

HYPE (HYdrological Predictions for the Environment)

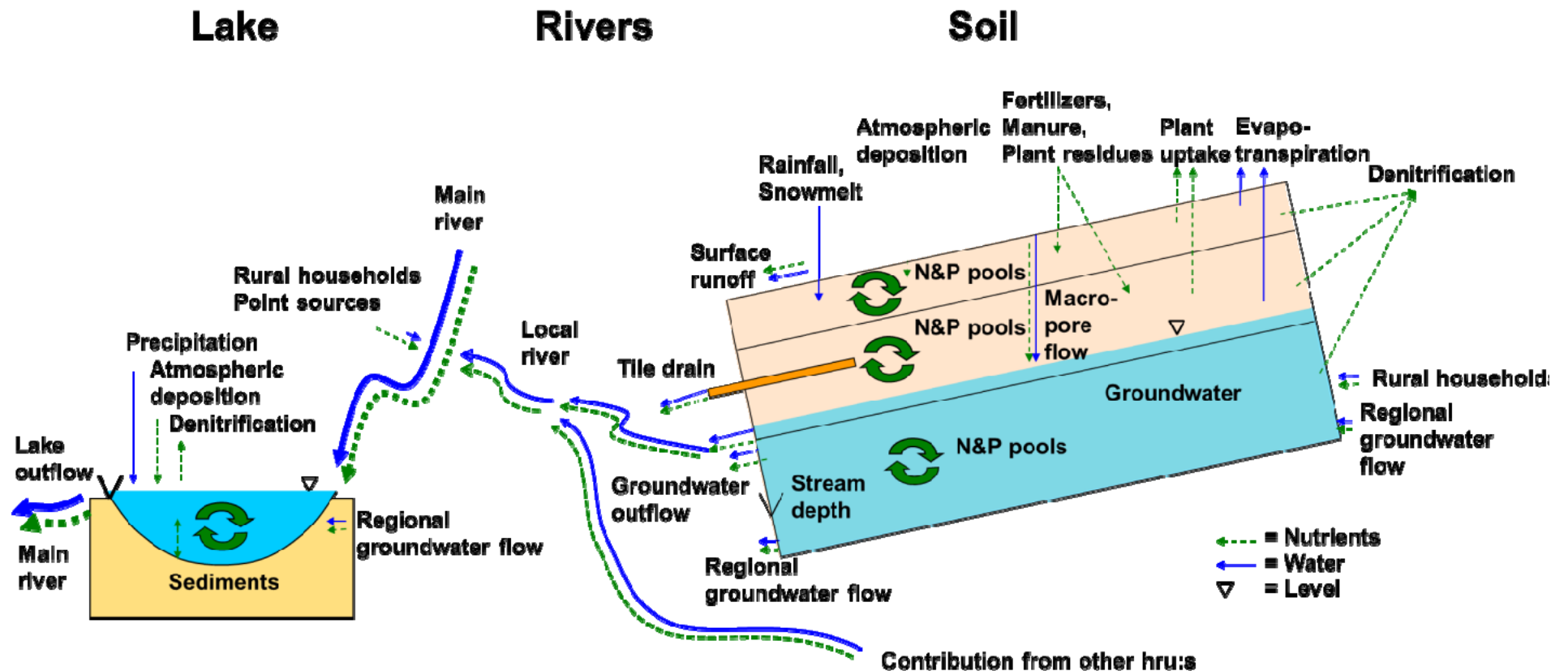
HYPE OSC (HYPE Open Source Community)

<http://hype.sourceforge.net/>



WMO Flood Forecasting Initiative, First meeting of the Advisory Group, Geneva 7-9 Oct 2013

HYdrological Predictions for the Environment (HYPE) model



The European HYPE (E-HYPE):

- a Pan-European hydrological model with high resolution
- operational in the SMHI production environment
- based on readily available global databases
- open for improvements and cooperation
- The model has been initiated and funded by GMES and several EU FP7 projects

European HYPE users:

- Water management and status in Sweden, **WFD**
(Water Framework Directive)
- Oceanographic forecasting, EuroGoos
- Eutrophication combatement of Baltic Sea
- Adaptation to climate change in the Baltic Sea region, **MSFD**
(Marine Strategy Framework Directive)
- Climate services

