



PRODUCTS



- Rainfall indicators over catchments
- On demand very high resolution weather forecast
- Streamflow forecast across the whole of Italy
- Maps of the spatial and temporal evolution of flood return period

SERVICE DELIVERY



- DestinE platform
- myDewetra, the National Civil Protection platform
- MeteoHub

MAIN USERS



The National Civil Protection System of Italy (national and regional level)

High-Resolution Early Precipitation to Flood Signals

Destination Earth Initiative. High-Resolution Early Precipitation to Flood Signals. Pilot Services supporting weather-related extremes resilience and impact mitigation.

The project addresses a key challenge: **how advanced forecasting models and early warning indicators can enhance regional preparedness and resilience to climate-related extremes**, especially floods.

The overall result is a **Pilot Service** that supports decision-making at different territorial scales. The service provides tailored, anticipatory tools to support to regions and communities better manage climate risks.

Aim of the Project

Exploit the Weather-Induced Extremes Digital Twin (Extremes DT) Operational Products to support decision-making in **reducing the impacts of weather-induced extremes**, with a focus on severe weather and flood forecasting for Italy by enhancing operational state-of-the-art modelling systems.

Hierarchy of Actions

A **three-step approach** with increasing complexity and resolution:

- 1 Early rainfall spatially aggregated **indicators** to provide pre-warning of potential floods
- 2 Application of the national **hydrological forecasting model** (FloodPROOFS) using Extremes DT products to simulate river behaviour and identify flood-affected areas
- 3 **On-demand simulation** chain combining the very high-resolution ICON model with FloodPROOFS, focused on selected critical areas

Key Strategies

Exploitation of Extremes DT Operational Products

High resolution precipitation data is used to build an appropriate indicator for anticipatory actions.

Integration of Extremes DT Operational Products

Extremes DT forecasts are coupled with Italy's operational hydrological models to enhance flood impact estimation across main watersheds.

Evaluation of the products as a trigger for on-demand high-resolution forecasting

Selected case studies will test the ICON-FloodPROOFS chain, evaluating the added value of simulations at high-resolution using DT boundary conditions.

Tools

- Tool for calculating **accumulated precipitation** for given small-scale river catchment areas using high-resolution atmospheric predictions.
- **Machine learning (ML) component** based on SynCast framework to provide flood indicator.
- Integration of Extremes DT (IFS with a resolution of 4.4 km) into **FloodPROOFS**, Italy's national-scale hydrological forecasting system.
- Tool for triggering on-demand **very high-resolution ICON forecasts** coupled with FloodPROOFS, using Extremes DT as input.
- **Full chain implemented on HPC** for met-hydrological forecasting.



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