

# The History of ecPoint Post-processing



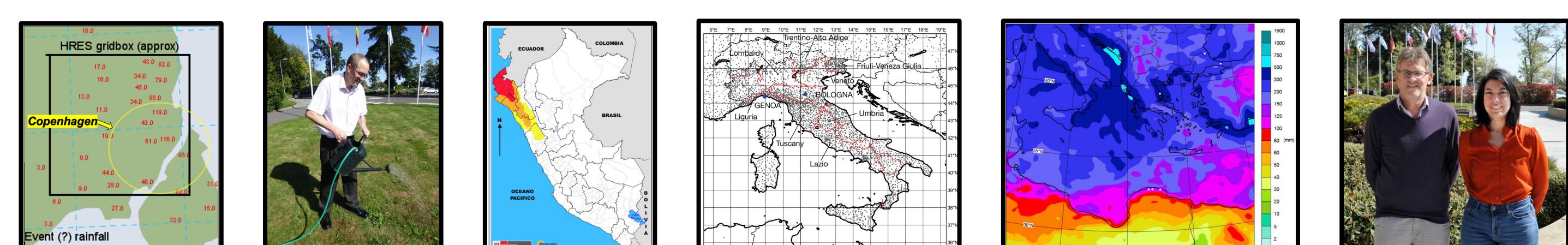
Tim Hewson, Fatima Pillusu, Esti Gascon, Axel Bonet, Cihan Sahin, Jenny Wong, Milana Vuckovic, Robert Osinski, Florian Pappenberger

## Background

- Most users want site-specific forecasts (i.e. for “points”)
- BUT** Global Models (GMs) deliver gridbox average forecasts
- For rainfall, for sites, GMs
  - Show too few dry days
  - Under-represent localized extremes
  - Over-predict slightly on average
  - Exhibit biases that depend also on situation (meteorological & geographical)
- Post-processing can target such issues, but historically “Post-processing gains for precipitation have been less pronounced {than for other variables} ... it's a bit of a mystery ... ” (Tilmann Gneiting, 2015)
- ecPoint** changed that, using non-local, non-parametric post-processing based on decision trees. It addresses all the above GM “features”.

## Timeline

2014: Sub-grid variability case in Denmark triggered idea  
2016: Post-processing concept presented at Otten Prize final (at EMS in Sofia)  
2017: First real-time ecPoint rainfall forecasts provided to Peru  
2019: 12h ecPoint-rainfall forecast products introduced by ECMWF  
2020: 6h ecPoint-rainfall blended with post-processed LAM EPS data to deliver real-time forecasts for Italy (MISTRAL project)  
2021: Underpinning ecPoint paper published  
2023: Sub-seasonal ecPoint temperature and rainfall forecasts, plus ERA5-ecPoint reanalysis back to 1950 (HIGHLANDER project)  
2025: Tim Hewson and Fatima Pillusu awarded Hugh Robert Mill award for precipitation research (Royal Met Soc), for ecPoint work  
2025: ERA5-ecPoint data to go live in the Climate Data Store (CDS)  
2026: ecPoint-rainfall 6,12,24h forecasts to be made operational at ECMWF



## Uptake by Country

### Confirmed users

Research studies (e.g. local verification)

