CENTAUR PROJECT

05th March 2024

This project has received funding from the European Union's Horizon Europe research and innovation programme under Grant Agreement No. 101082720 - CENTAUR

CENTAUR Overview

1 CENTAUR objectives, achievements and challenges

CONTEXT

Climate change's impact on human lives and security is continuously growing:

- Over the last 50 years, the number of disasters has multiplied by a factor of five mainly driven by climate and weather extremes (WMO 2021)
- In particular, the last twenty years have seen the doubling of major floods.

Climate change is behind environmental degradation, which is a threats multiplier and an aggravating factor for political instability, that has implication on peace and security across the world.

OBJECTIVES

CENTAUR responds to societal challenges from Climate Change threats developing/demonstrating new components for Copernicus EMS and Copernicus SEA, with the objectives of:

- Improving situational awareness and preparedness around climate change and impact on complex emergencies and (security) crises.
- Anticipating the occurrences and knock-on effects of crisis events triggered by climatic extremes, thus contributing to resilience and effective adaptation.

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1 CENTAUR objectives, achievements and challenges

THEMATIC AREAS

Emergency Management

Flood-related threats to population, assets and infrastructures in **urban areas**.

Security

Water and food insecurity as precursors of political instability, conflict and forced displacement.

OPERATIONAL BENEFITS

Emergency Management

- Including of a prototype urban flood layer within the European Flood Awareness System (EFAS) map viewer.
- Improving early warning Integrating the CEMS mapping portfolio with enhanced products and services for mapping flood extent in urban areas

Security

- Enriching the current portfolio by integrating new vulnerability and fragility indexes.
- Reinforcing early warning capacities and pro-active geo-intelligence services for systematic surveillance of early signs and drivers of social unrest, population movements, and conflicts in connection with food and water insecurity

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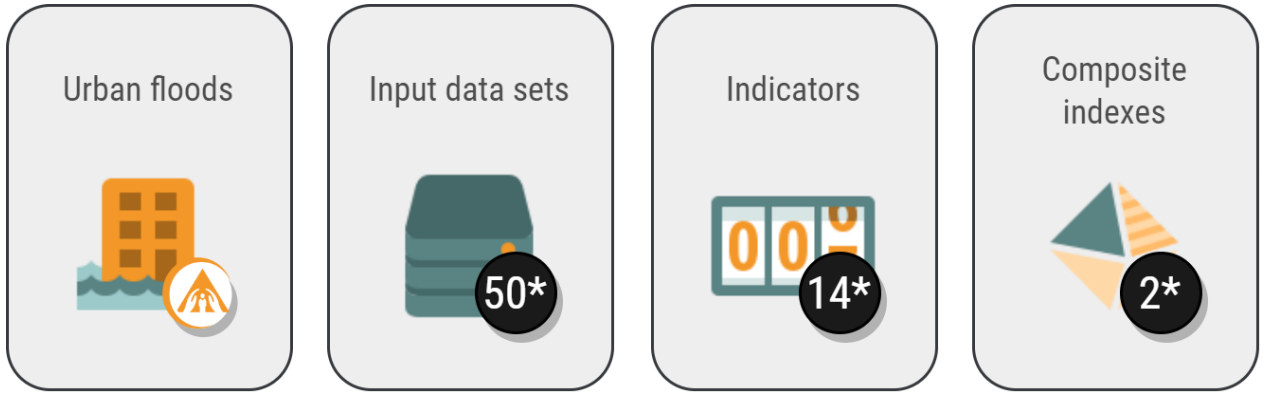
CENTAUR Overview

2 Conceptual model – New services and components

CENTAUR's UF track focuses on assessing urban flooding from a physical and socioeconomic point of view, by developing novel indicators and composite indexes.

URBAN FLOOD CONCEPTUAL MODEL



** indicates the number is liable to change during the project, due to unforeseen circumstances (e.g., additional input data required for validation, indicator not computed due to complexity in data collection, creation of a new index, etc.).*

- **Dual-mode monitoring system: i)** the system runs a continuous **global monitoring to detect potentially hazardous events, alerts are triggered at pre-defined thresholds; ii)** an **event-driven monitoring** is launched at the scale of the area of interest (AOI).
- The model considers several indicators of exposure and vulnerability to urban flood hazards, as well as of severity of impacts.

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Dual-phase system relies on historical, current, and prospective data to enhance monitoring of flood-prone urban areas.

