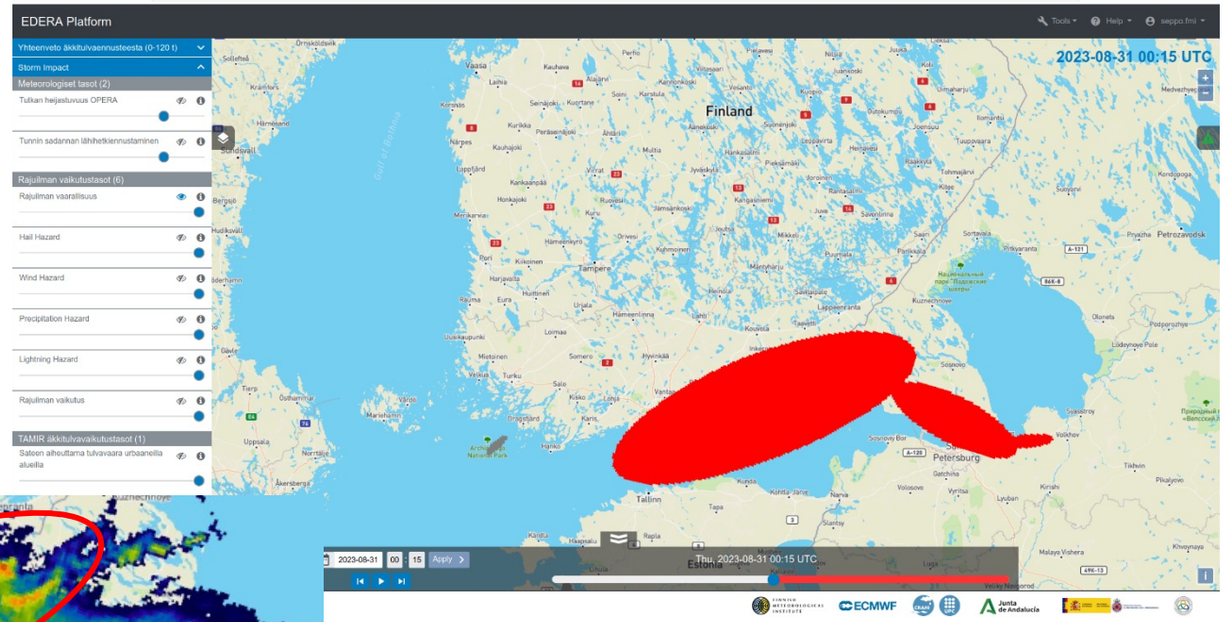
The Combined Hazard Nowcast Layer



Radar reflectivity





Hazard nowcast
(present time)

- Ellipses fitted to areas of heavy rainfall (reflectivity over 35 dBZ)
- Each ellipse is assigned a hazard class by using a machine learning model
- 4 hazard categories based on climatological thresholds
- The overall hazard category is the maximum of the 4 sub-categories
- Additional layers for each hazard type

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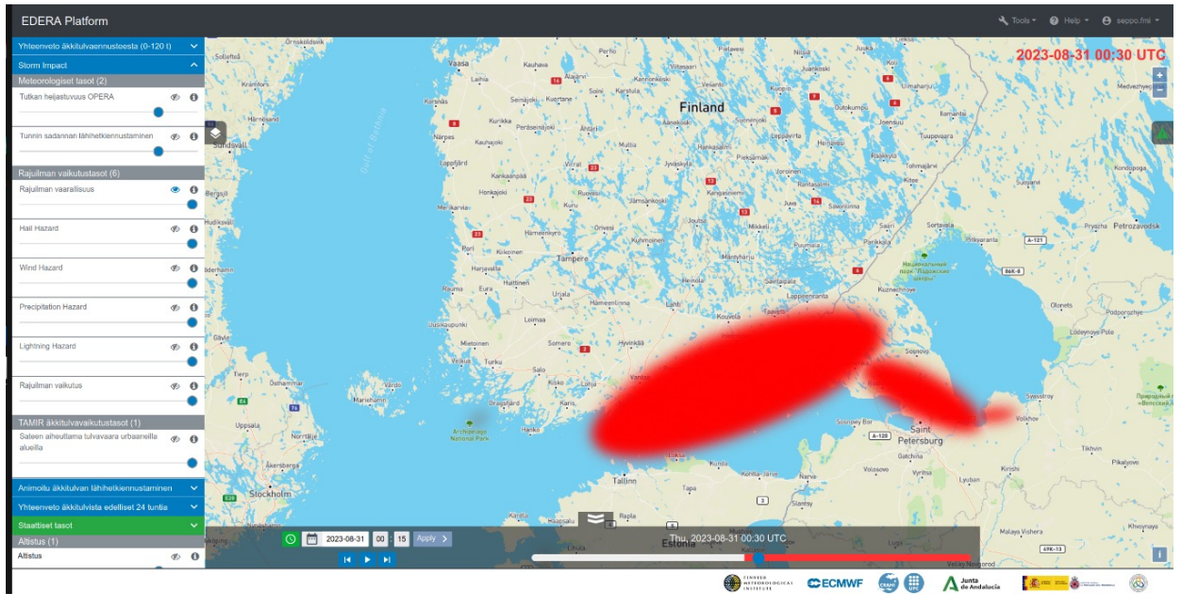
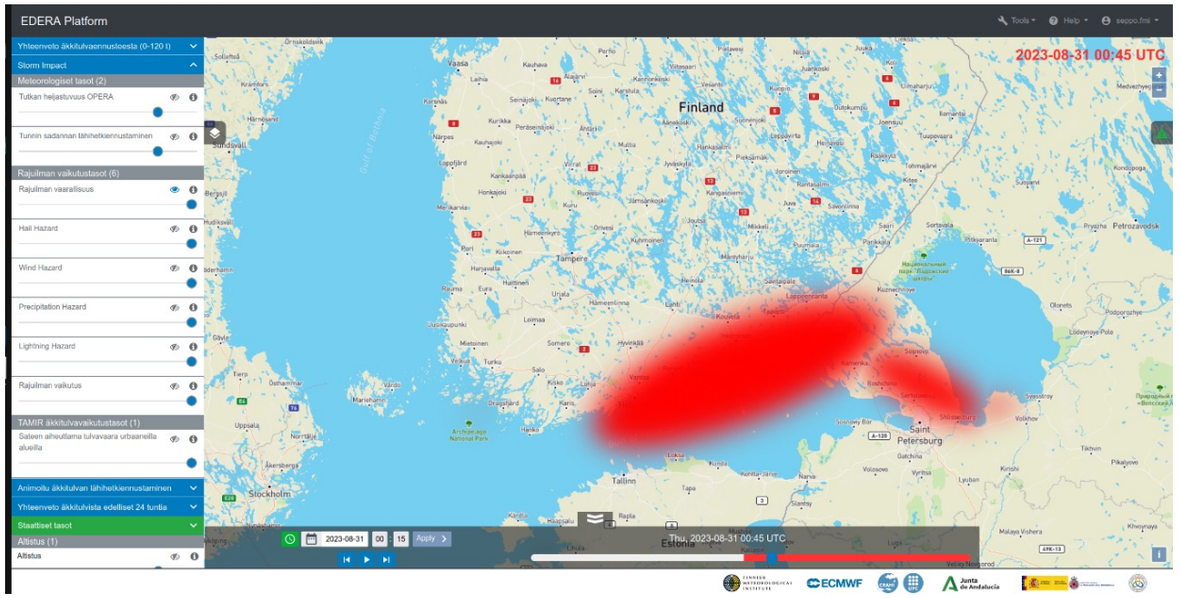
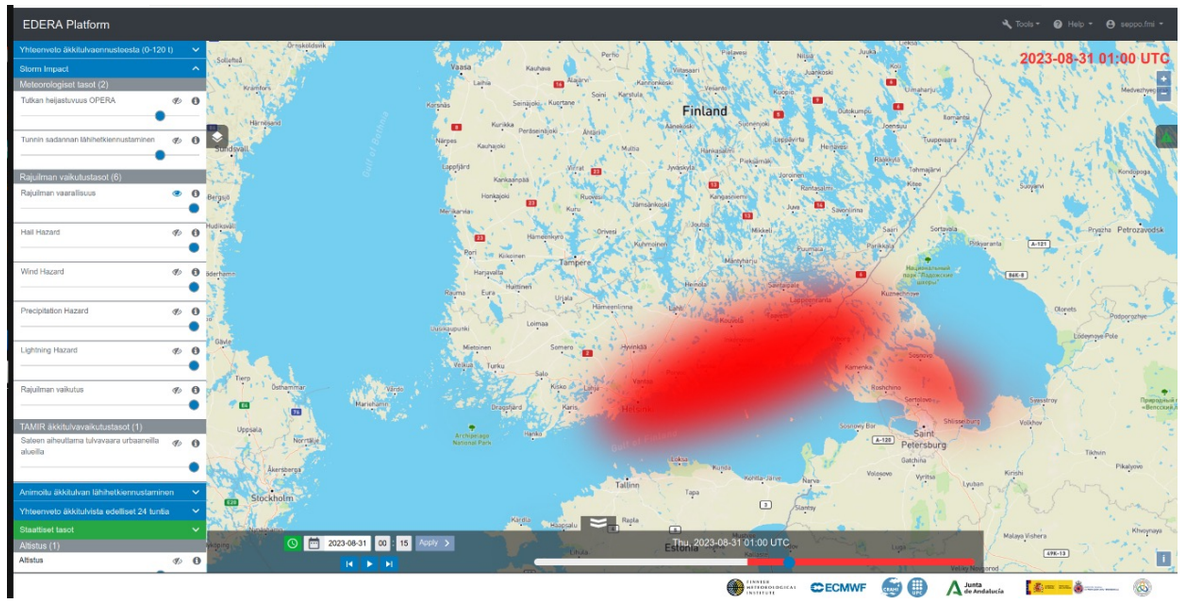
Uncertainty Representations