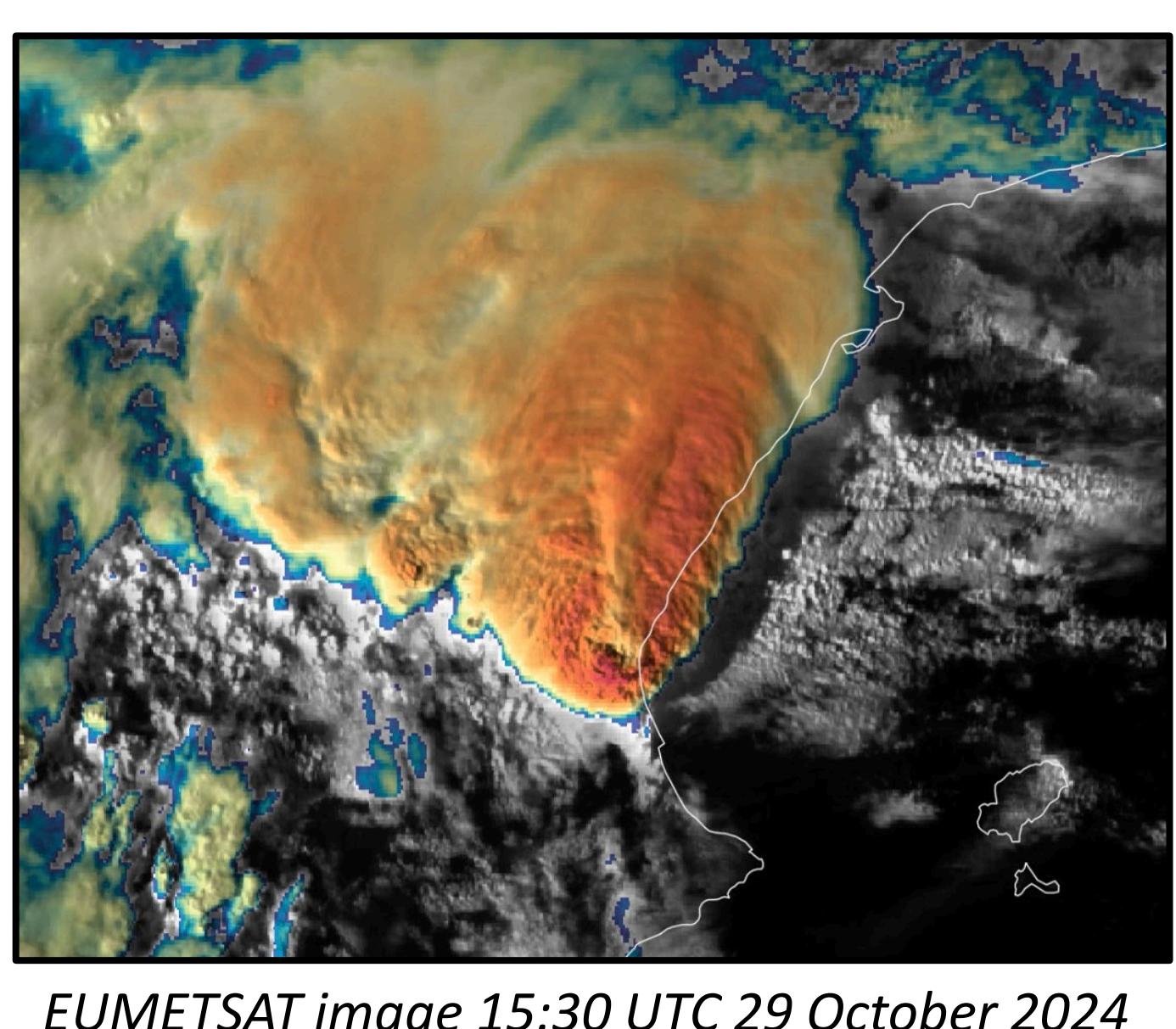
Requests for software / data / documentation

Some countries have been active in 2 or 3 of these classes (e.g. Hungary)

