EMS2022
22nd EMS Annual meeting
Bonn | 4 - 9 September 2022

On the crossing-point forecast

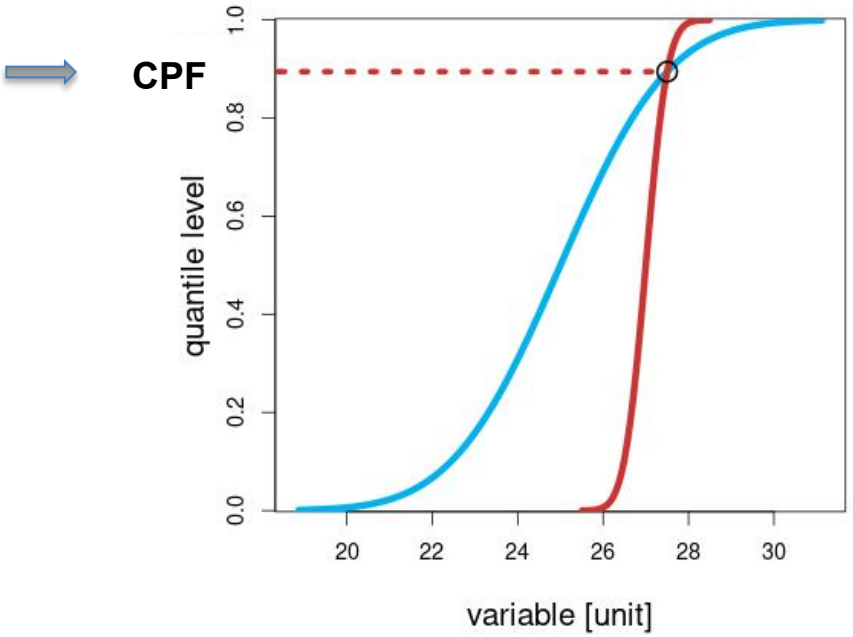
Zied BEN BOUALLÈGUE

ECMWF

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A new (simple) concept

- the crossing-point forecast (CPF) is a probabilistic forecast
- CPF focuses on the intersection point between **climate** and **forecast** cdfs
- CPF takes value in [0,1] on the quantile level axis



CPF applications

- **Verification of probabilistic forecasts:**
  - use of proper scoring rules

- **Forecasting extreme events:**
  a comparison with **EFI** (Lalaurette, 2003)
  - examples
  - verification results

CPF applications

- **Verification of probabilistic forecasts:**
  - use of proper scoring rules

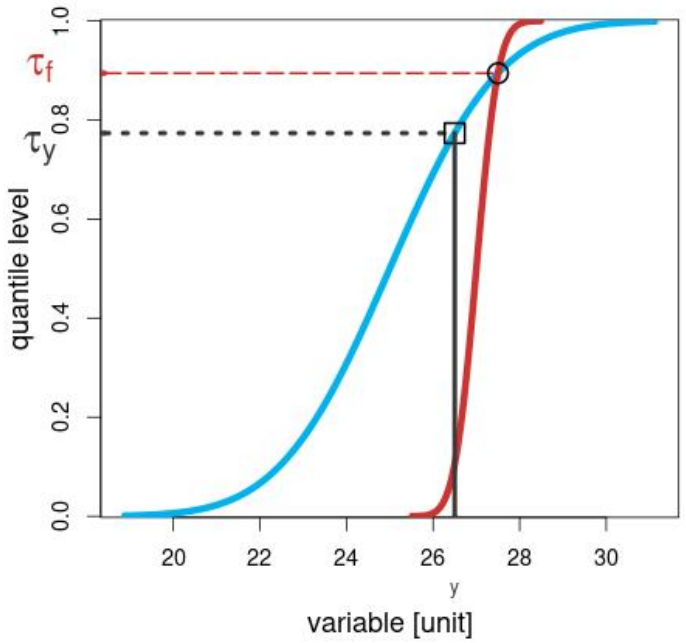
- **Forecasting extreme events:**
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Proper scoring rules / consistency

mean forecast …… root mean squared error
median forecast …….... mean absolute error
quantile forecast …….... quantile score
crossing-point forecast ….. **diagonal score**