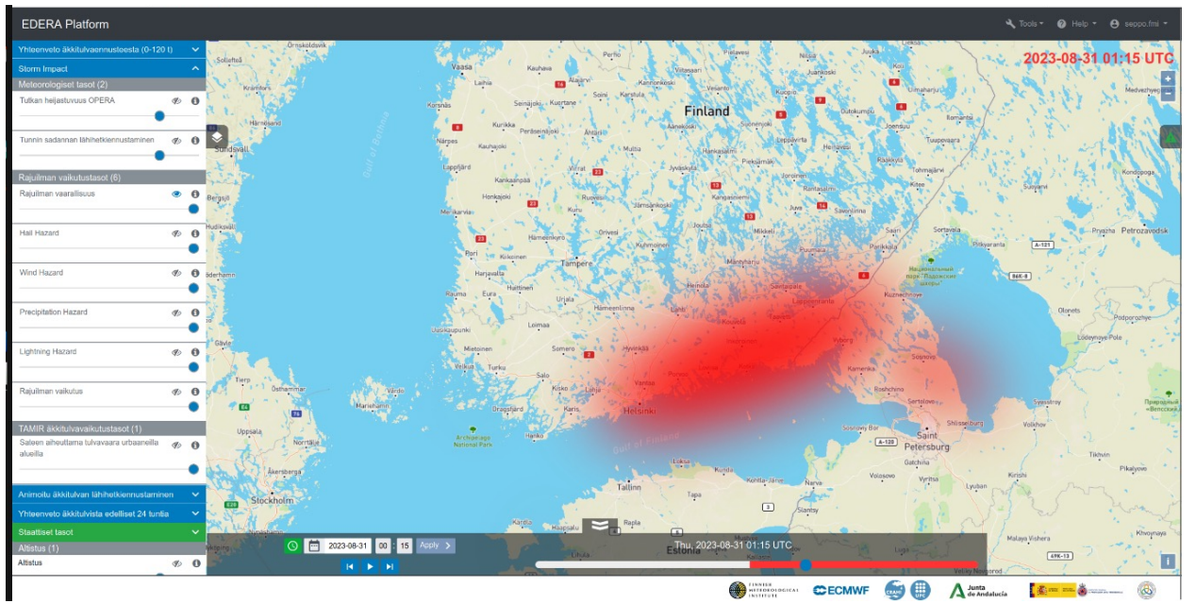
Next 15 minutes



Next 30 minutes

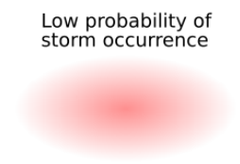


Next 45 minutes



Next 60 minutes

- The nowcast layers show future storm positions
- Storm hazard level does not change during the forecast time window
- Uncertainty in the nowcasts is visualized by increasing spread and transparency of the ellipses