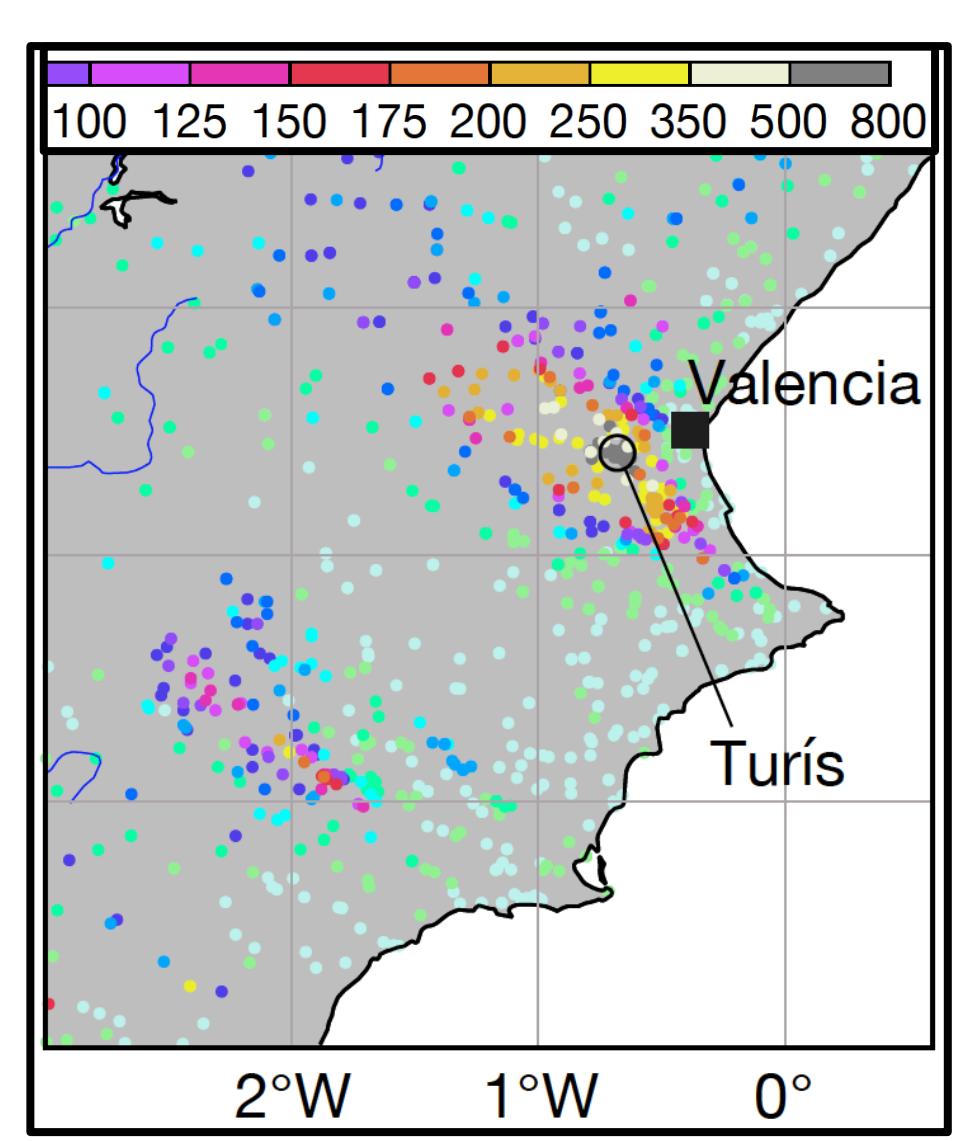


ecPoint training workshop  
Tashkent, Uzbekistan

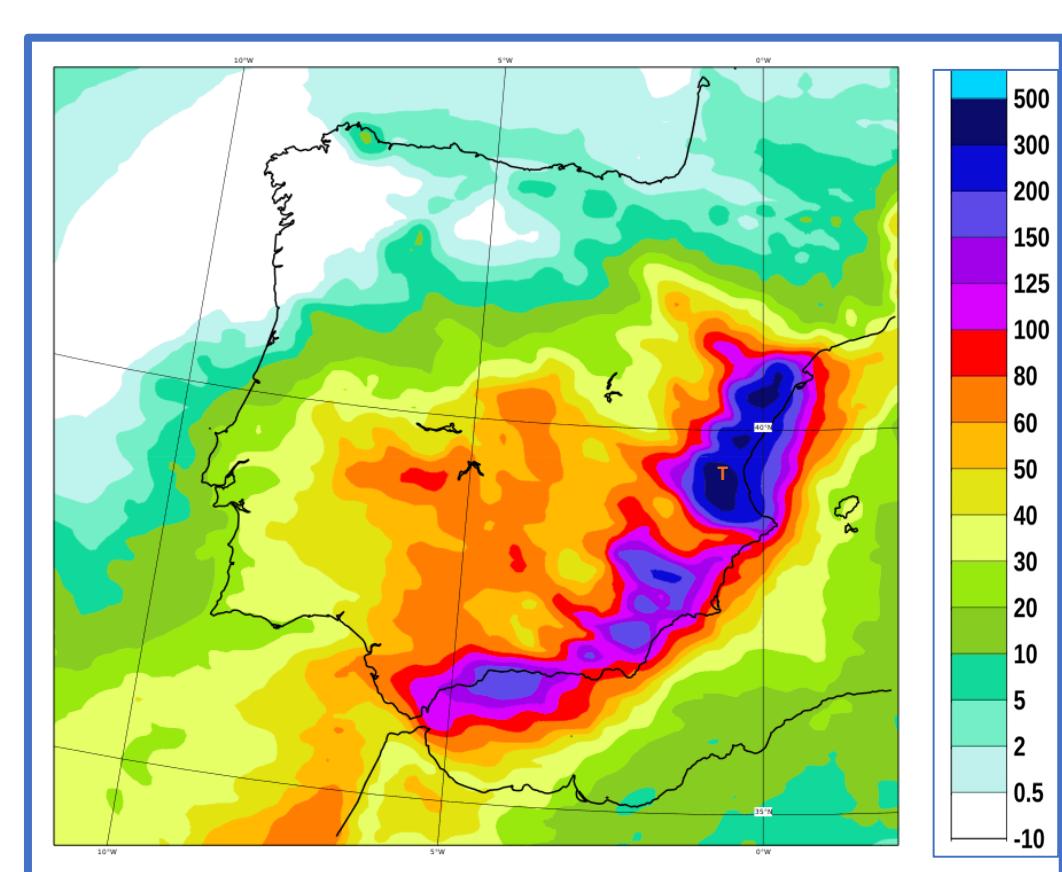
## Example: Medium Range Forecast Products – Valencia Floods, Oct 2024