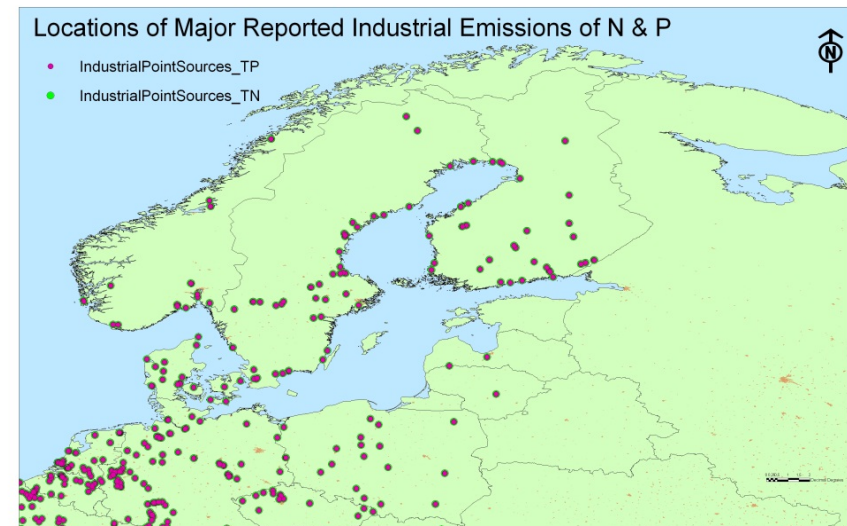
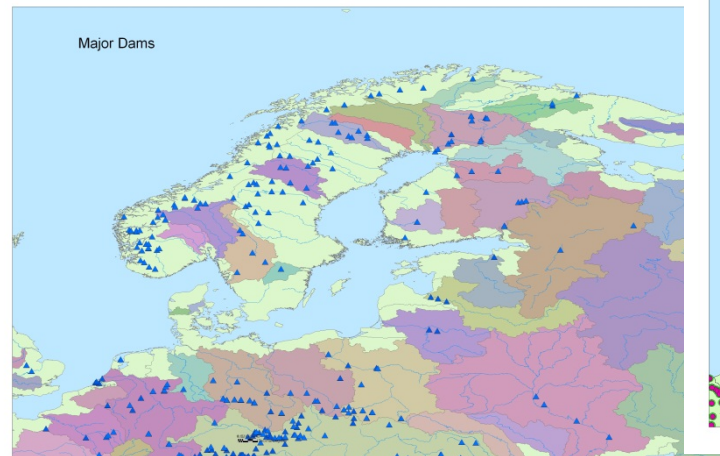
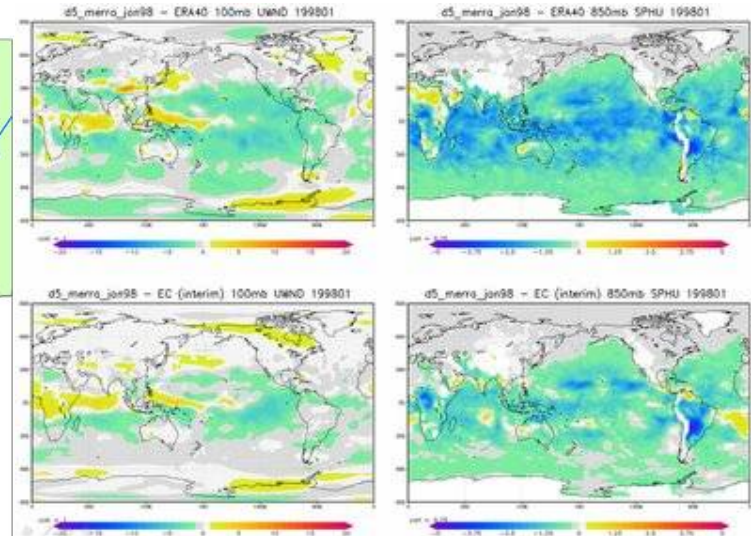
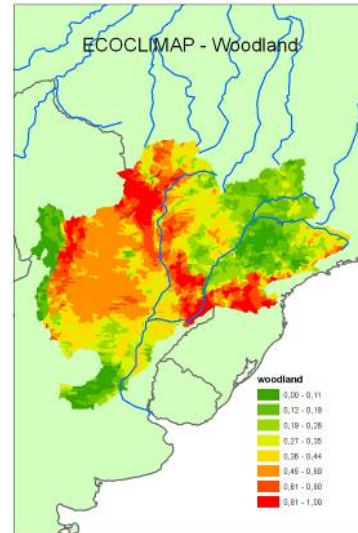