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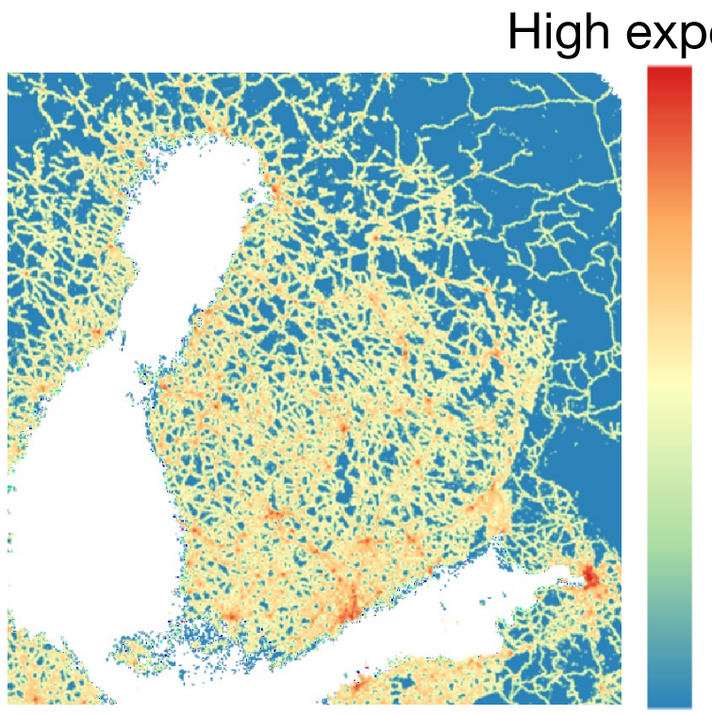
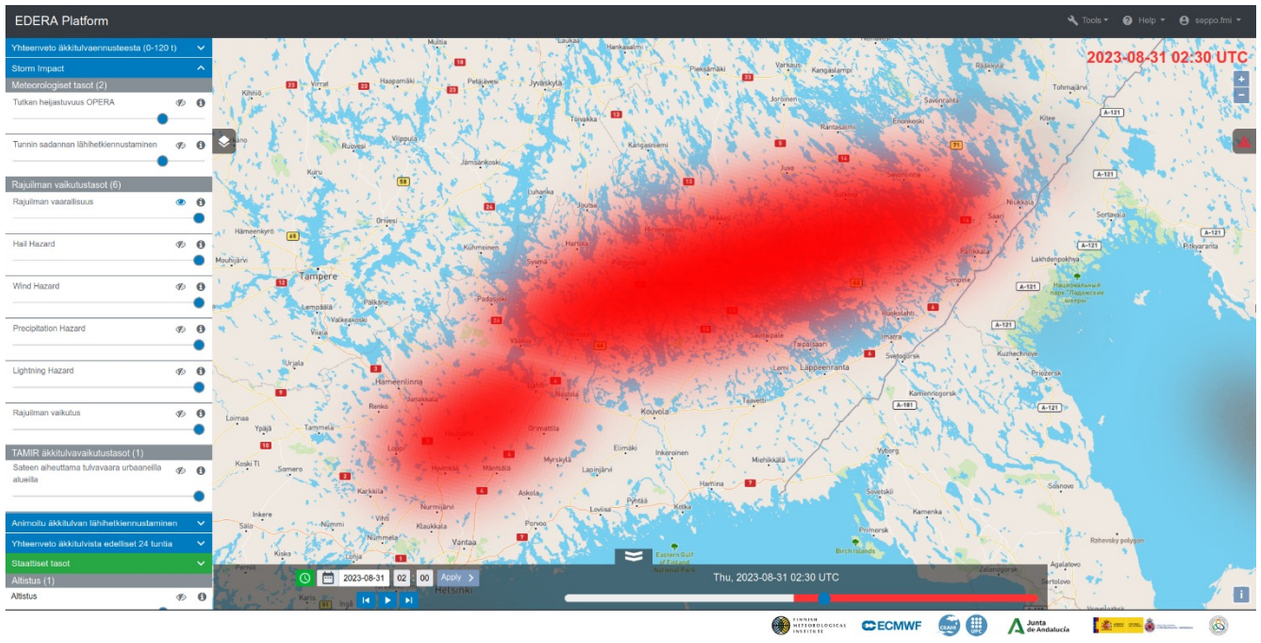
Convective Impact Nowcasts

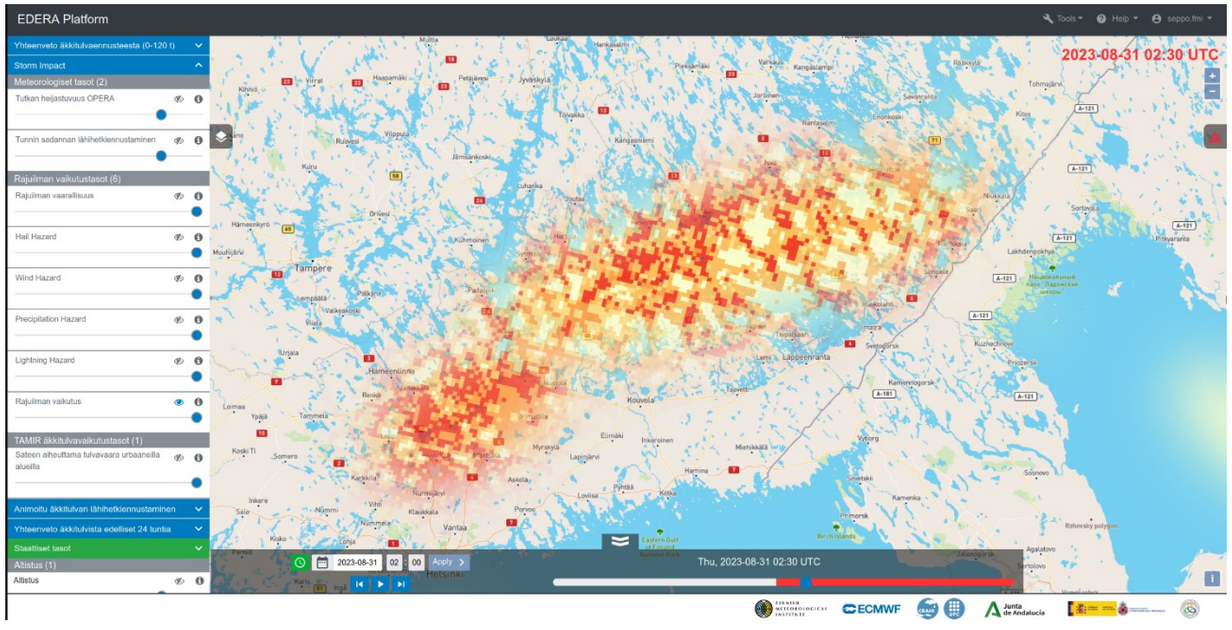
- Hazard nowcasts are combined with exposure layer to give weight to vulnerable areas
- We use pan-European exposure layer provided by ECMWF
- Exposure raster provided by HARCI-EU and JRC: combination of population, health, education, transport and energy-related exposures