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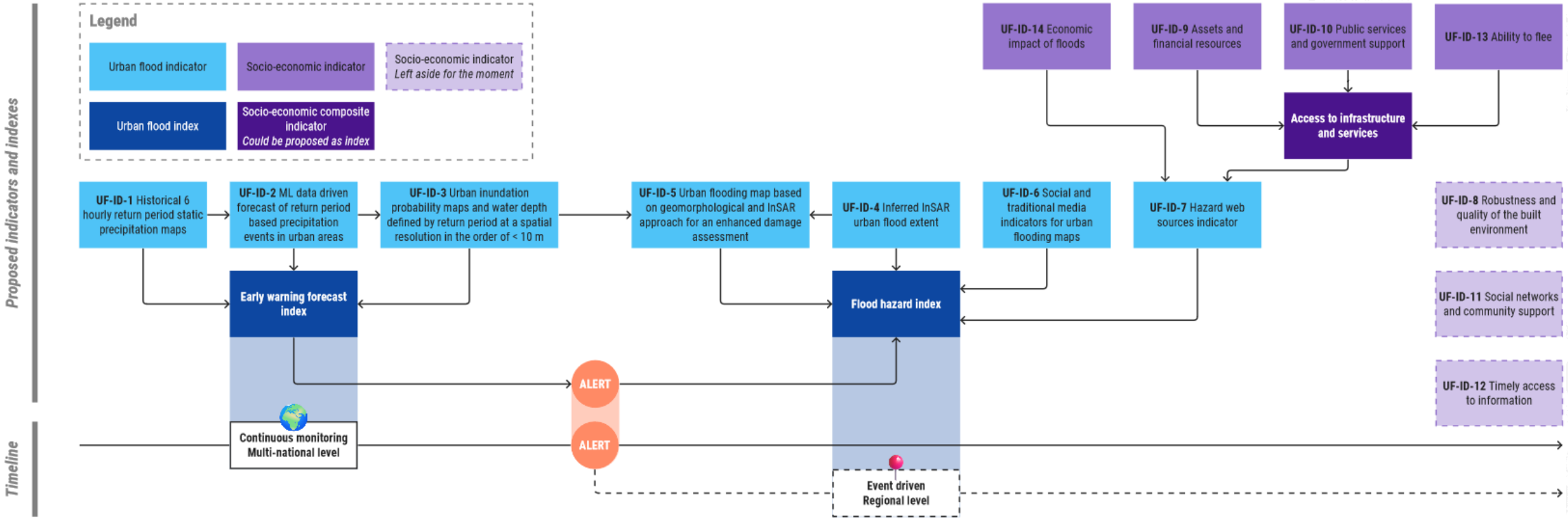

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2 Conceptual model – New services and components

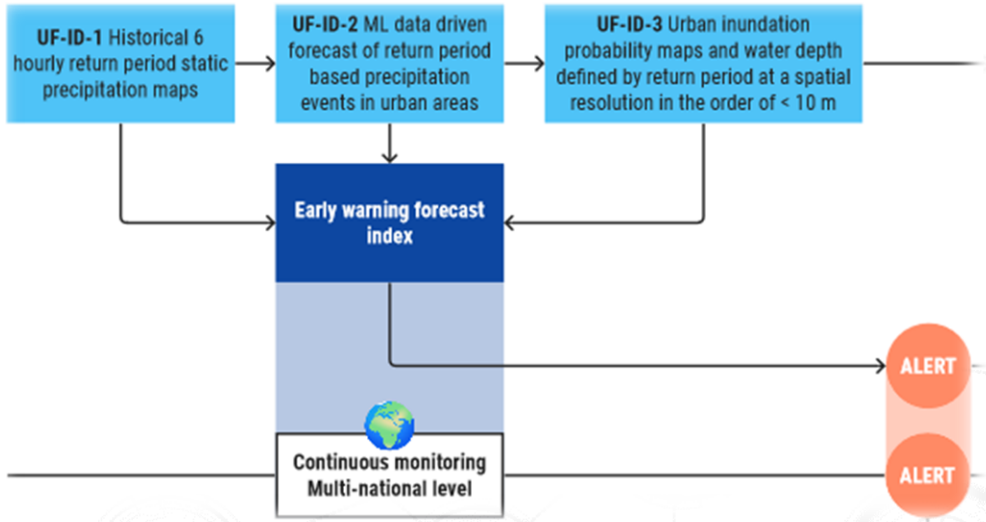
URBAN FLOOD CONCEPTUAL MODEL

EARLY WARNING FORECAST INDEX - CONTINUOUS MONITORING MODE

It **relies on UF-ID-1 to UF-ID-3 indicators**, sourced from meteorological data and high-resolution flood inundation mapping:

- UF-ID-1 assesses historical rainfall to identify extreme events with return periods indicating deviations from historical norms.
- UF-ID-2 predicts urban rainfall intensities by amalgamating historical, current, and forecasted weather data.
- UF-ID-3 combines ancillary data for HR urban inundation probability and depth maps for precisely prediction of local precipitation impact. Urban areas most susceptible to flooding at high resolution, ideally at 10 meters or less, are identified.

