

SMHI

# Evaluation of seasonal forecasting skill over Sweden



# **CONPHYDE** multimodel

#### for seasonal streamflow forecasting



#### Improve the coverage and forecast skill

	Existing	Development
Coverage	Selected catchments	Whole of Sweden at ~10 km <sup>2</sup>
Model	HBV	S-HYPE
Initialisation frequency	Monthly	Weekly

Forecast skill



### **S-HYPE**

- Developed since 2009
- ~36000 sub-catchments (average of 10 Km<sup>2</sup>)
- ~300 variables







### Data

#### **Temperature and precipitation data (PTHBV)**

- Gridded 4x4 km data
- Interpolated from measurement stations
- Daily resolution

#### Stream runoff and water level

~350 stations





Station-corrected model
 Best possible forecast initialisation



- Station-corrected model
- Re-analysis period
  To be able to evaluate the results



- Station-corrected model
- Re-analysis period
- Ensemble Streamflow Prediction (ESP) strategy
  - ~ Climatological forecasts

Period	1981 – 2016
Ensemble members	25 random years
Initialisation frequency	4 times a month
Temporal resolution	1 week





- Station-corrected model
- Re-analysis period
- Ensemble Streamflow Prediction (ESP) strategy
- Continuous Ranked Probability Skill Score (CRPSS)
  Similar to the Mean absolute error (MAE) but for probabilistic forecasts





- Station-corrected model
- Re-analysis period
- Ensemble Streamflow Prediction (ESP) strategy
- Continuous Ranked Probability Skill Score (CRPSS) ESP vs runoff climatology (reference)





#### **Forecasting skill** Temporal distribution



Lead time





#### **Forecasting skill** Spatial distribution (i)



11



#### **Forecasting skill** Spatial distribution (ii)



12



#### **Forecasting skill** Temporal aggregation





# Forecasting skill

**Catchment flow indices** 



- Spatial patterns of forecast skill
- Can forecast skill be coupled with catchment flow indices? E.g. base flow index (BFI):



- Hydrological regionalisation based on 15 flow indices
- Can streamflow predictability be related to hydrological regions based on these indices?



# **Forecasting skill**

#### **Skill vs. hydrological regions**





# In short

**Evaluation of seasonal forecasting skill over Sweden** 

- Seasonal forecasts with S-HYPE are skilful across Sweden
- Increasing initialisation frequency contributes to keep a high forecast skill
- Streamflow predictability can, to some extent, be coupled with hydrological regions based on flow indices