Input Data



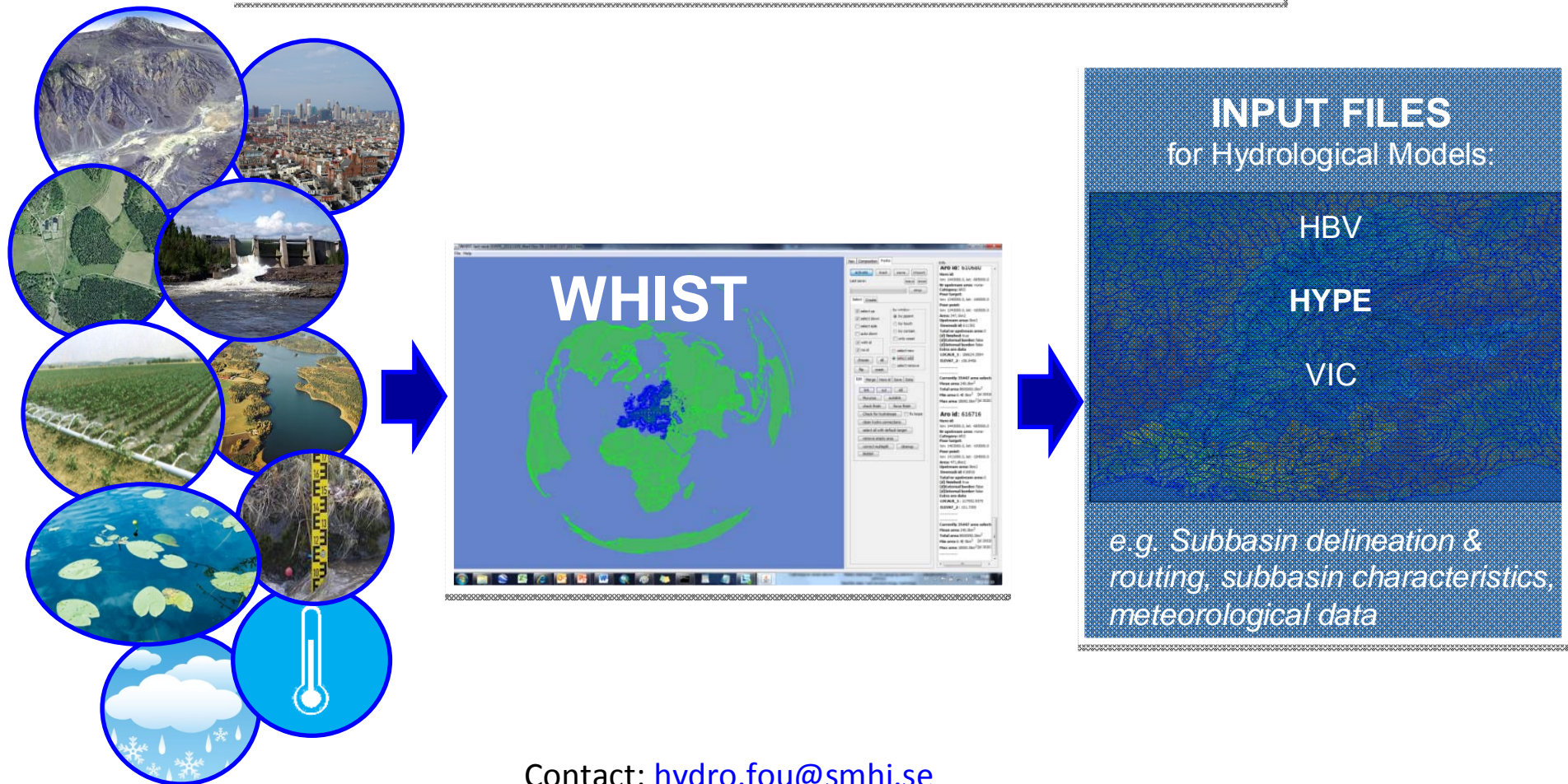
Readily Available Global Databases

- Topography: [HydroSHEDS](#)
- Observed river discharge: [GRDC](#), [BALTEX](#), [EWA](#) (daily and monthly)
- Observed nutrients and yearly river discharge: [EEA](#)
- Land use + soil: [ECOCLIMAP](#) and European Soil Atlas
- Forcing data (P & T):
Re-analysis products (e.g. downscaled [ERA40](#), [Climate runs](#))
- Major Dams: [ICOLD](#)



WHIST – World Hydrological Input Set-Up Tool

From global geographic databases to Hydrological Models



Contact: hydro.fou@smhi.se

HYPE services

2011 the version of E-HYPE2.0 is released

2011 an Open Source Community for the HYPE code is launched

<http://hype.sourceforge.net/>

2012 The model provides forecasts and climate change impacts

2012 Nutrient load provided for the whole European domain

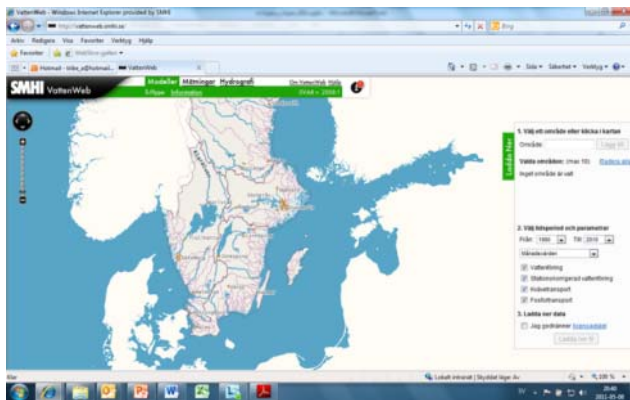
2012 Model results available for free downloading for La Plata Basin