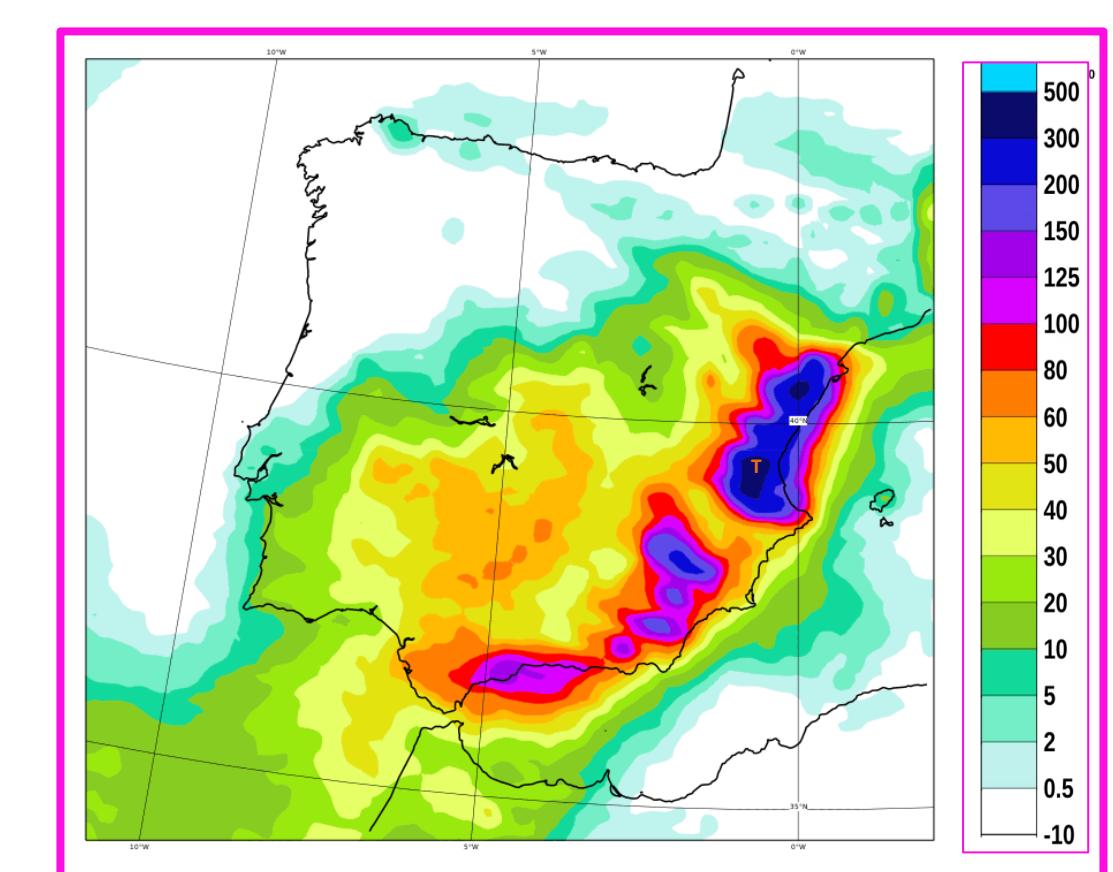
EUMETSAT image 15:30 UTC 29 October 2024