Gneiting, 2011

Ben Bouallegue, 2021

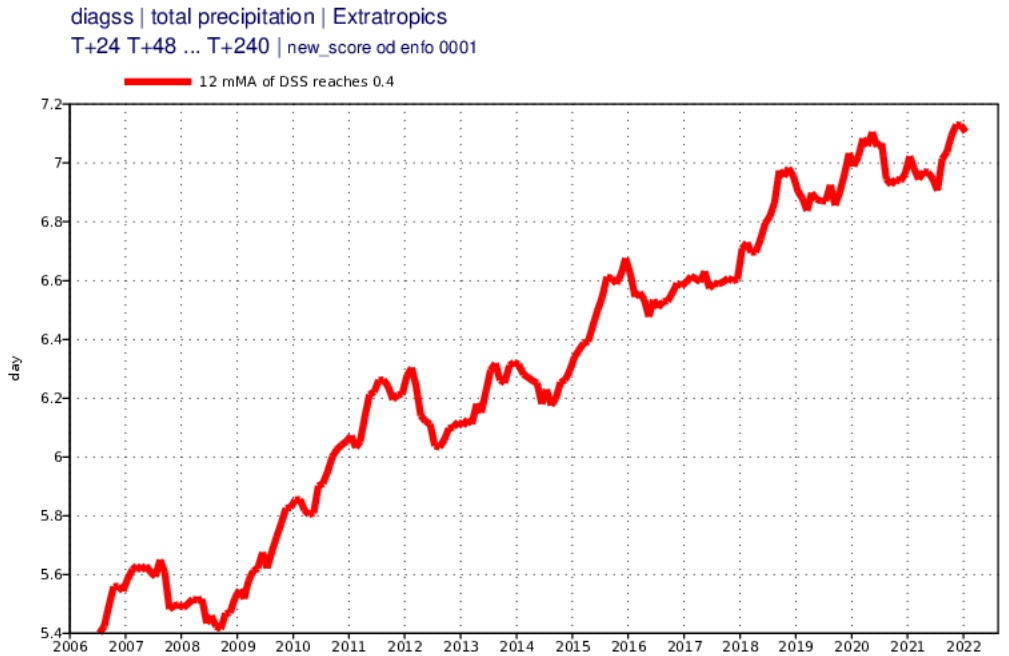


$$S(\tau_f, \tau_y) = \begin{cases} \tau_y^2 - \tau_f^2 & \text{if} \quad \tau_y \geq \tau_f \\ (1-\tau_y)^2 - (1-\tau_f)^2 & \text{if} \quad \tau_y < \tau_f \end{cases}$$

Verification of probabilistic forecasts

Evaluation of ECMWF forecast performance:

- long-term trend of the **diagonal skill score** of daily precipitation ENS forecasts



CPF applications

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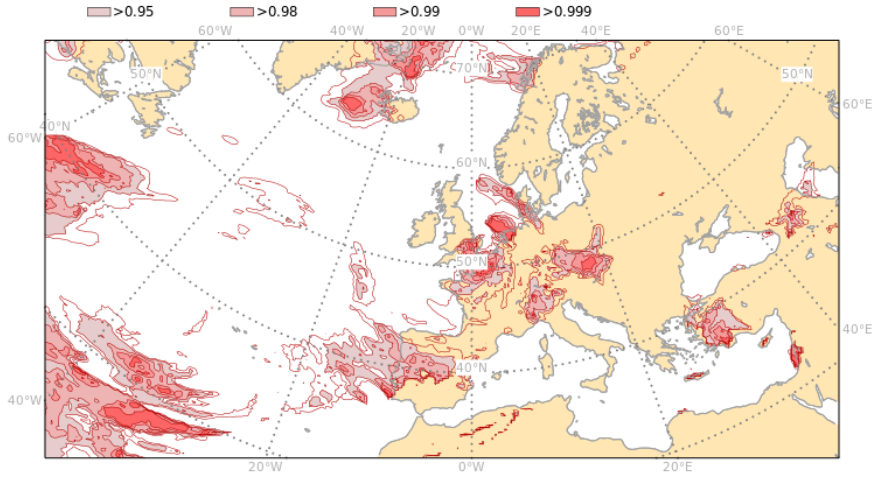
A precipitation example