impact = hazard * exposure



Hazard nowcast



Impact nowcast

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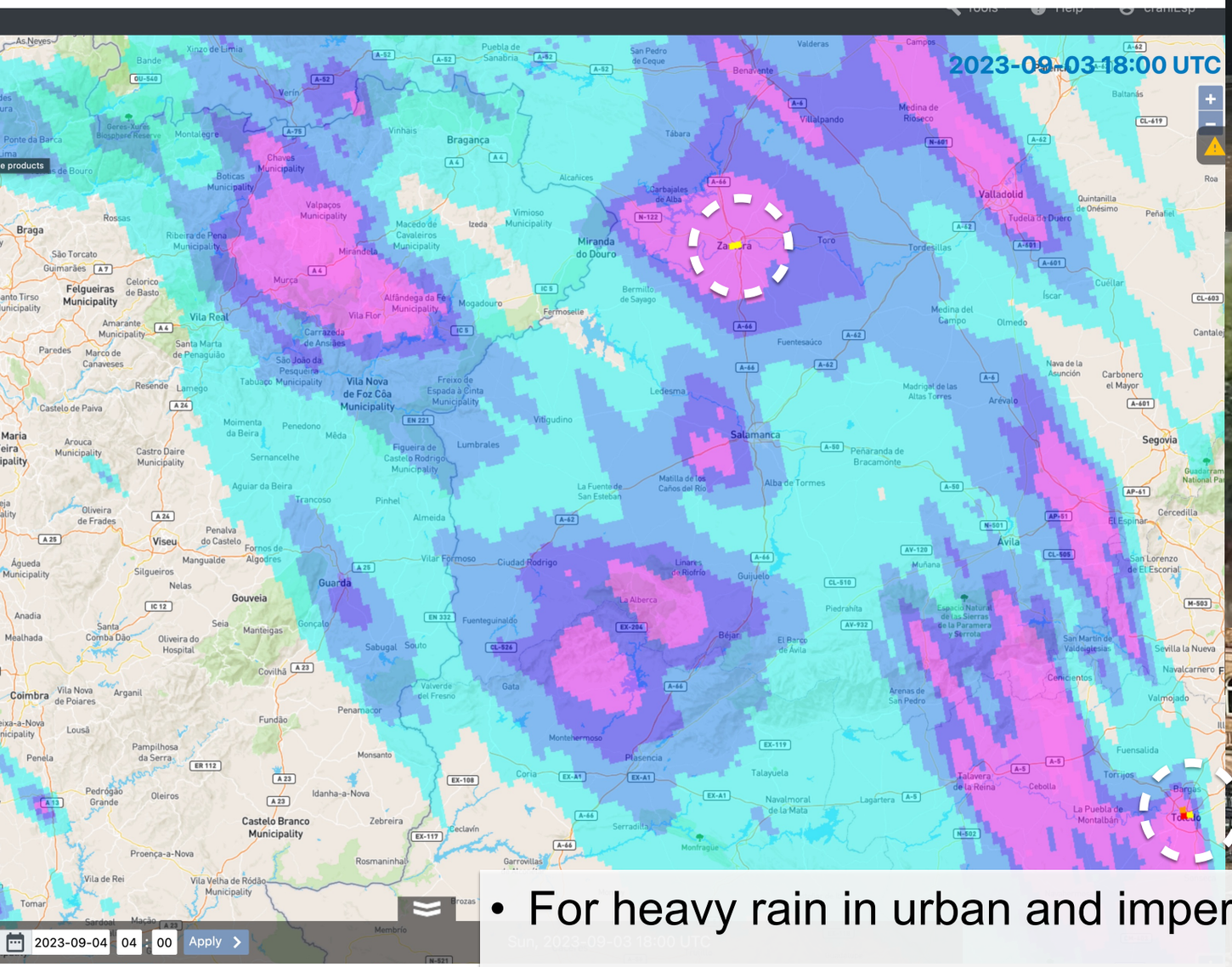
Pluvial floods product



- For heavy rain in urban and impervious areas (e.g. large roads).
- Running in real time with radar-based nowcasting (up to 6h)
- Based on comparing real-time with climatology of 1-h accumulations

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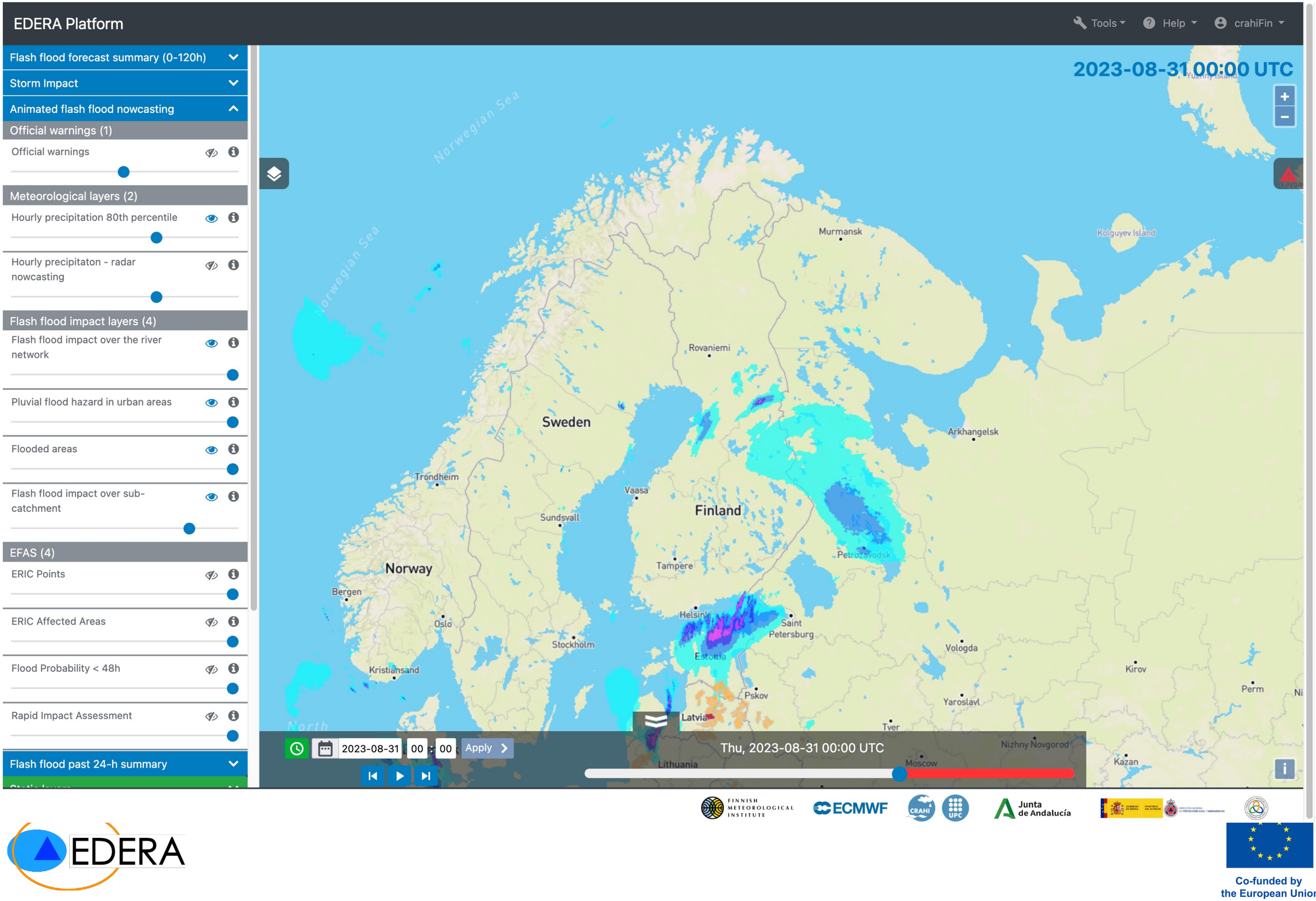
Animated flash flood nowcasting