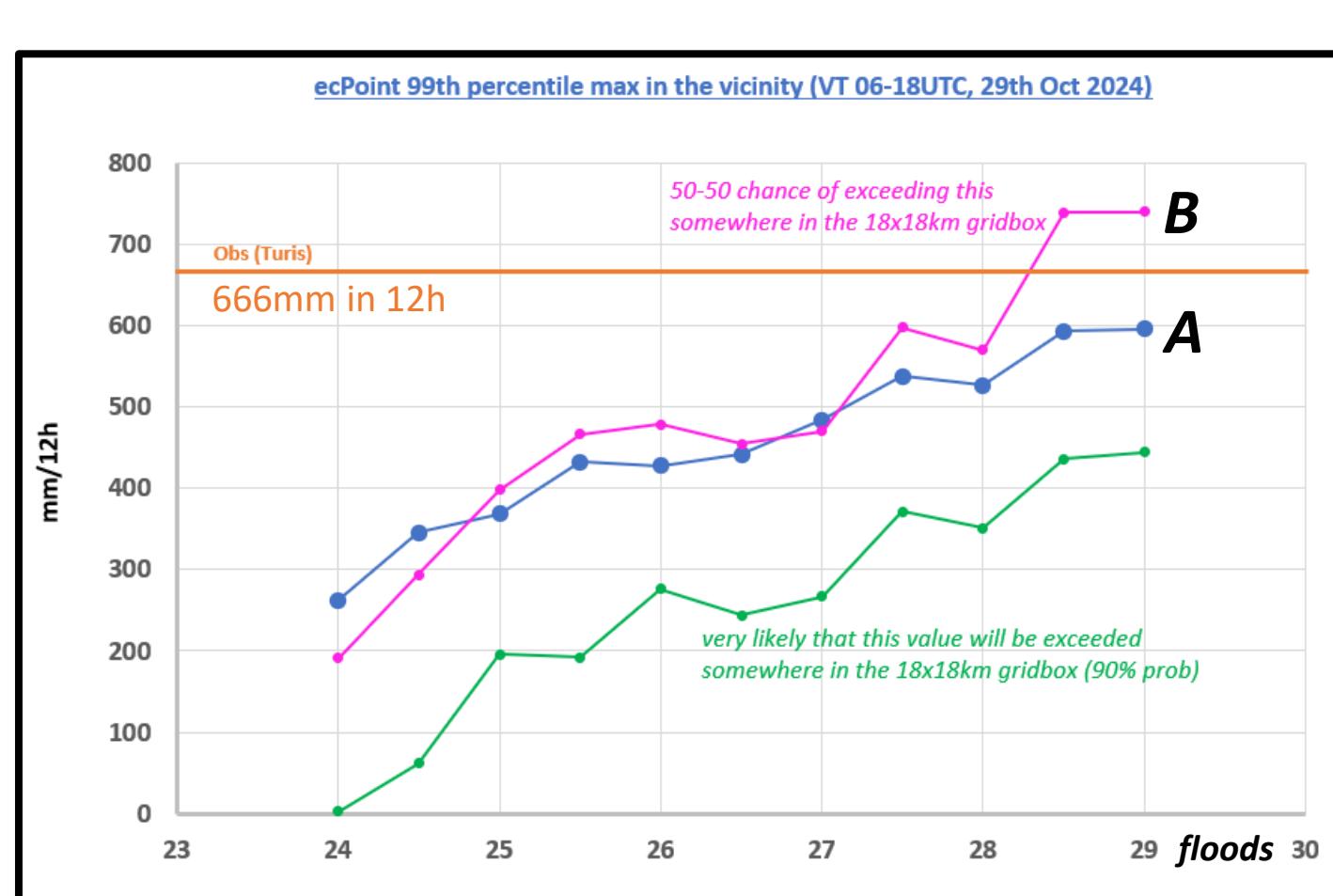
24h event rainfall totals (mm)



A. Standard 99<sup>th</sup> percentile ecPoint forecast, 12h rainfall in mm (1% chance of exceedance at a given site). 4-day lead. T=Turis.



