



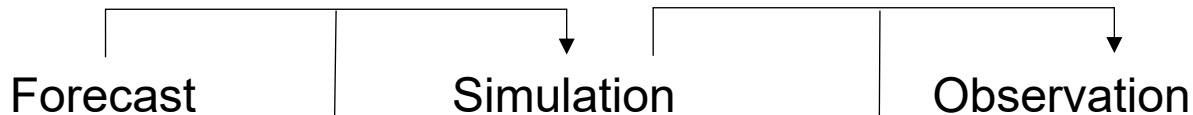
YIHENG DU, ILIAS PECHLIVANIDIS

SMHI, NORRKÖPING, SWEDEN

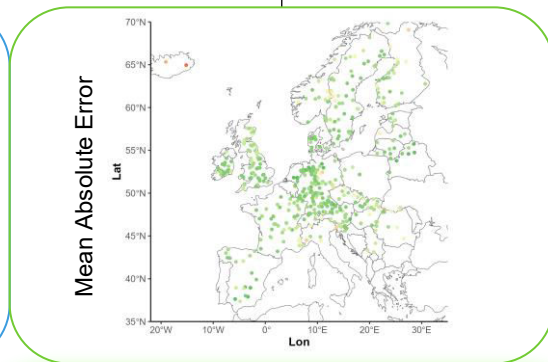
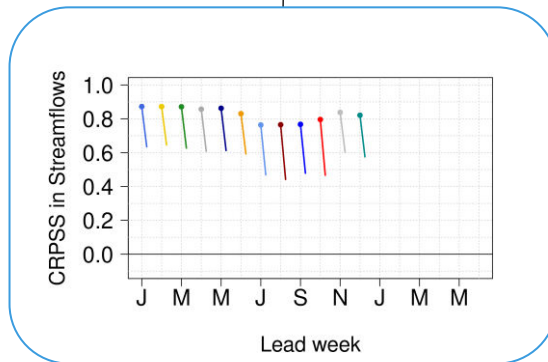
**ENHANCING SEASONAL HYDROLOGICAL
FORECASTING VIA LOCAL DATA
INTEGRATION AND MACHINE LEARNING**