2013 Model results available for free downloading for Niger River

Large-scale HYPEs on the web

SWEDEN

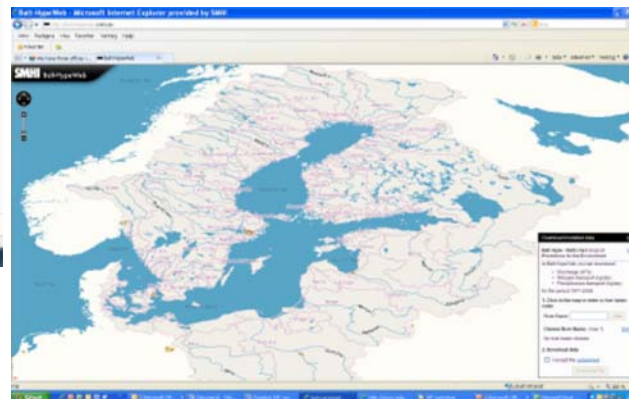
<http://vattenweb.smhi.se/>



450 000 km²
38 000 sub-basins
400 observation sites

Baltic Sea basin

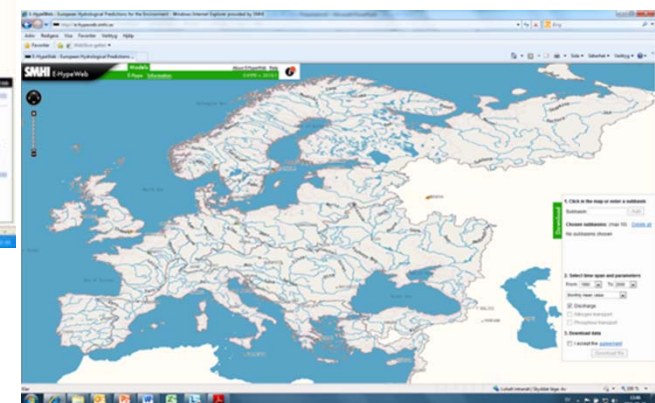
www.smhi.se/balt-hype



1.8 milj km²
5 128 sub-basins
150 observation sites

EUROPE

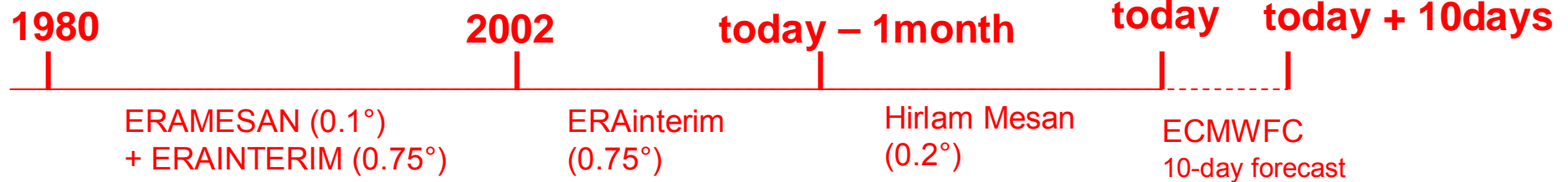
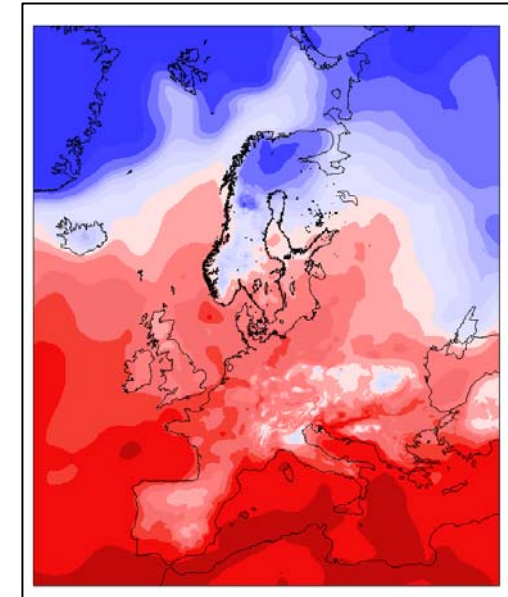
www.smhi.se/e-hype