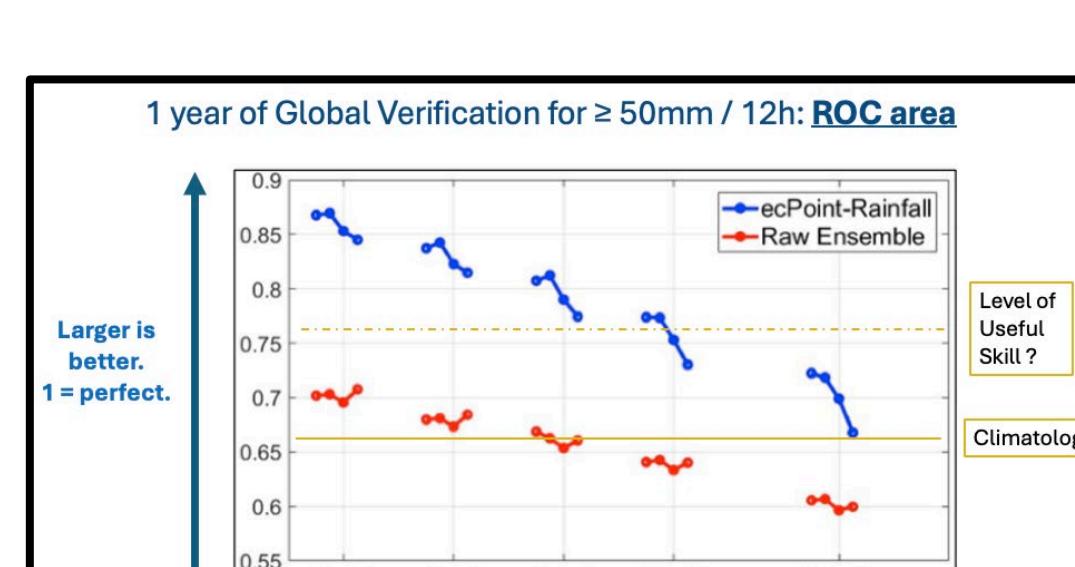
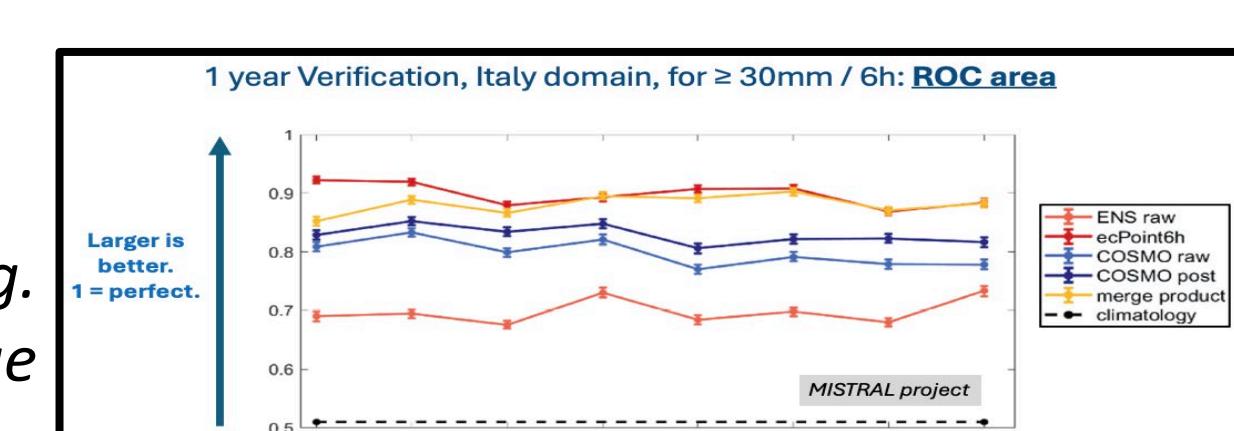
B. Alternative (pre-operational) ecPoint product: 50-50 chance of exceedance somewhere in the vicinity (12h rainfall (mm), 18x18km box). 4-day lead.