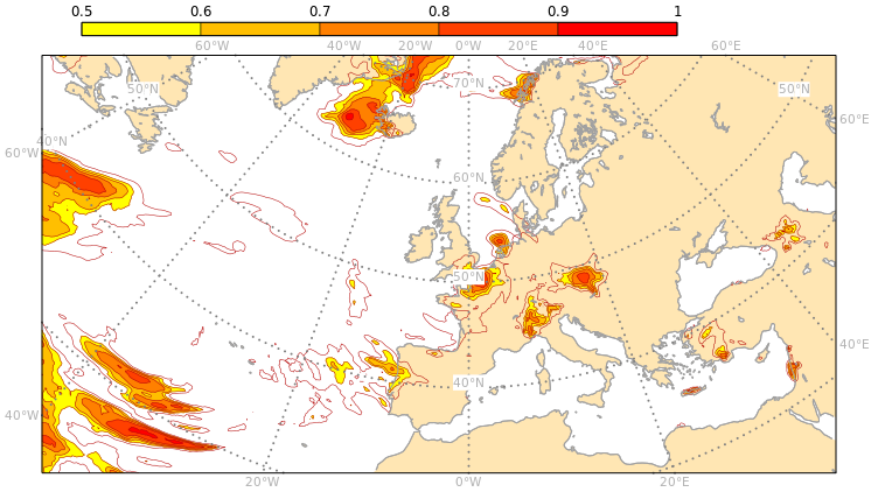
25/07/2021

CPF

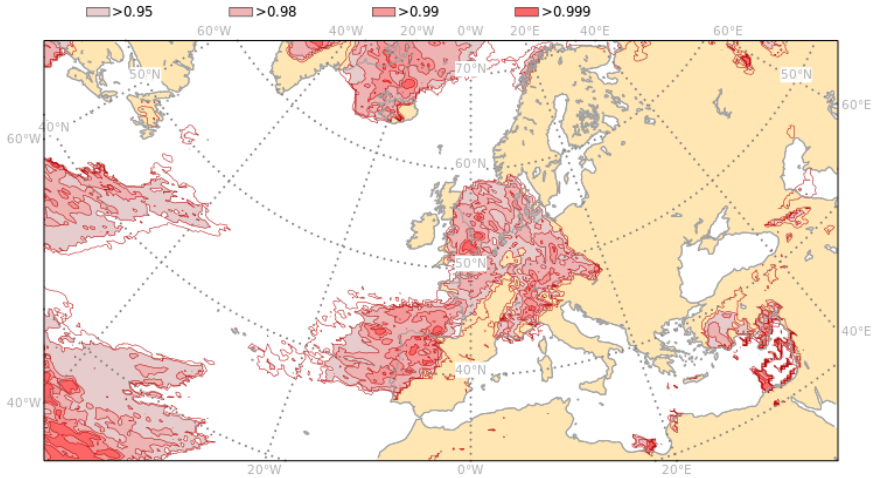
EFI

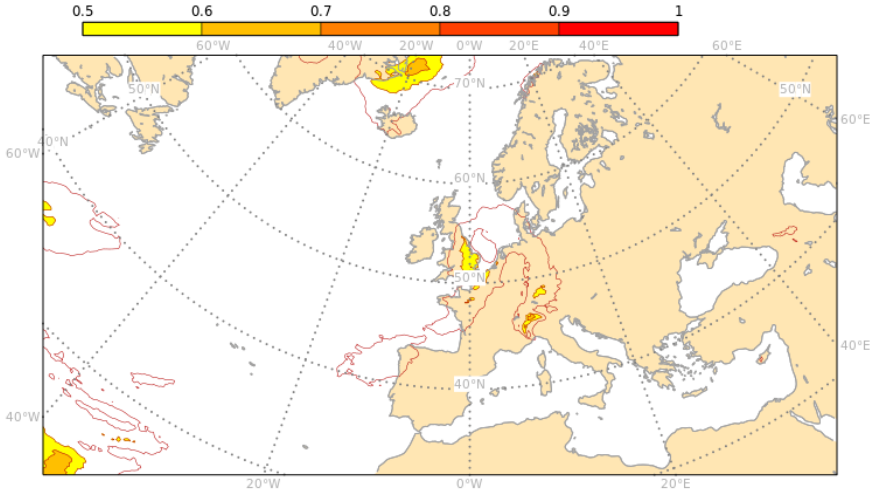
Day 1





Day 6





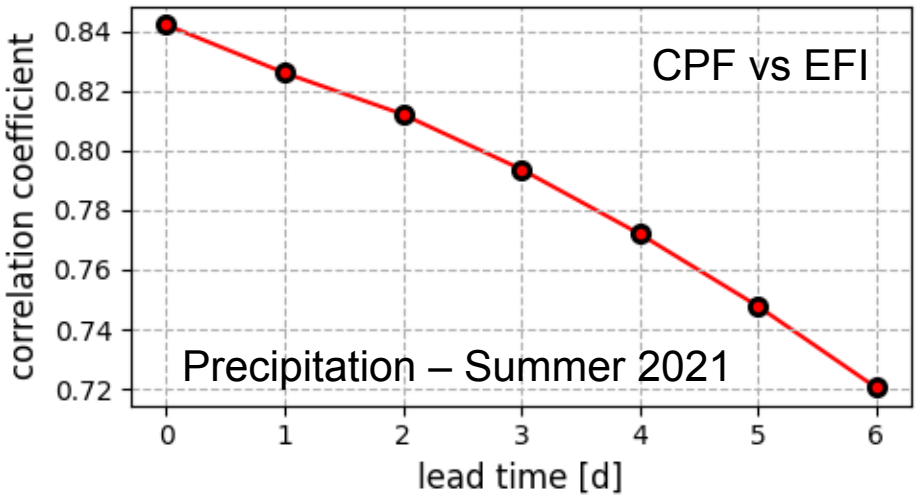
CPF interpretation

