

European water information for environment and security



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E-HYPE - a pre-operational water model

- A high resolution pan-european hydrological modell, making data available for WFD, Floods Directive, and other related directive needs.
- SMHI will initiate an operational E-hype for the full European continent in a 0.1 version, autumn 2010
 - Will be open/free for national, local in-house operational set-up & use
 - Can well serve as an operational platform for data flow to Downstream services
 - Is a first (good!) shot, with on-going development, refinement

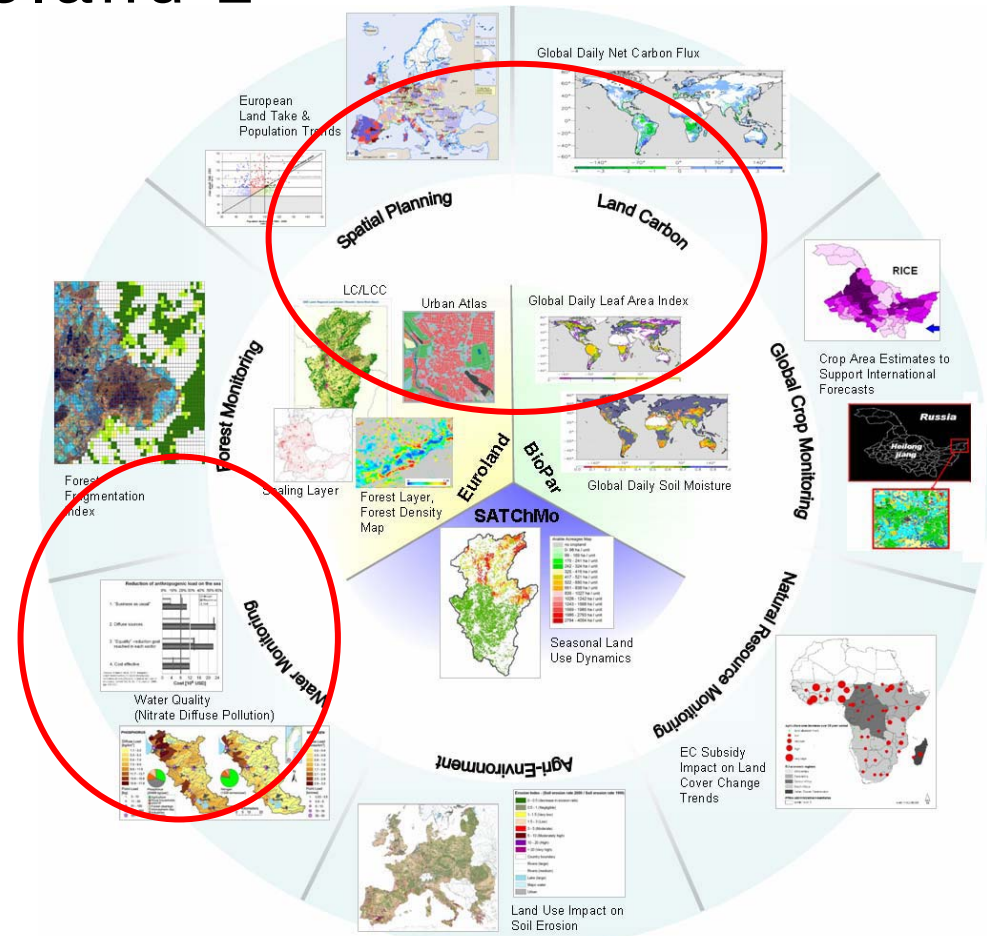
Part of CIS Water/Geoland 2

CIS Water will include products from Euroland and Biopar in hydrological and water quality models.

Updated information on land cover will improve the quality of model results.