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EDERA Animated Flash Flood NowcastingProducts

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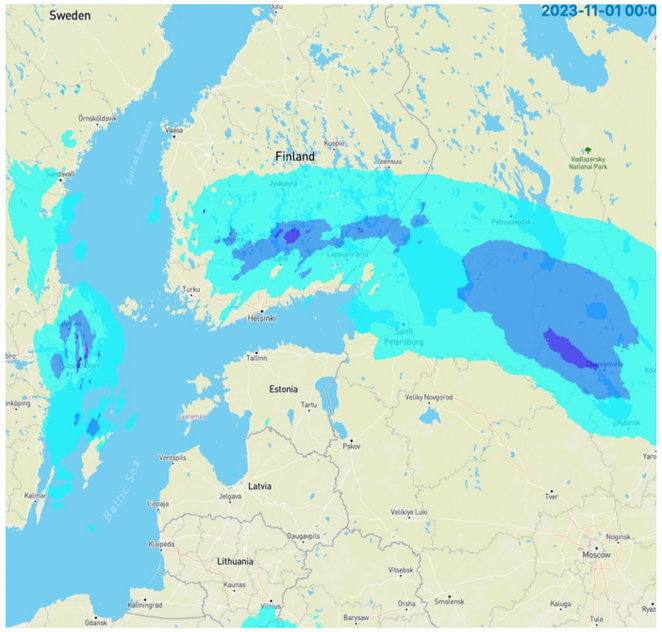
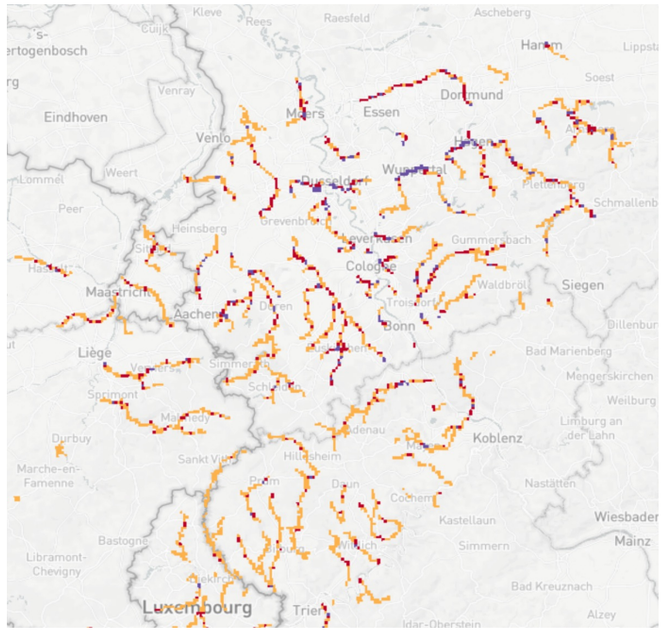


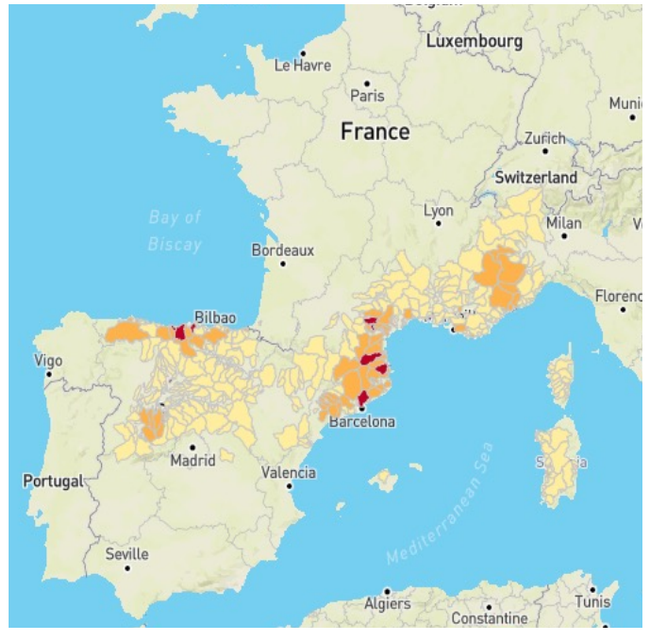
Summary precipitation

Summary and animated layers showing total precipitation per timestep up to 5 days



Flash flood impact

Summary and animated layers showing expected flash flood impact category up to 5 days for 4 decision-making periods



Catchment flash flood impact

Summary layers showing expected flash flood impact category per river catchment up to 5 days for 4 decision-making periods