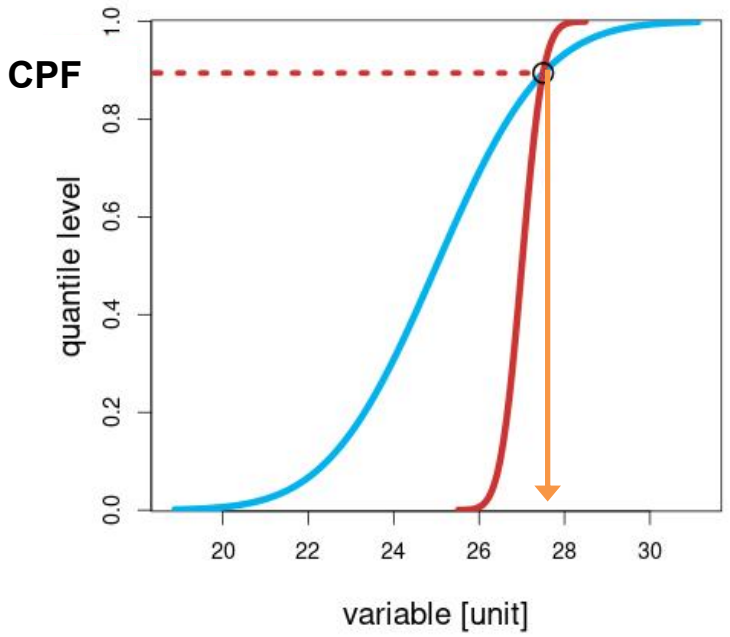
CPF:

- is interpreted as a “**probabilistic worst-case scenario**”,
- is the most extreme forecast event such that the risk in the forecast is larger than the climate risk,