Frequent updates of the forecast (i.e., every 6 hours) facilitate continuous updates of UF-ID-2 and predictions.



Gap between meteorological forecasts and high-resolution inundation modelling is filled. Major novelty achieved within CENTAUR.

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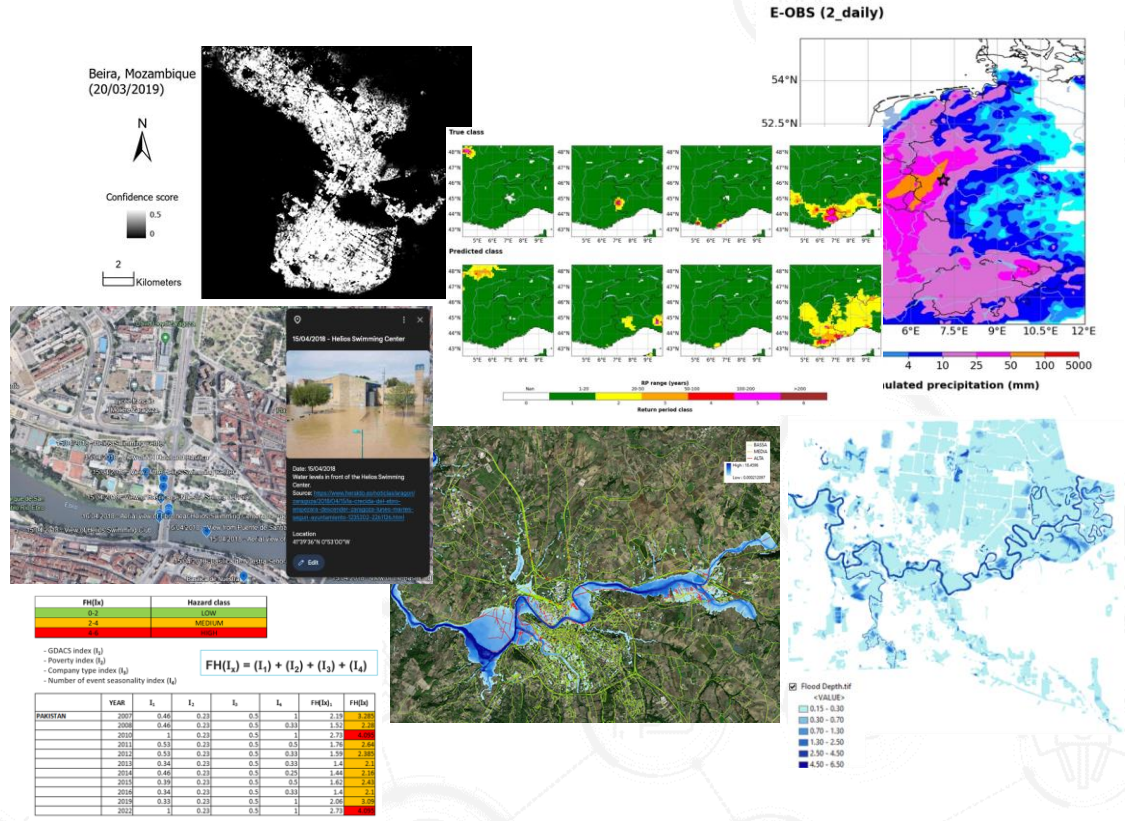
INNOVATIVE INDICATORS

URBAN FLOOD CONCEPTUAL MODEL

7 INDICATORS PRODUCED IN THE CONTEXT OF URBAN FLOOD AND RELATED 4 SOCIO-ECONOMIC RELATED INDICATORS

UF-ID	NAME
UF-ID-1	Static map of precipitation associated to return period
UF-ID-2	Forecast of return period
UF-ID-3	High-Resolution urban flood maps for various return periods
UF-ID-4	Inferred INSAR urban flood extent
UF-ID-5	Enhanced Urban Flood Damage Assessment
UF-ID-6	Social/Traditional media indicators for Urban Flooding Map
UF-ID-7	Flood hazard index
UF-ID-9	Assets and financial resources
UF-ID-10	Public services and government support
UF-ID-13	Ability to evacuate
UF-ID-14	Economic impact of floods