8.8 milj km²
35 000 sub-basins
950 observation sites

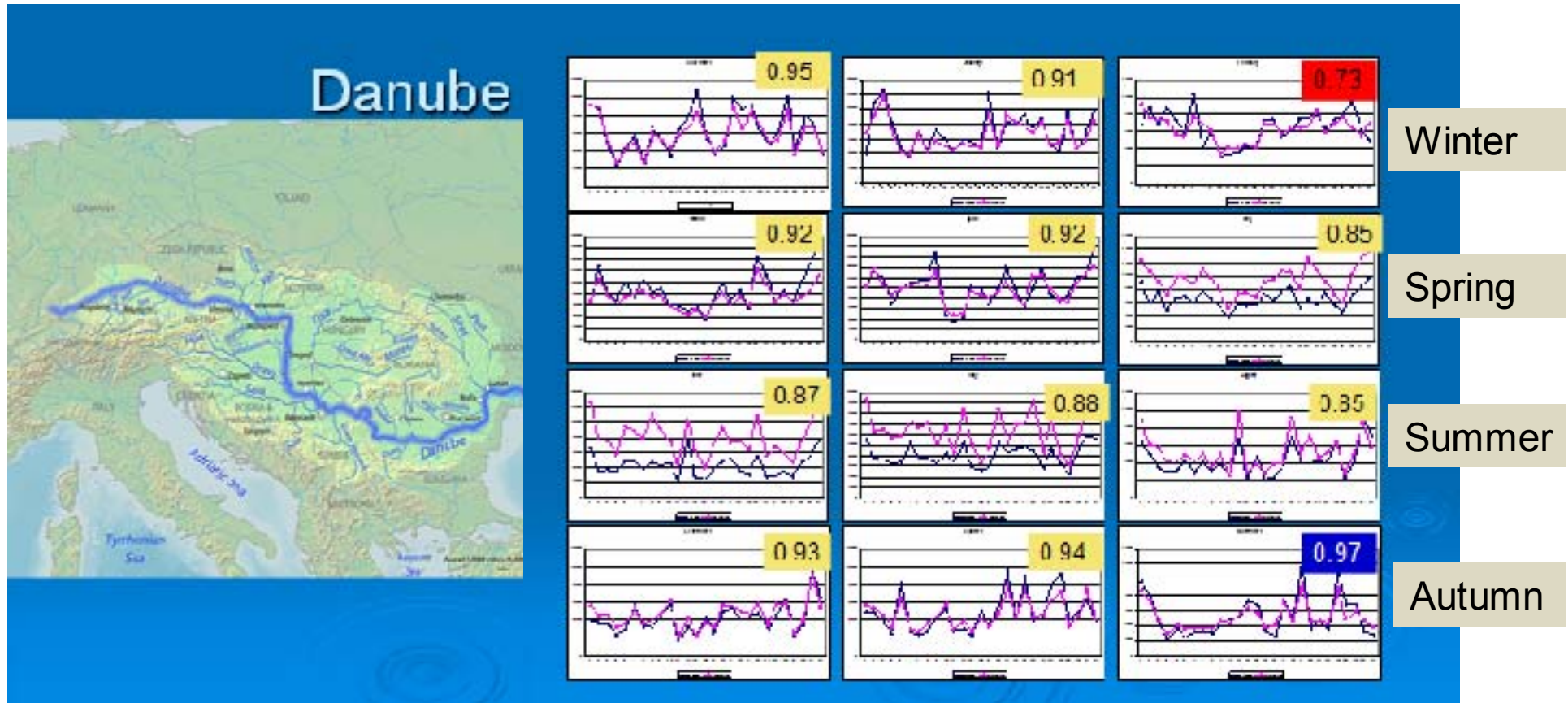
Operational System at SMHI

- E-HYPE in the hydrological production system
 - ✓ Since 2010: Baltic Sea and Atlantic Ocean (discharge)
 - ✓ Nov. 2012: All European seas (discharge, nitrogen, phosphorous, E-HYPE 2.1)
- Delivery to users via FTP on request
- Model forcing:



Current negotiations to include E-HYPE in EFAS

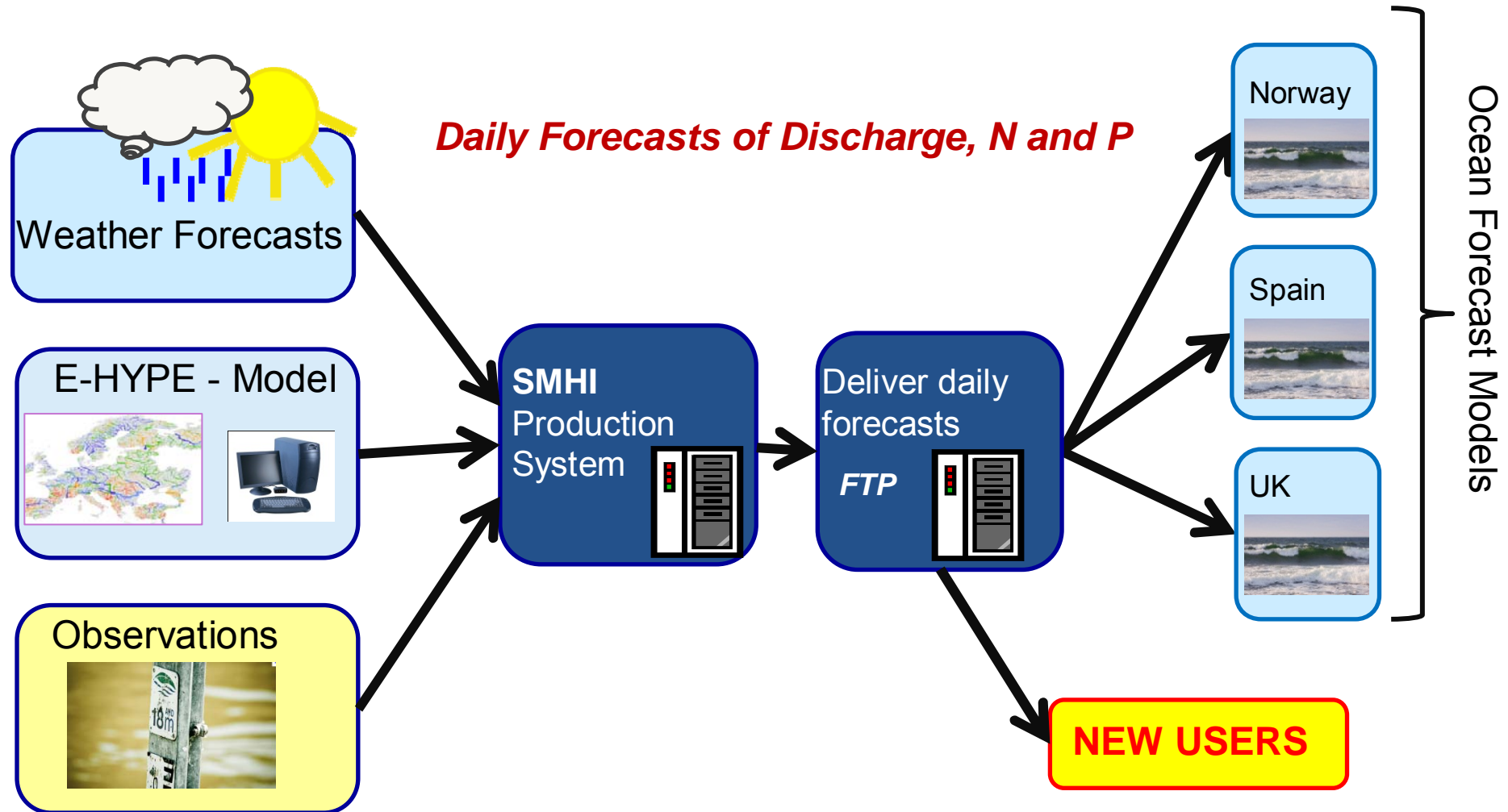
- Currently E-HYPE compares surprisingly well against LISFLOOD, given the coarser forcing data and lack of regional calibration
- 2013: Test E-HYPE with JRC's own 5 km interpolated Precipitation data set, possibly some regional fitting?
- SMHI to make E-HYPE forecasts operationally available via a WMS – (note that rather than absolute discharge, SMHI will deliver relative discharge, ie relative to flooding return periods)