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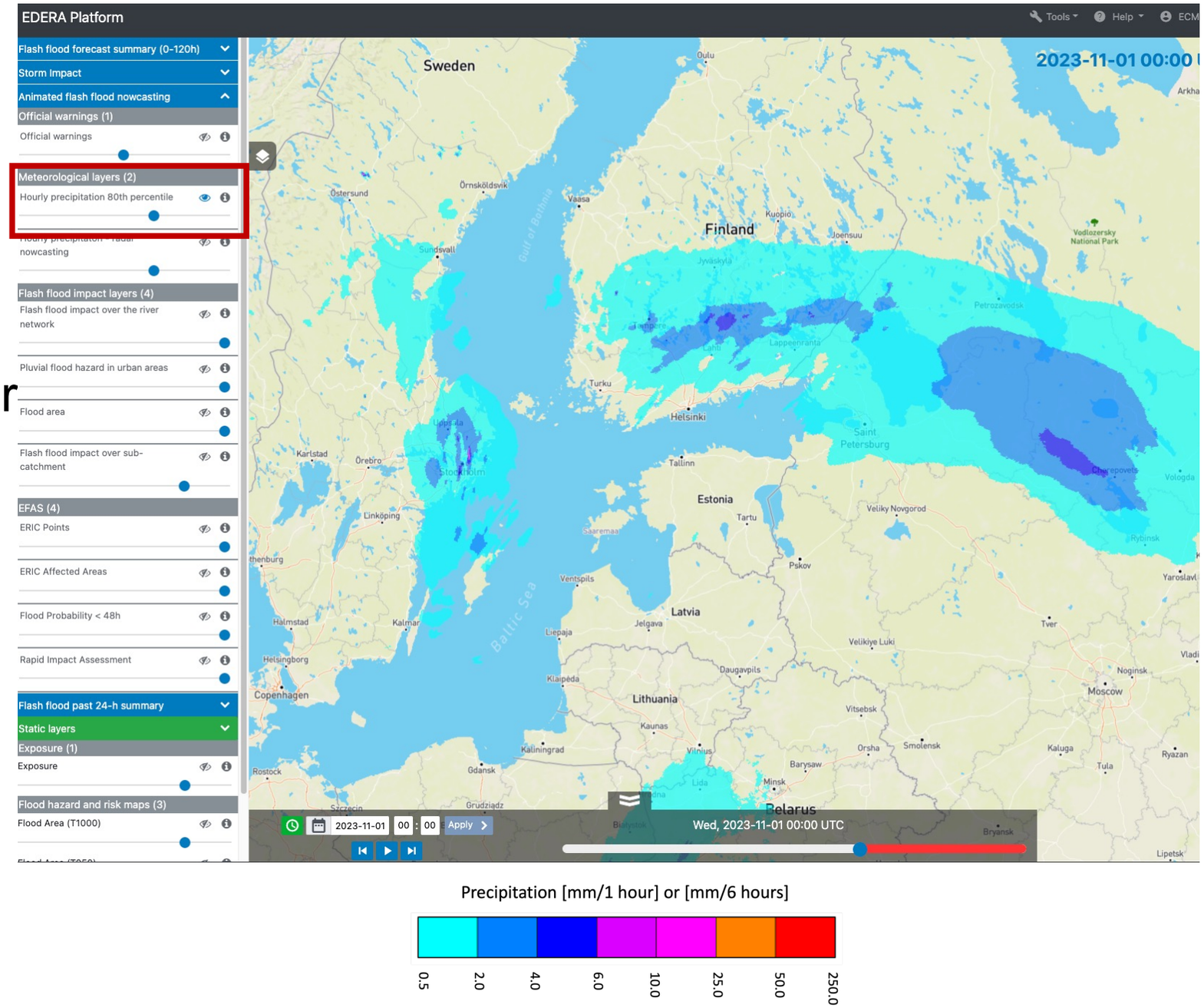
Animated flash flood nowcasting - Total precipitation 80th percentile

Update, time range and timestep:

- Hourly update
- Range: up to 6 hours
- Hourly time step for 0-6h. Driven by blending of radar nowcasting and NWP
- Hourly past precipitation. Driven by radar and NWP blends

Probabilistic based product which summarises ensemble forecast



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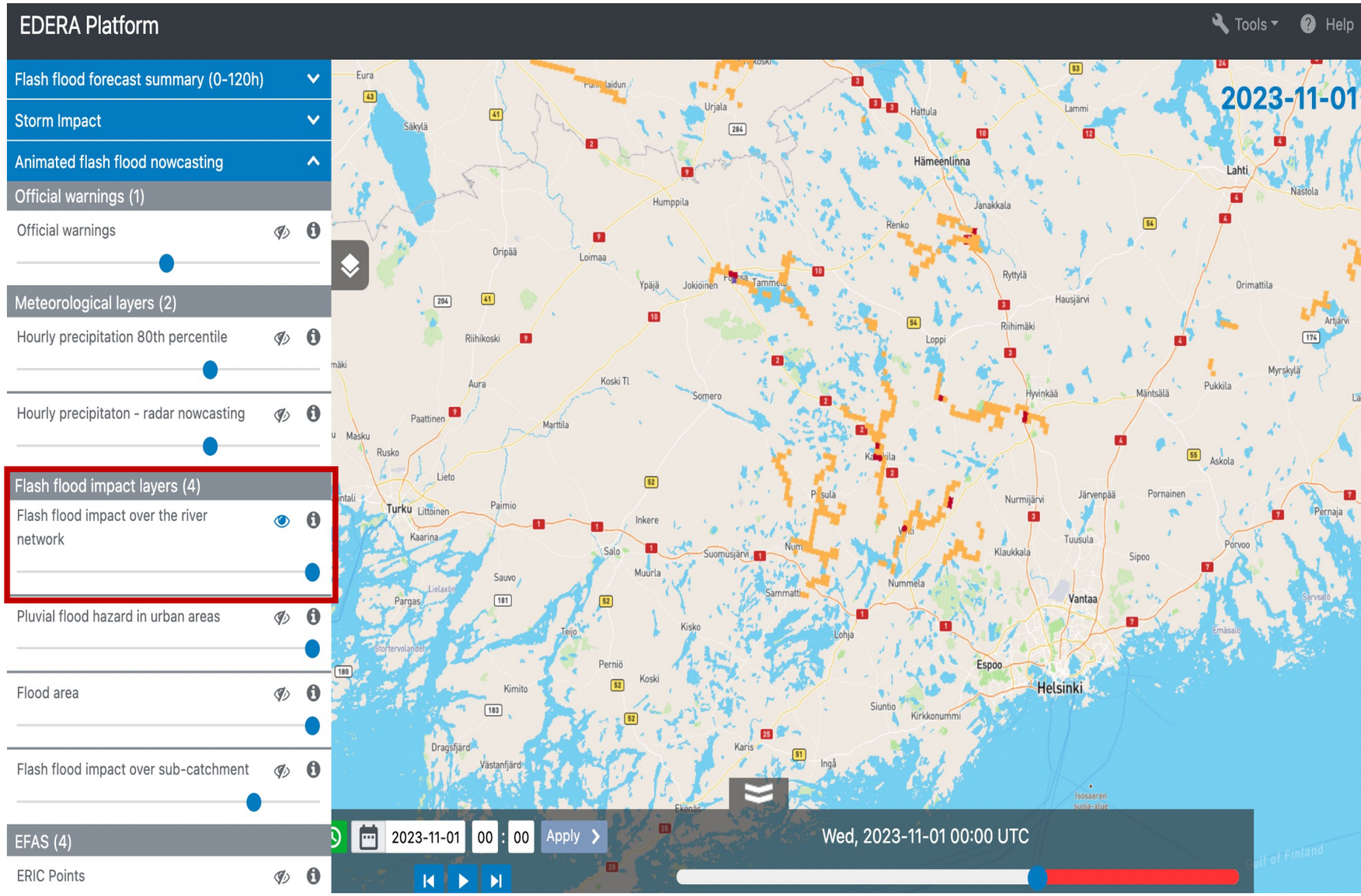
Animated flash flood nowcasting - Flash flood impact over river network