OBJECTIVE



Assess

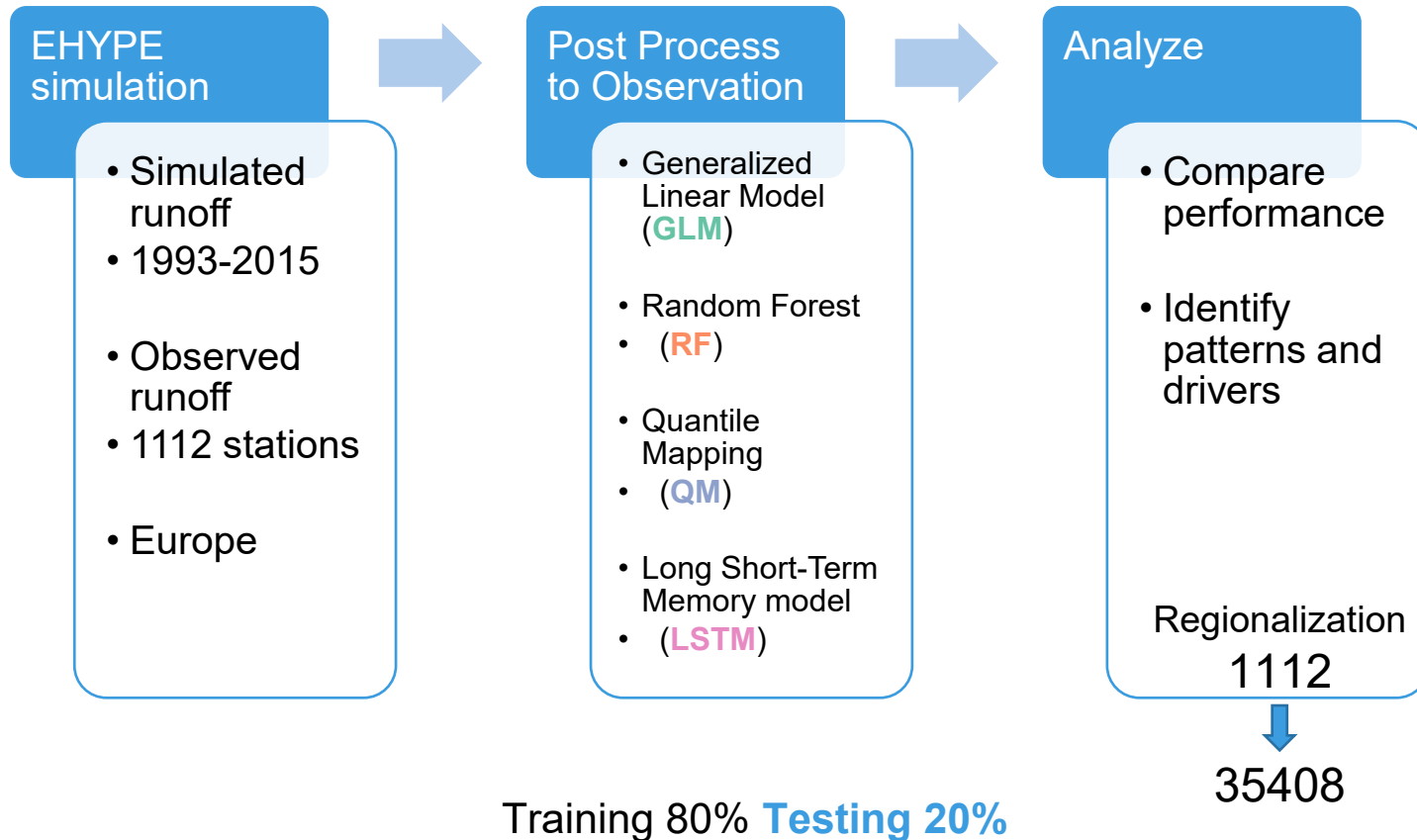


Improve

Skill deterioration

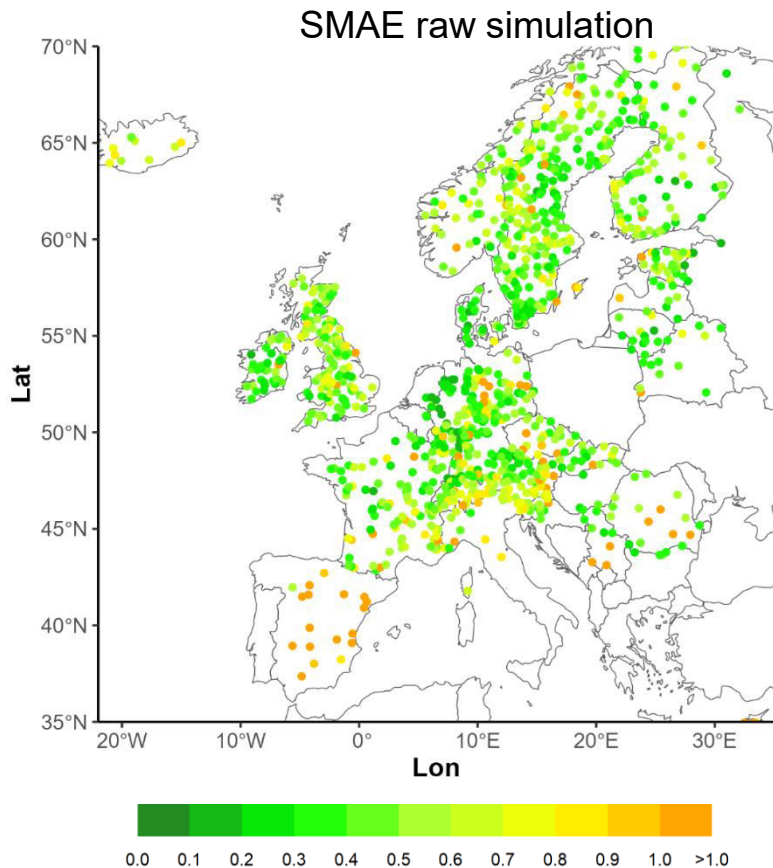
Model imperfection

EXPERIMENT DESIGN

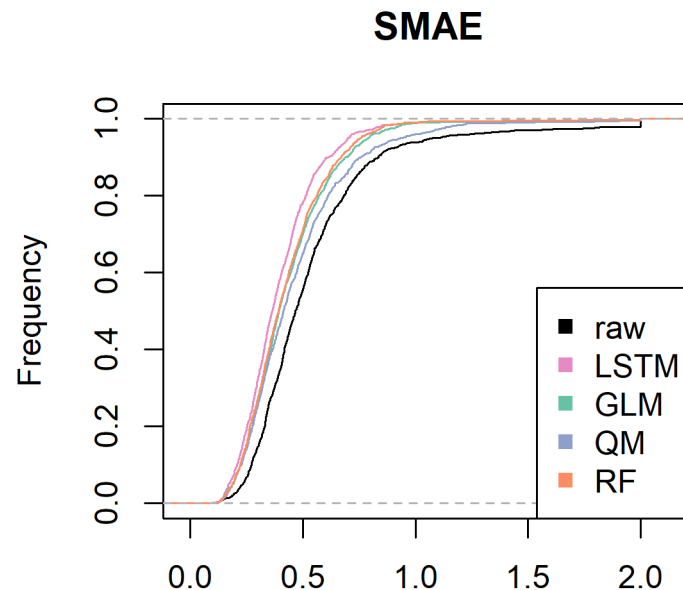