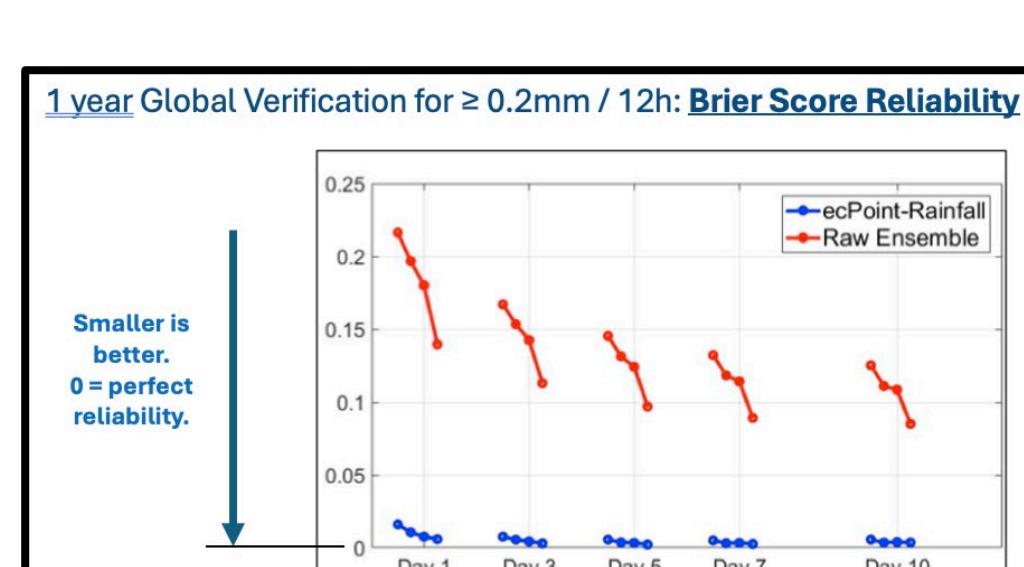
Day-by-day evolution of ecPoint forecasts in the lead up to the Valencia floods of 29<sup>th</sup> October 2024, versus the Turis observation