Update, time range and timestep:

- Hourly update
- Range: up to 6 hours
- Hourly time step for 0-6h. Driven by blending of radar nowcasting and NWP

1-km river channel network

4 impact categories



	Low Exposure	Medium Exposure	High Exposure
High Likelihood			
Medium Likelihood			✓
Low Likelihood			

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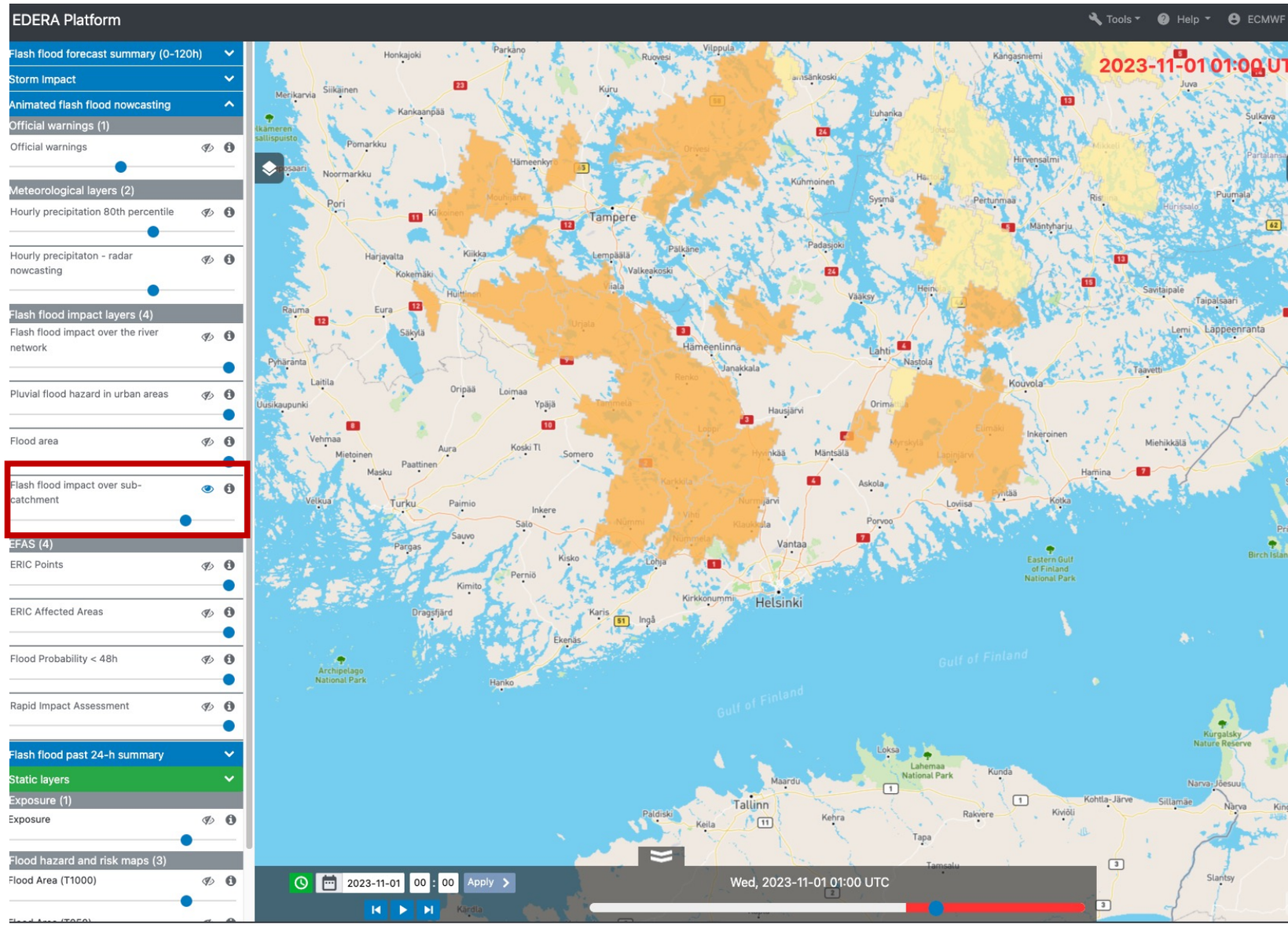
Animated flash flood nowcasting - Flash flood impact over sub-catchment

Update, time range and timestep:

- Hourly update
- Range: up to 6 hours
- Hourly time step for 0-6h. Driven by blending of radar nowcasting and NWP

Sub-catchment summary (90th percentile of river network cells)

4 impact categories



	Low Exposure	Medium Exposure	High Exposure
High Likelihood			
Medium Likelihood			✓
Low Likelihood			

