Operational multi-model hydrological seasonal forecasts for Europe: development, skill and challenges

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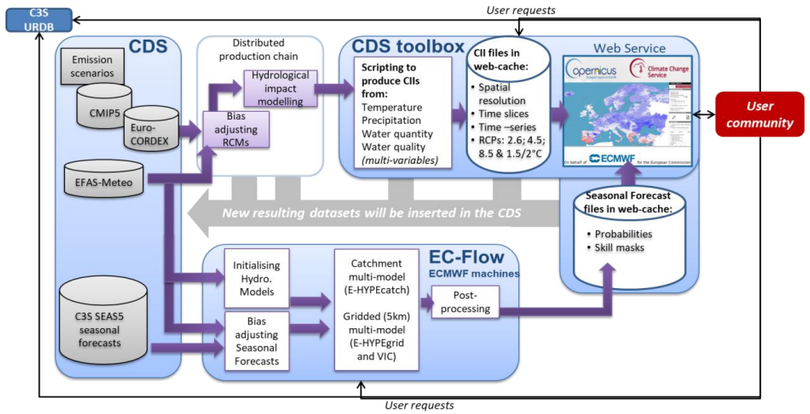
Background: C3S WaterSIS

Operational service for the water sector.

- Speed up the workflow in climate-change adaptation by using **seasonal forecasts** and **climate-impact** indicators across **Europe** using a **high-resolution multi-modelling** approach.



Objective

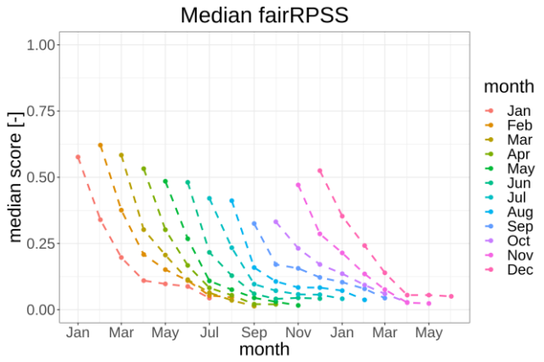
- **Downscale** models to 5x5 km EFAS drainage network.
- Create **bias adjusted** air temperature and precipitation.
- Produce **hindcasts** and **terciles** from 1993 till 2016 of river flow.
- Perform hindcast **skill assessment**.
- **Operational implementation** of a multi-model seasonal forecasts in ecflow (ECMWF).

Methods

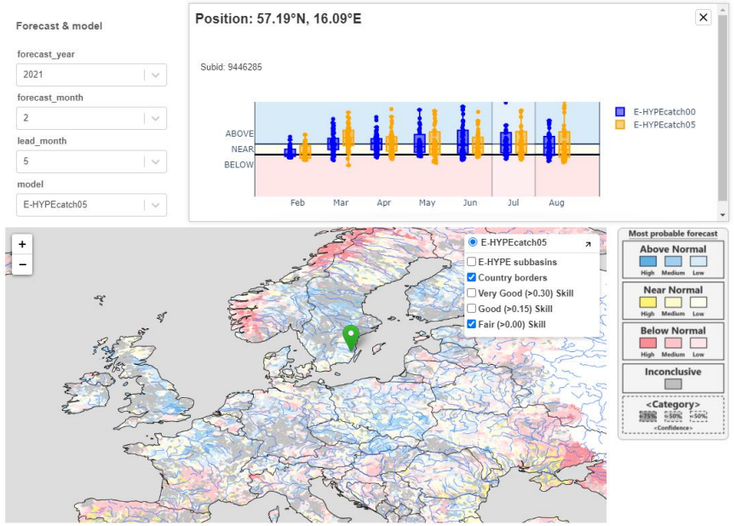
- Align hydrological models **E-HYPE & VIC-WUR**.
- Bias adjustment of air temperature and precipitation using **empirical quantile mapping** and EFAS-meteo reference dataset (1990-2018).
- **Bilinear remapping** of SEAS5 from 0,33° to 5 km.
- **Disaggregation** from daily to 6h VIC-WUR forcing.

Results

- **120 TB** VIC-WUR and E-Hype model forcing and output!
- **Positive skill** across Europe.
- Better skill in North of Europe except for the spring (snow melt). Skill close to climatology in Mediterranean autumn.



VIC-WUR CRPSS skill for each init month plotted against their target.



Conclusion and Future Outlook

- Setting up a multi-model seasonal forecast system is not straightforward. Differences in models should be handled carefully to produce comparable results.
- Lining up the models with identical soil and vegetation input datasets and calibration procedures might increase the robustness of the seasonal forecast system.
- How should we interpret the seasonal forecast and skill in a changing climate?

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