Danube (817,000km²):

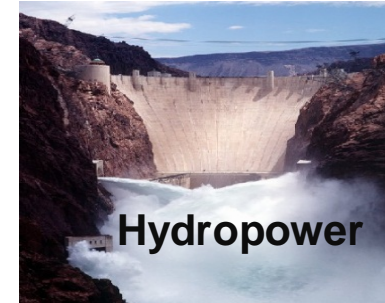
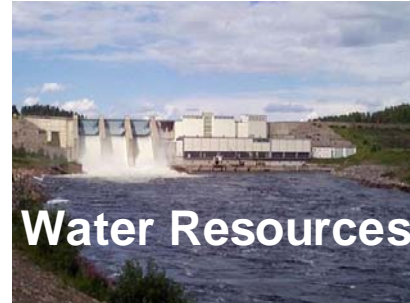
Correlation coefficient between observed and simulated monthly river discharge data for each month (Dec→Nov) during 1980-2006.

Example: E-HYPE for Delivering Operational Forecasts



What can E-HYPE be used for?

Simulations for all of Europe: homogenous, simultaneous



1970

Hindcasts

2012

Forecasting

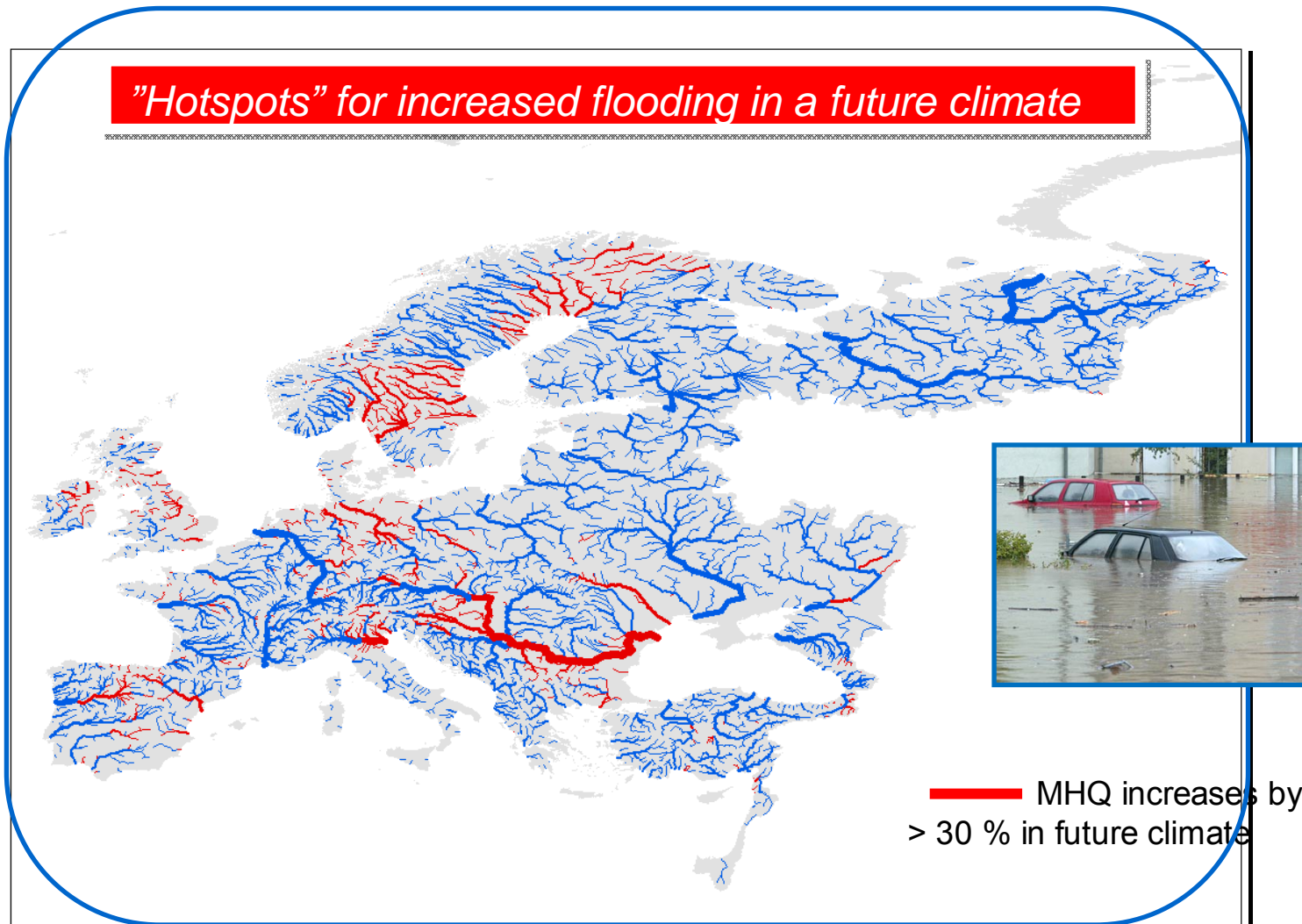
2020

Decadal Predictions

2100

Climate Scenarios

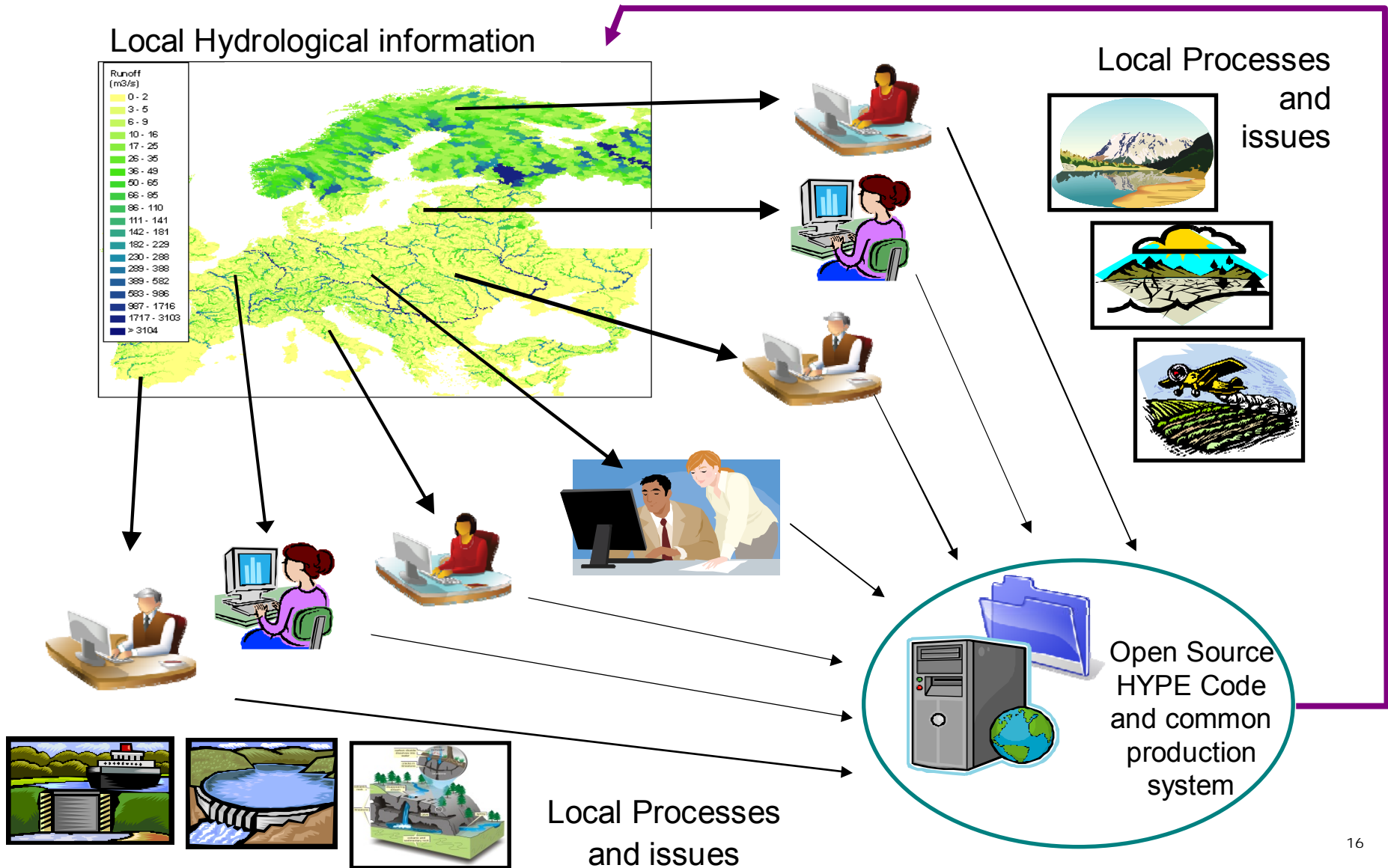
Example: E-HYPE for future climate predictions