POST PROCESSING: PERFORMANCE

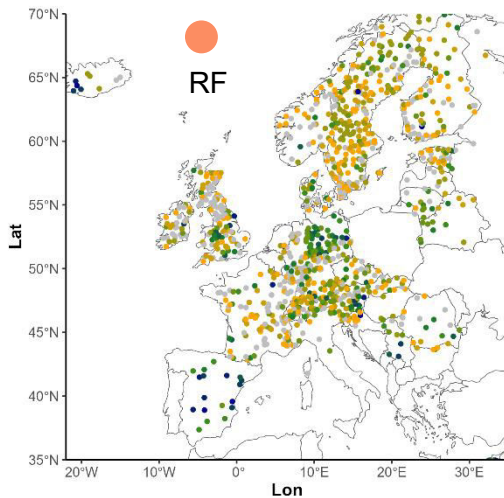
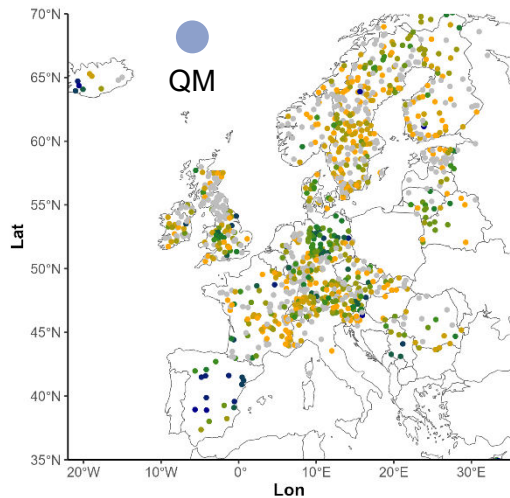
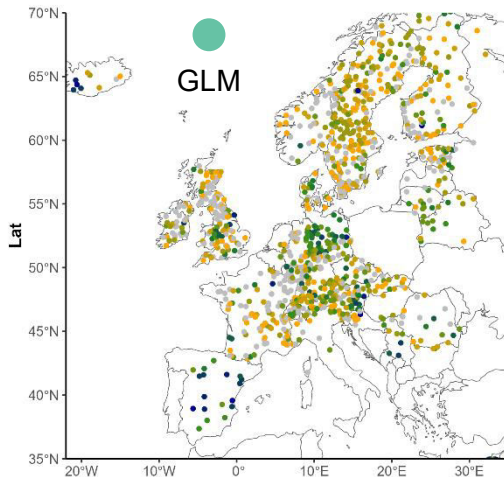
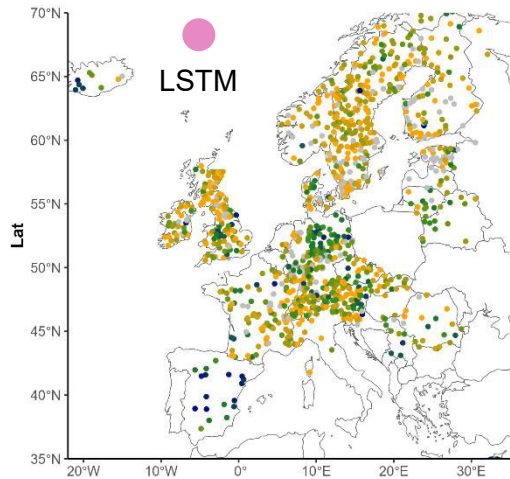
Scaled Mean Absolute Error