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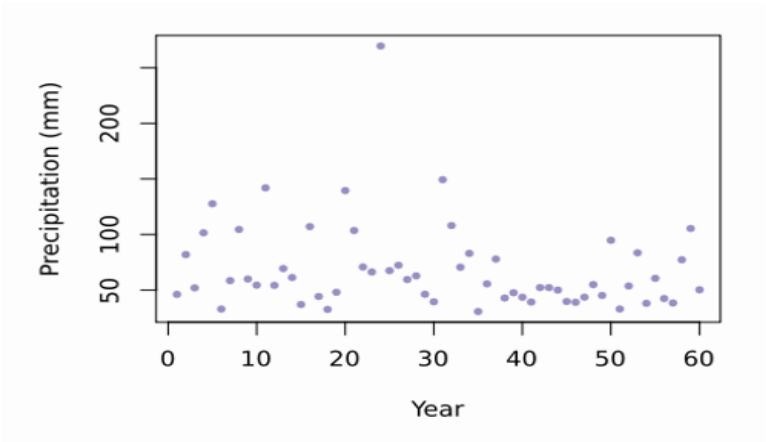
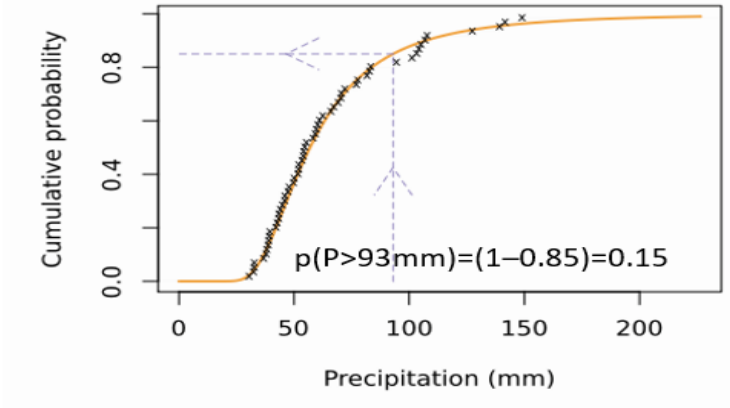
Methods | Estimating return periods

1 | Annual maximum precipitation
(based on 6-hourly or daily precipitation)

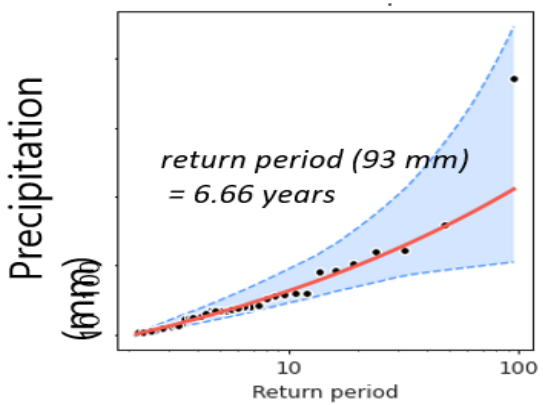


2 | Fit a distribution
(GEV)



annual probability of exceedance = (1 –cdf)

3 | Return period estimation



return period = 1 / probability of exceedance

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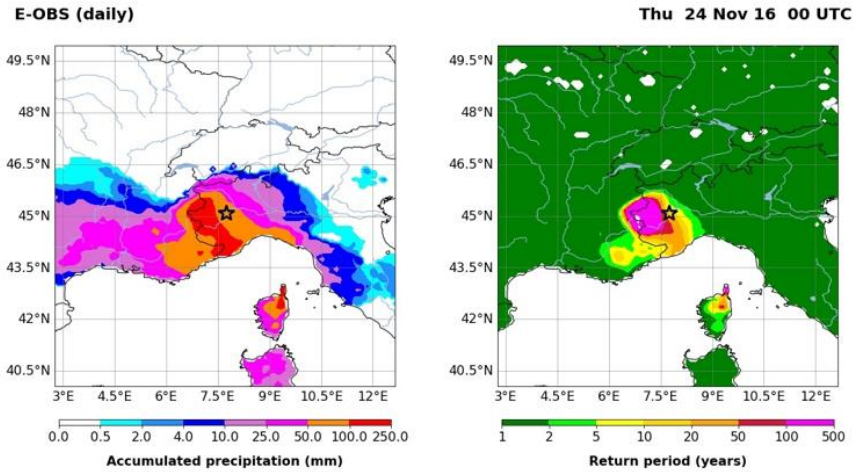
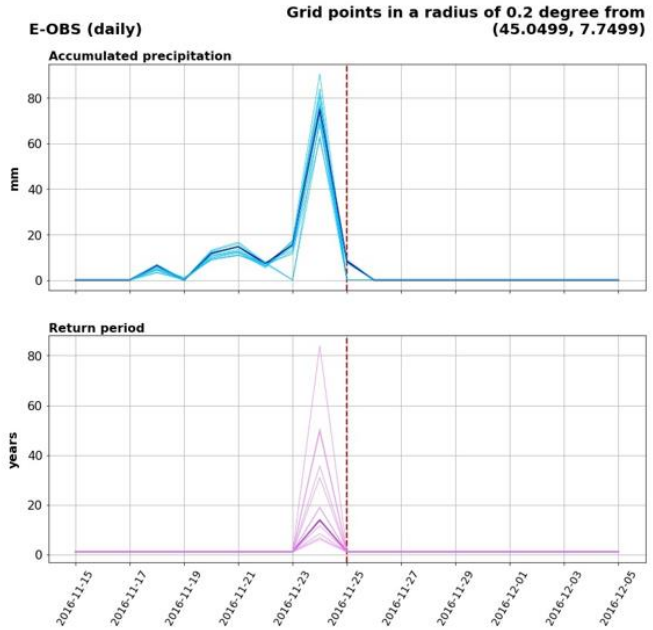
CENTAUR Overview – Use Case example