Web based „End user scenario tool“

Policy driver: Water Frame Work directive



CIS Water: Partners

- **Metria, SE**
(www.lm.se)
- **Infoterra, DE**
(www.infoterra-global.com)
- **SMHI, SE**
(www.smhi.se)
- **GIA, DE**
(www.imaps.de)
- **AGI, LT**
(www.ekoi.lt)
- **GISAT, CZ**
(www.gisat.cz)
- **WUR LEI, NL**
(www.lei.wur.nl)

The E-HYPE model can be used for

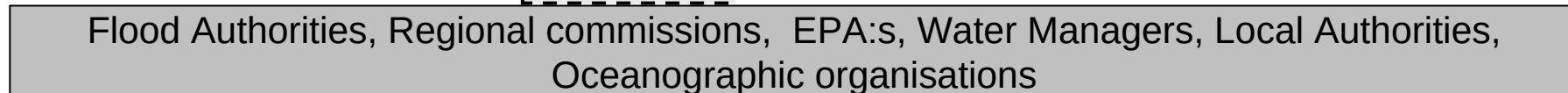
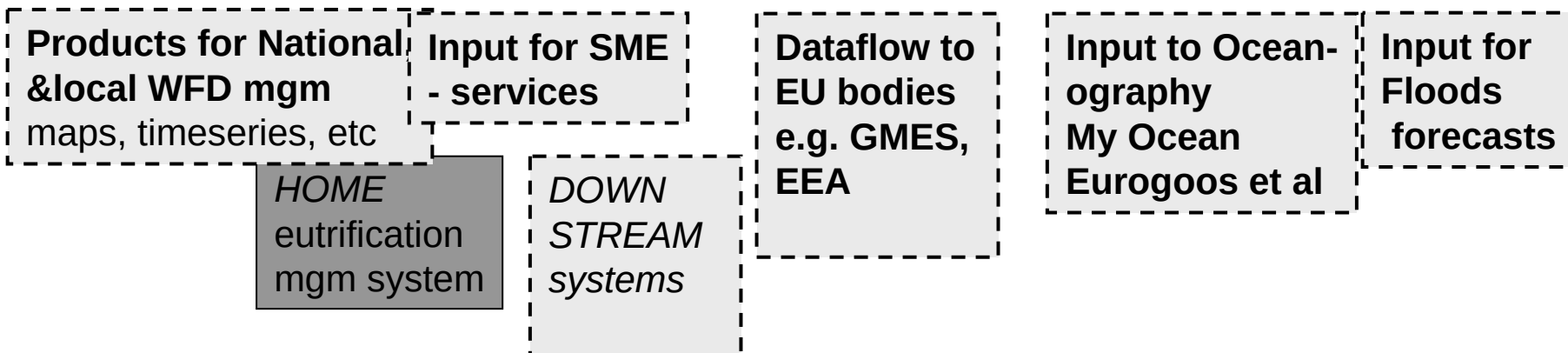
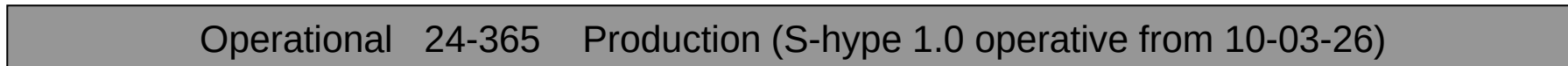
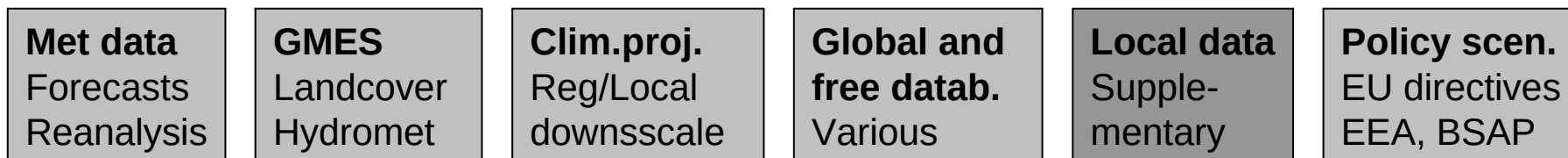
- hydrological forecasts.
- predictions in ungauged basins.
- filling time-gaps in monitoring programs.
- flow normalisation of loads.
- reconstructions of historical and pristine conditions.
- climate change impact assessments.
- ensemble modelling.
- status characterisation of waterbodies.
- harmonising local or trans-national compilations.
- allocating water.
- planning infrastructure development.
- source apportionment of pollutants.
- estimating effects of remedial measures.
- management of environmental flow.
- input to downstream services (e.g. ecosystem models for specific lakes or coastal zones, hydraulic flood models, and oceanographic models.)