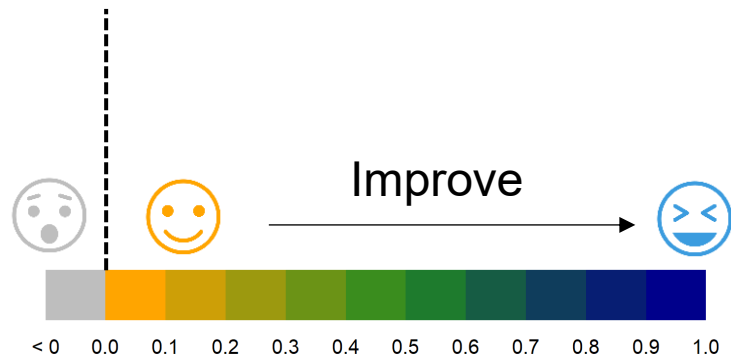
$$SMAE = \frac{\overline{|sim - obs|}}{\overline{obs}}$$



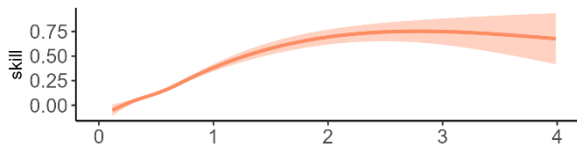
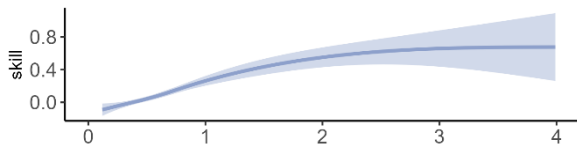
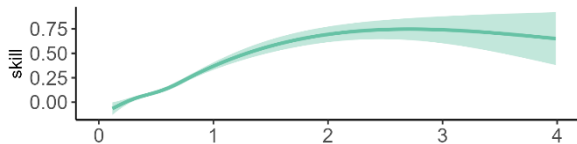
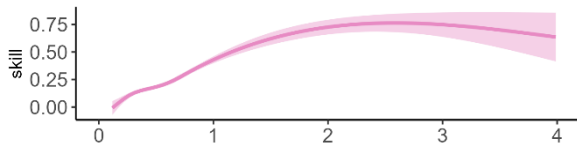
POST PROCESSING: SKILL



$$Skill = 1 - \frac{SMAE_{pp}}{SMAE_{raw}}$$



POST PROCESSING: SKILL



Skill ~ raw SMAE ~ ?