## Verification

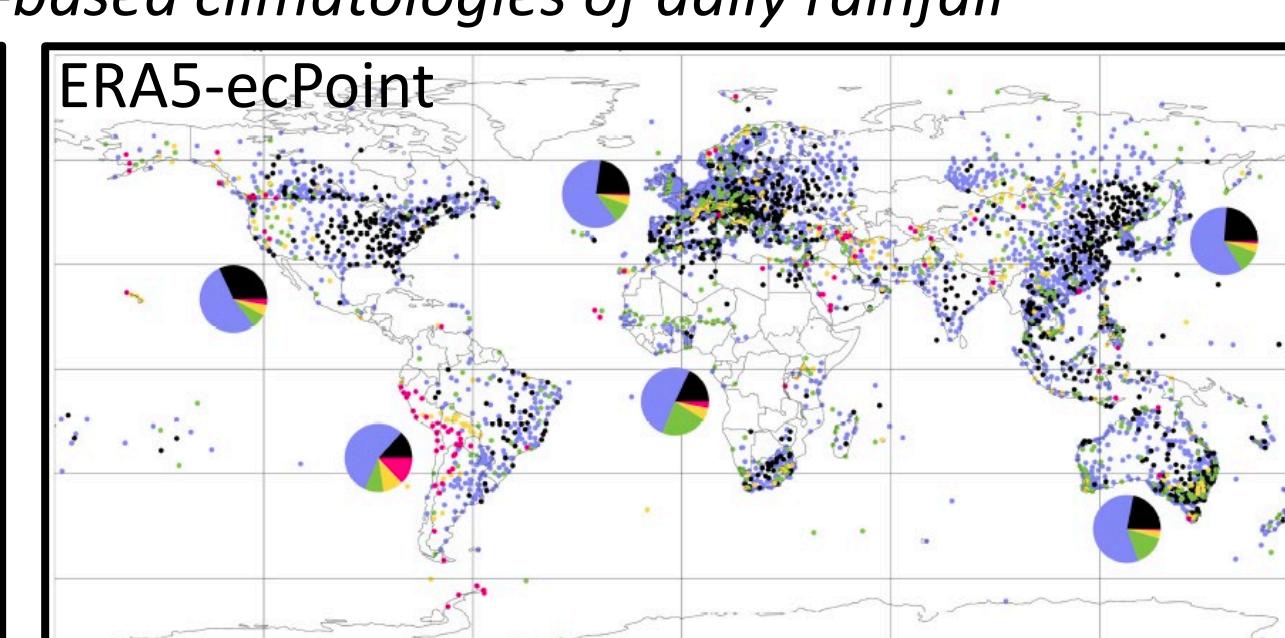
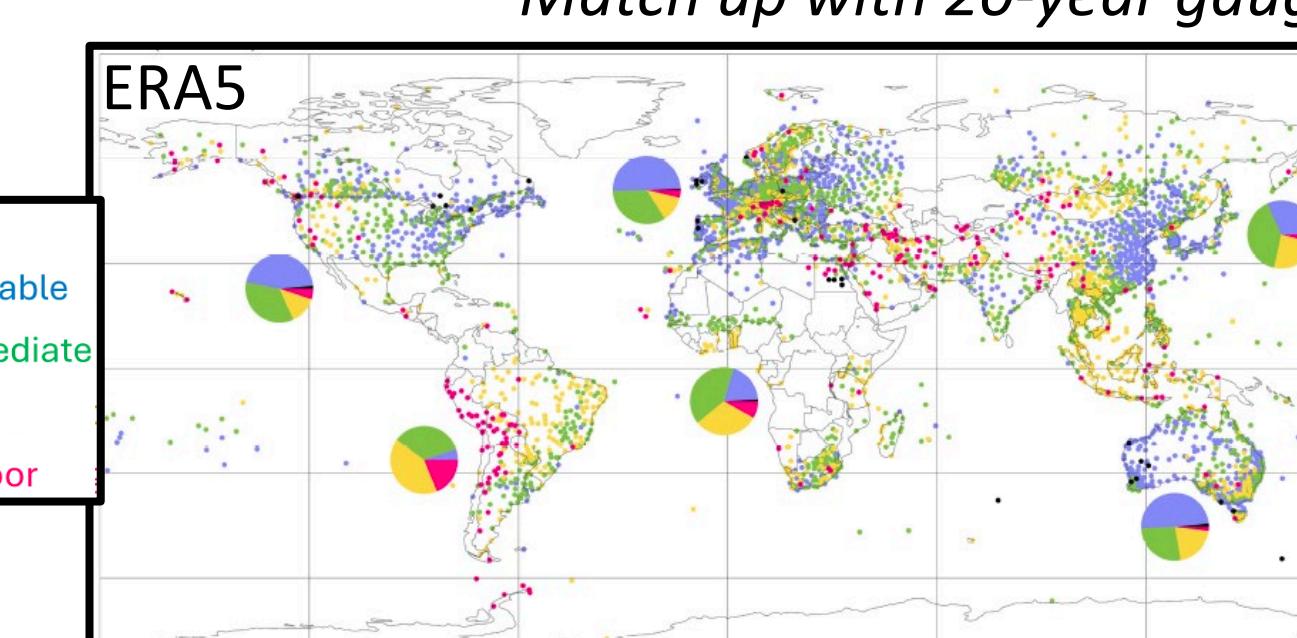
Different EPS systems with/without post-processing. COSMO is a 2.2km LAM ensemble. COSMO adds value in certain situations – e.g. JJA evening convection.



Performance of RAW IFS ensemble versus ecPoint. ROC area = discrimination ability.



Match up with 20-year gauge-based climatologies of daily rainfall



## Some quotes

“ECMWF has to implement this!” – Dominique Marbouy, France, 2016

“The fact that ecPoint performs so much better for high thresholds is amazing” {re: ROC scores versus post-processed 2km COSMO ENS, over Switzerland} – Mark Liniger, MeteoSwiss, 2022

“...for 2mm, 10mm and 50mm ecPoint had much better reliability and much better discrimination.” {than DWD post-processed rainfall forecasts} – Cristina Primo-Ramos, DWD, 2022

“...this is a rather remarkable rate of operational use...” {for such a new product} – Francois Lalaurette, France, 2023

## Where to next ?

- What else can we use ecPoint for ? (climate model downscaling, point observation QC, ...)
- Hydrological model inputs (bias-corrected gridscale or flash flood modelling applications)
- Can AI assist with ecPoint decision-tree creation ? (under discussion)
- Can we apply ecPoint post-processing to AIFS-ENS forecasts ? (yes but need CAPE)
- Will new AI methods supplant ecPoint globally ? (no evidence yet)