E-HYPE

European HYdrological Predictions for the Environment





Readily Available Global Databases

Water

- **Topography:** Hydro1k, Hydrosheds (USGS)
- **Land use + soil:** ECOCLIMAP, CORINE (EIONET 2003), Globcover 2000, European Soils Database (JRC 2006)
- **Forcing data (P & T):** A combination of ERA-40/Interim, and forecasts (ECMWF, SMHI)
- **Major Dams:** ICOLD



Nutrients

- **Agricultural Data:** EUROSTAT and CAPRIS (BRITZ et al. 2007) for Nuts regions.
- **Point Sources:** Population data from HYDE database (EEA), treatment level and standard values for emissions (van Drecht et al. 2009), EEA Industrial Emissions database
- **Atmospheric Deposition:** MATCH model (SMHI)

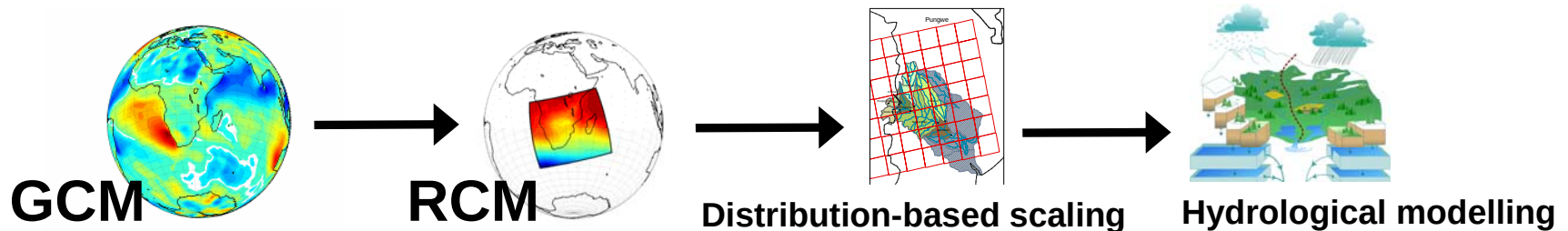
Forcing data

Meteorological data

- Re-analysis: ERA-40, ERA-interim, ERA-Mesan
- Nowcasting: ECMWF, HIRLAM-mesan
- Forecasting: ECMWF, HIRLAM