POST PROCESSING: DRIVERS

Descriptors:

- Climatology
- Topography
- Human impact

Hydrological regimes

- Clusters

Name	Abbreviation	Unit
Precipitation	Prec	mm
Temperature	Temp	°C
Snow depth	Snow	cm
Actual evapotranspiration	AET	mm
Potential evapotranspiration	PET	mm
Dryness index	PET/Prec	--
Evaporative index	AET/Prec	--
Upstream Area	Area	km ²
Elevation	Elev	m
Relief ratio	Relief	--
Slope	Slope	%
Degree of Regulation	DoR	%

(Pechlivanidis et al 2020, WRR)

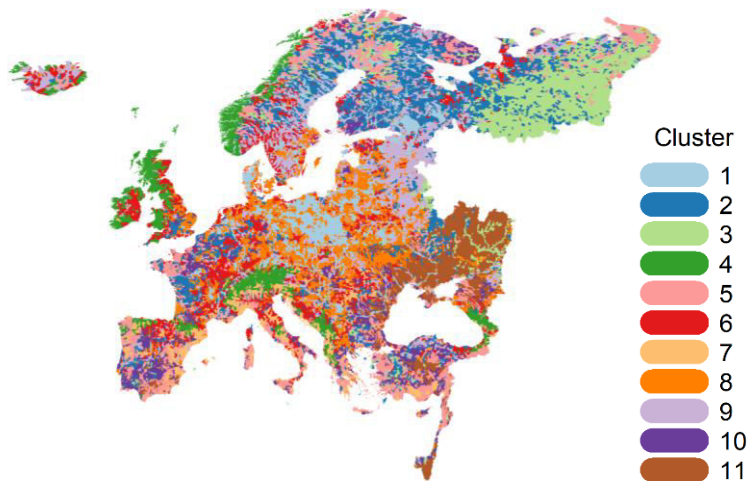
POST PROCESSING: DRIVERS

Descriptors:

- Climatology
- Topography
- Human impact

Hydrological regimes

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Hydrological signatures

Qm	Mean annual specific runoff	mm/year
q05	Normalized high streamflow	--
q95	Normalized low streamflow	--
q70	Normalized relatively low streamflow	--
mFDC	Slope of streamflow duration curve	%/%
Dpar	Range of Pardé coefficient	--
CV	Coefficient of variation	--
Flash	Flashiness	--
PD	Normalized peak distribution	--
RLD	Rising limb density	--
DLD	Declining limb density	--
BFI	Baseflow index	--
RC	Runoff coefficient	--
EQP	Streamflow elasticity	--
HPC	High pulse count	--

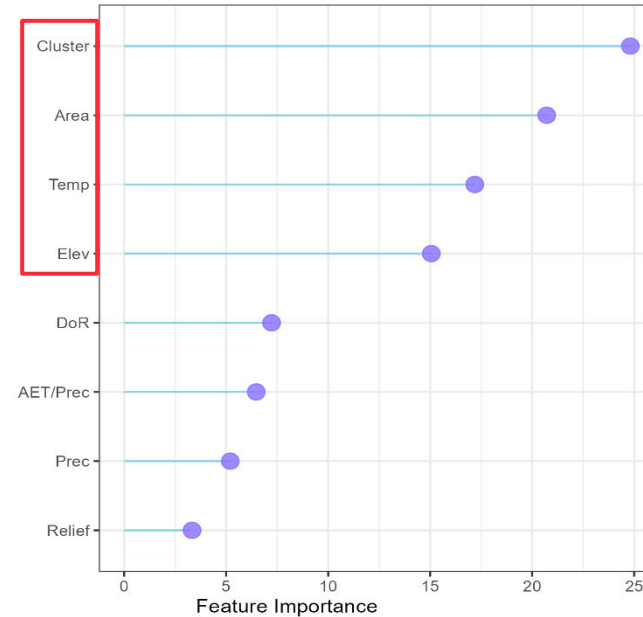
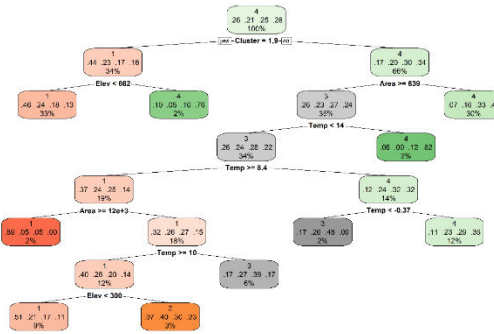
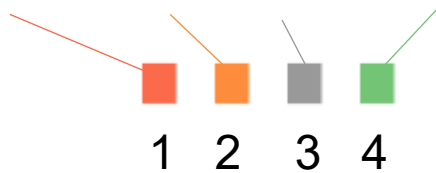
(Pechlivanidis, I. G. et al. (2020). *Water Resources Research* <https://doi.org/10.1029/2019WR026987>)