and

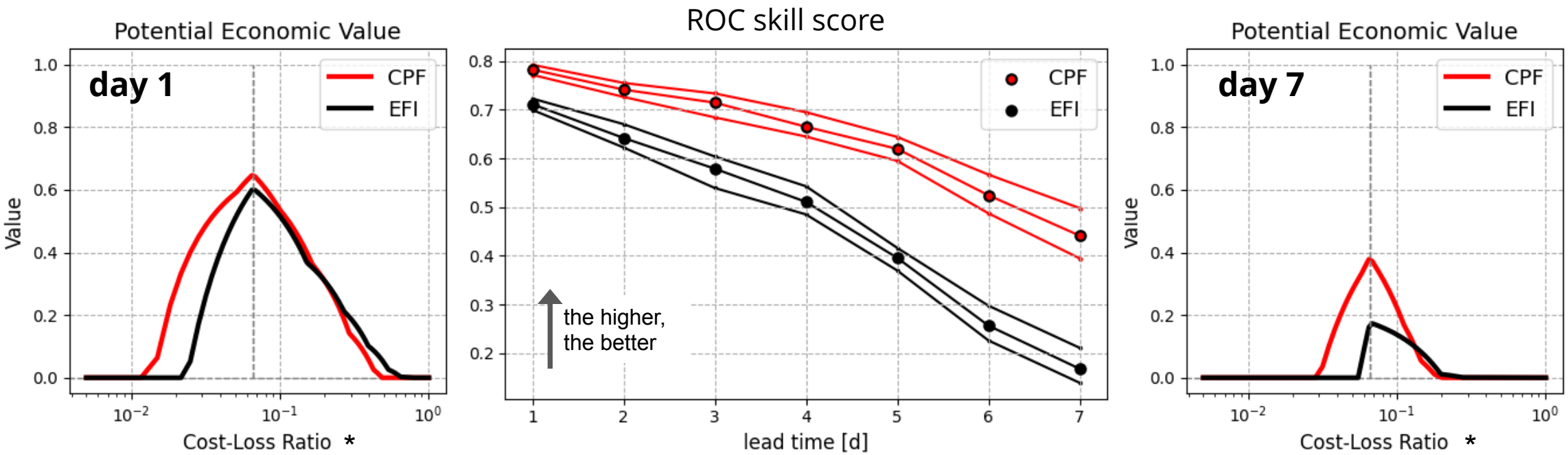
- conveys information about the event intensity in terms of a climate quantile (or a return period),
- is a probabilistic forecast (it has a meaning, the concept of reliability holds),
- but can also be used as an index: the larger, the more likely an extreme event.





Verification results

- Daily precipitation, Europe, Summer 2021
- Event: observation > 95% climate quantile
- Decision-thresholds used to populate contingency tables are consistent with the forecast visualisation



