Post-Processing Hydro-Meteorological Tercile Forecasts with Weather Regime Data using Machine Learning

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Method:

Training a **Gaussian Process** model to post-process monthly tercile forecasts of catchment level hydrological variables in Switzerland (PREVAH output) with European **weather regime (WR)** data. Variables: **total discharge, baseflow, soil mositure and snow melt**.

Data Types:

Raw forecasts - daily ensemble means of PREVAH outputs (51 members) converted to weekly tercile classes of ”low”, “medium” & “high” w.r.t climatology.

Pre-processed forecasts - PREVAH outputs forced with meteorological forecasts post-processed with quantile mapping by MeteoSwiss.

WR data - based on 500 hPa geopotential height (Z500) over Euro-Atlantic region, provided by KIT.

Data coverage: April 2018 – September 2020

Fig 1 . Compositions of the six processing cases investigated.

Results:

Best Practice is the approach with the highest overall accuracy among all six processing cases applied to a individual catchment (total 307).

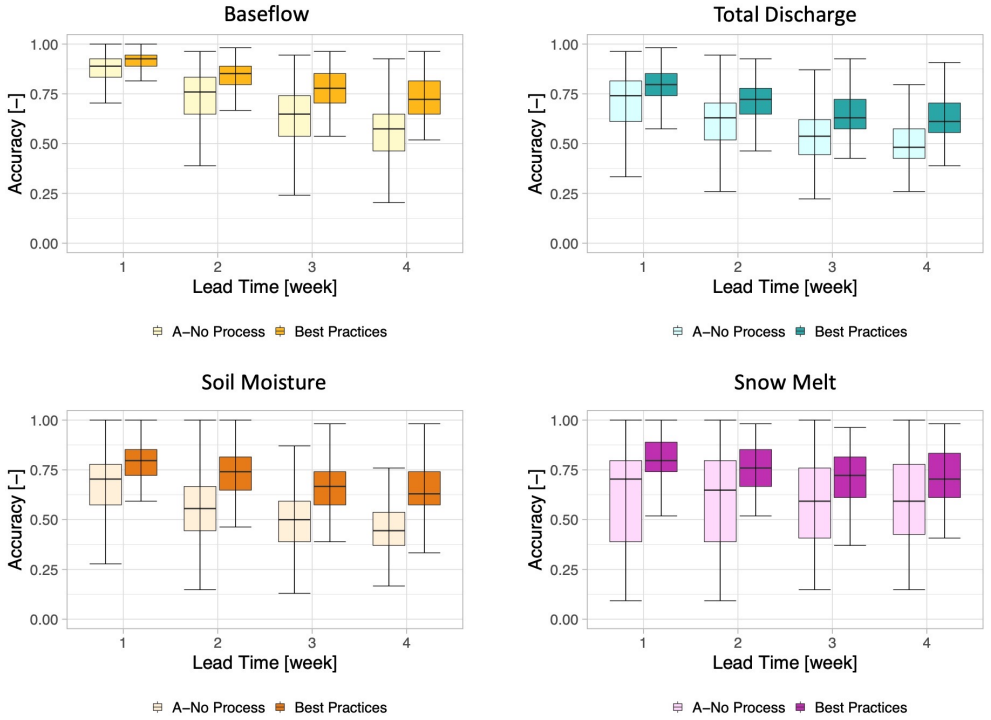

Fig 2. Overall accuracy of tercile forecasts when applying best practice technique to each individual catchment compared to the overall accuracy when no processing technique applied.

Tab 1. Proportions of catchments out of 307 that score the highest overall accuracy when WR data are included in the GP model. Results here combine Case D and F (see Fig 1.), without and with pre-processing method.

	WK1	WK2	WK3	WK4
Baseflow	4%	26%	36%	56%
Total Discharge	8%	37%	35%	54%
Soil Moisture	31%	36%	49%	55%
Snow Melt	5%	19%	21%	35%

Highlights:

- The GP post-processing technique is able to improve forecast accuracy but the degree of improvement varies with **lead time and catchment**.
- Different variables respond to the post-processing techniques differently.
- The benefit of WR increases with lead time and most obvious in **high elevation catchments with steep slopes**.