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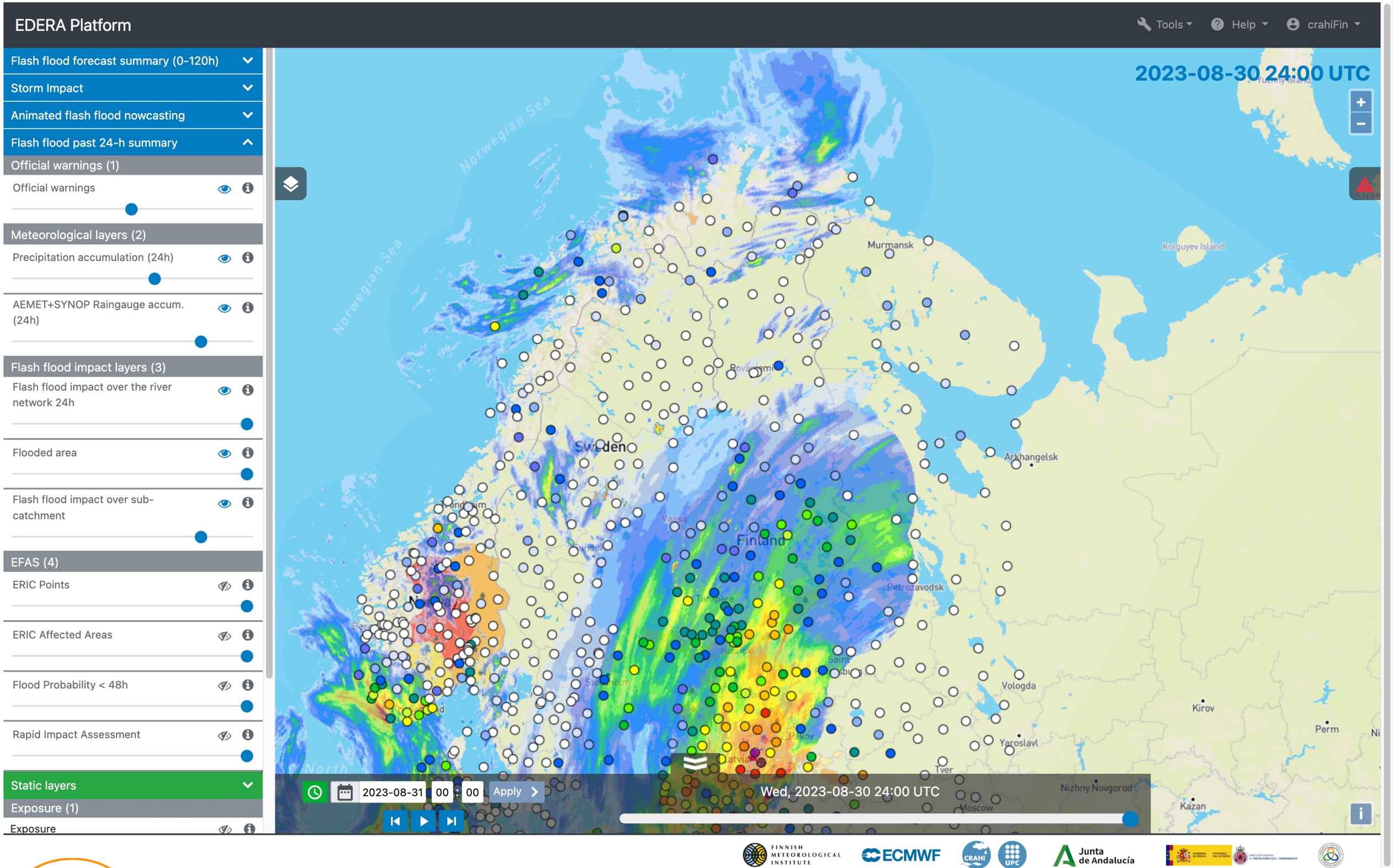
Daily summary



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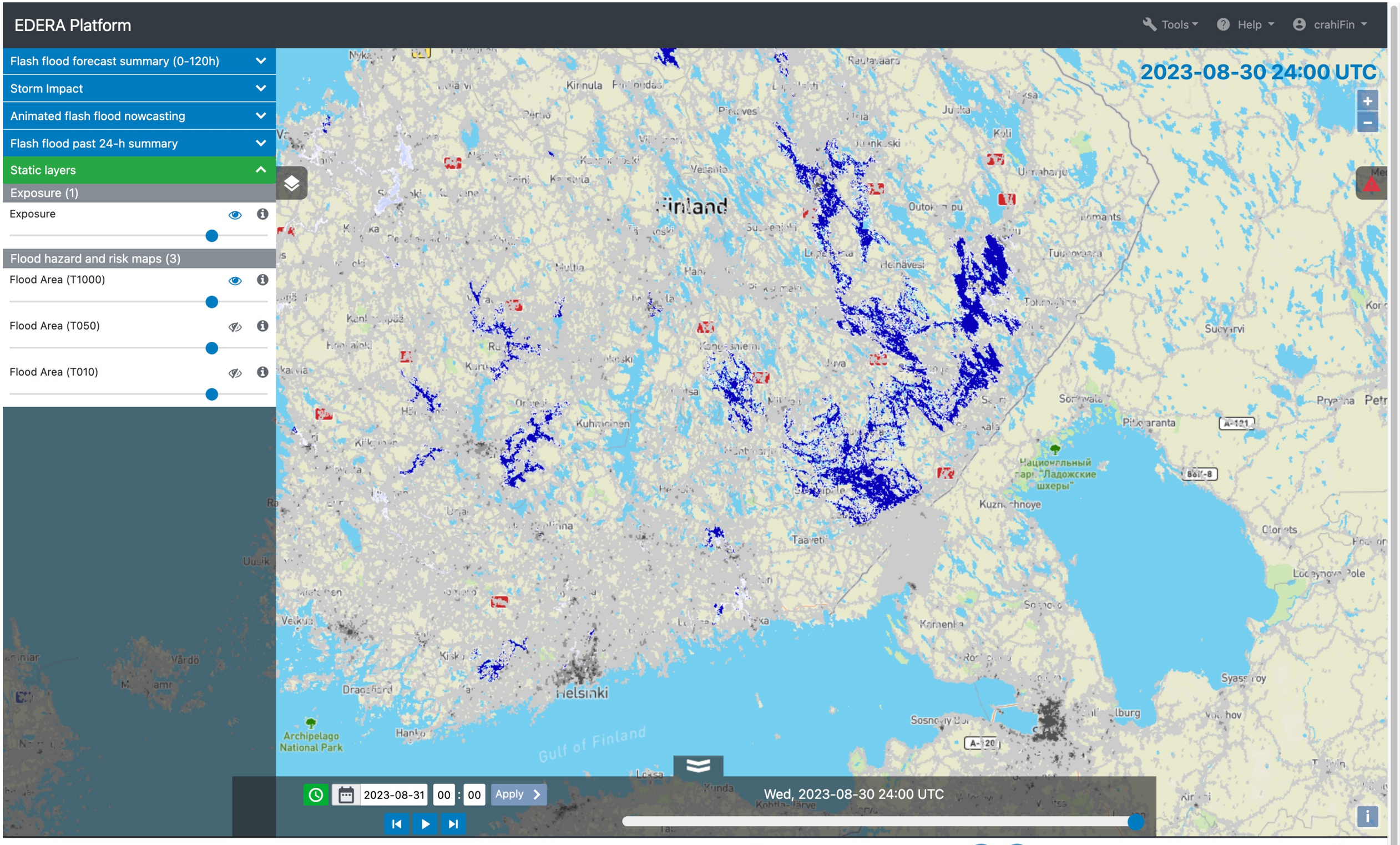
Static layers



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EMERGÊNCIA E PROTEÇÃO CIVIL
AUTORIDADE NACIONAL