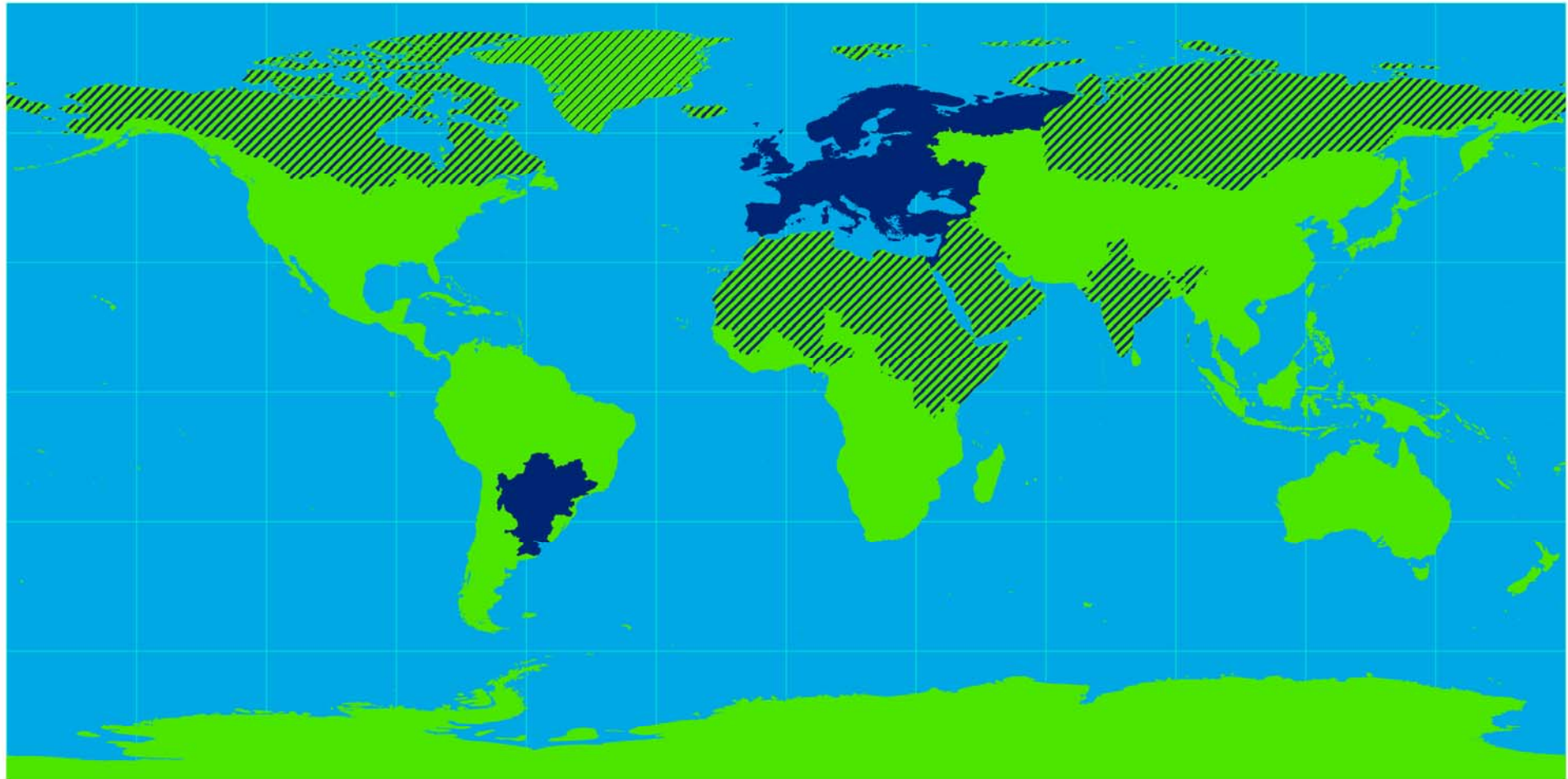
Why collaborative coding

- **New challenges with water in focus:** e.g. environmental issues, climate change, EU directives... which are interdisciplinary! Thus, new codes are needed!
- More effective model development – lower cost!
- Higher quality – more brains developing the same code!
- Enables specialisation and testing in parts of a holistic system.
- Facilitates ensemble modelling and uncertainty estimates.
- Facilitates models comparison and evaluation.
- Enables transparency, reviews and dialogues.
- One voice – although no one group have all answers!

HYPE OSC (Open Source Community) vision – example E-Hype



HYPE applications



 **Developed: E-HYPE, Balt-HYPE, S-HYPE, LPB-HYPE**

 **In progress: Arctic-HYPE^{*}, Niger-HYPE, MENA-HYPE, In-HYPE**

**First hindcast delivered for oceanographic model 2013-03-09!*