Return periods for extreme precipitation events
UF-ID-1 | WG02 – Italy (daily)





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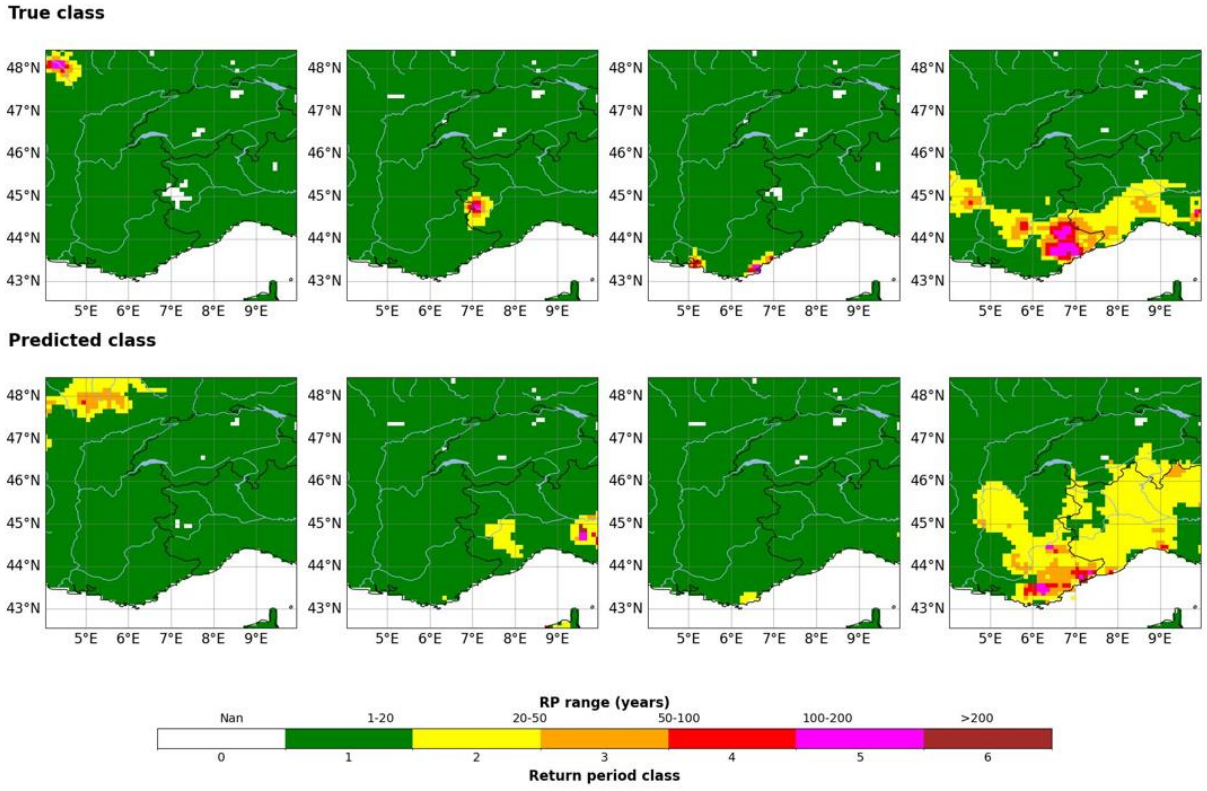
CENTAUR Overview – Use Case example

First results from the ML model for the Italian use case (UF-ID-2)



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THANKS FOR YOUR ATTENTION!!

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