POST PROCESSING: DRIVERS

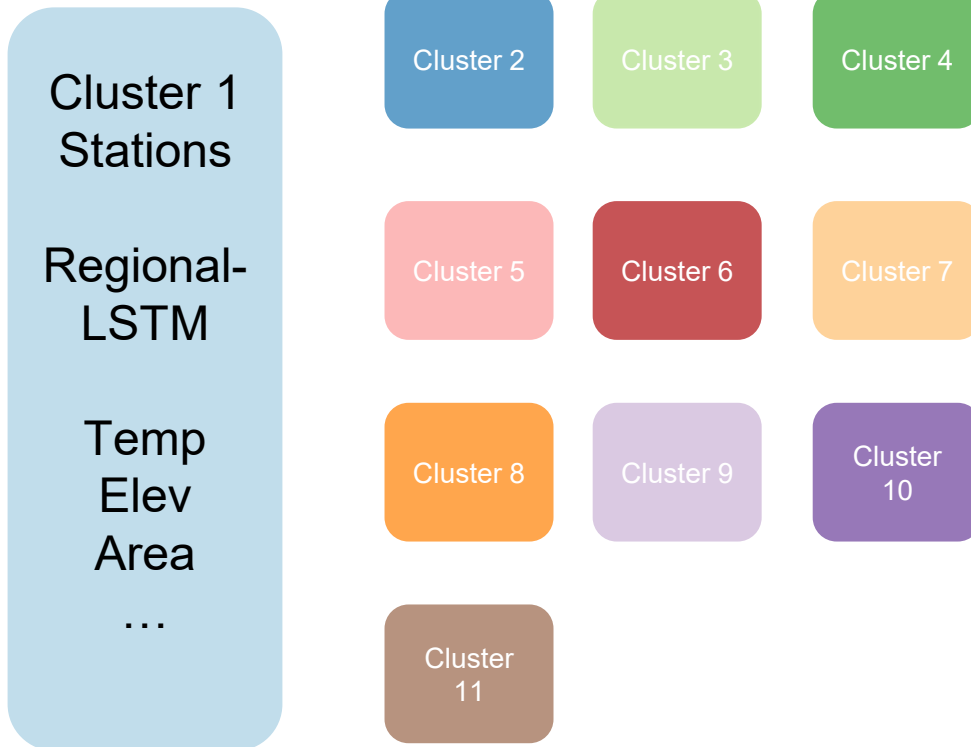


Classification and Regression Tree CART

- Potential drivers
- Group of raw SMAE, quartiles [poor, medium, good, very good]



POST PROCESSING: DRIVERS → REGIONALIZATION



1. Enhanced hydrological simulations through post-processing methods
2. Performance varies across stations: LSTM, robust
3. Higher skills in lower raw performance sub-basins
4. Links with Hydro-Cluster, Area, Temp, Elev, will be used for regionalization

Thanks for sharing your insights with us!



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CLINT
CLIMATE INTELLIGENCE



I-CISK
HUMAN CENTRED CLIMATE SERVICES