*distorted axis with log-transformation

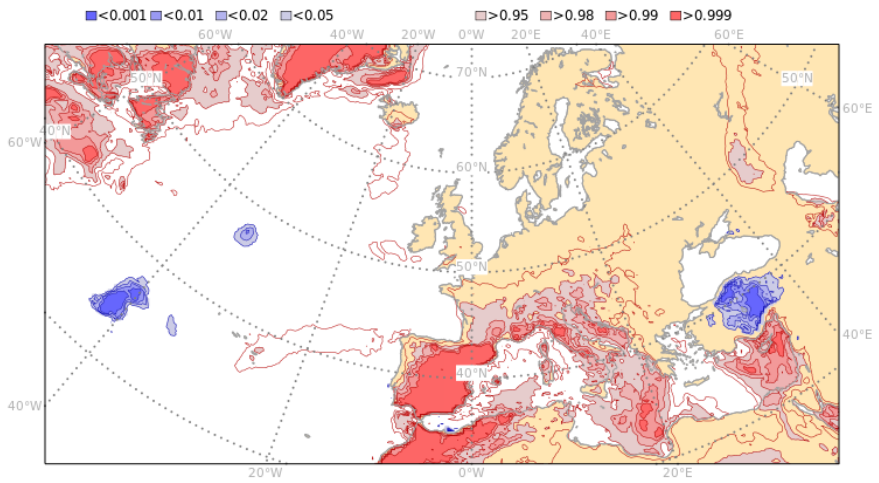
A 2m temperature example

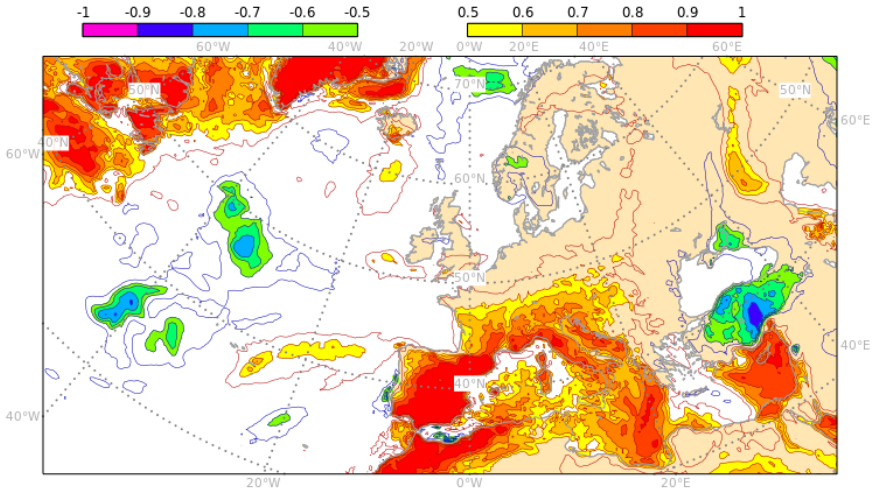
14/08/2021

CPF

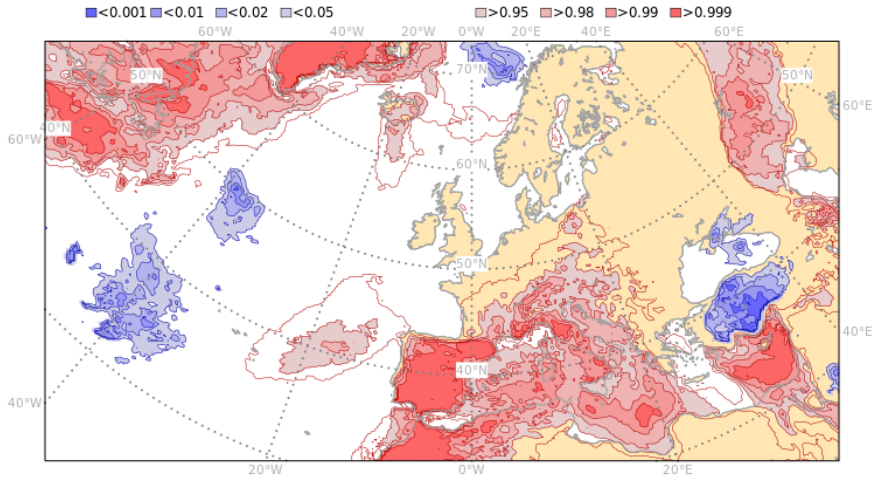
EFI

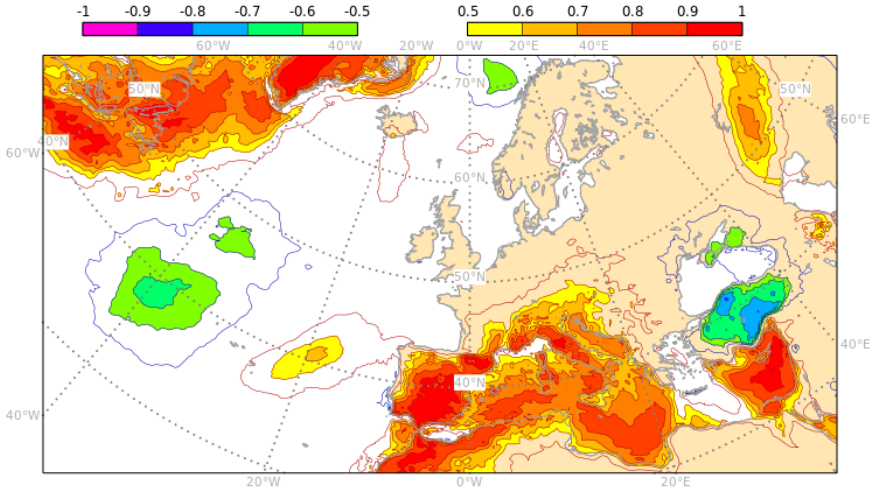
Day 1





Day 6





Take-home message

- The **crossing-point forecast** (CPF) is a **new** type of probabilistic forecast.
- In forecast **verification,** CPF is consistent with the **diagonal score**.
- In forecasting **extreme events, CPF shows promising results**.



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Thank you for your attention

Contact : zied.benbouallegue@ecmwf.int

Reference: Ben Bouallègue Z (2021), On the verification of the crossing-point forecast, Tellus A: Dynamic Meteorology and Oceanography, 73:1, 1-10, DOI: 10.1080/16000870.2021.1913007

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