Climate model data

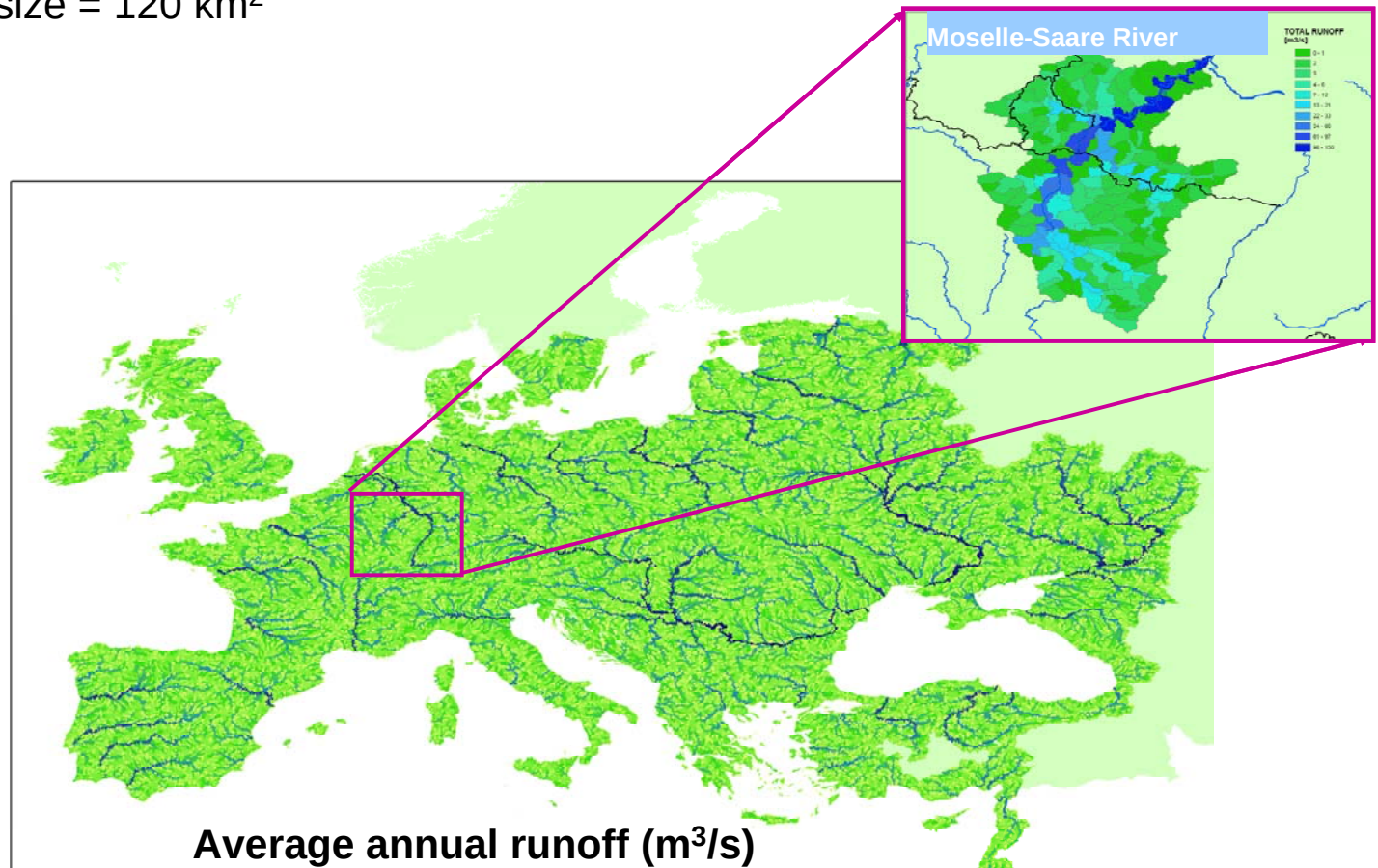
- The Rossby Center ensembles
- EU ENSEMBLES project



Flexible subbasin division and resolution

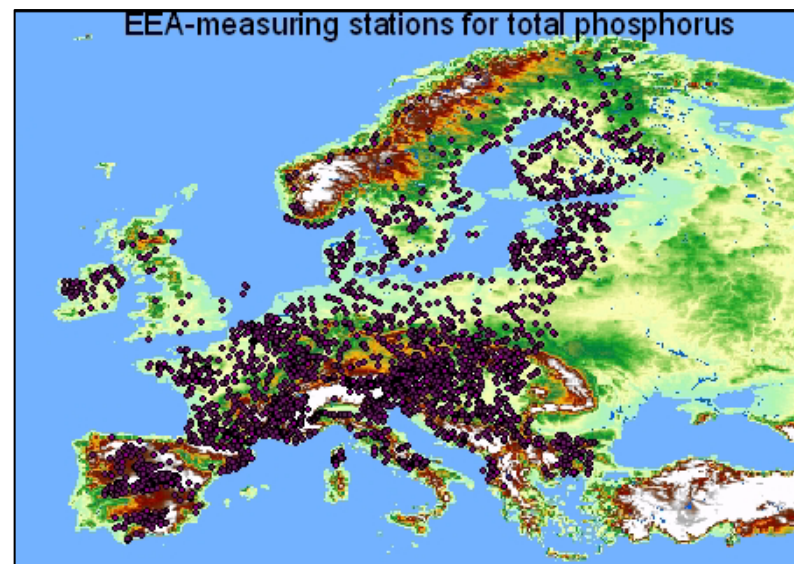
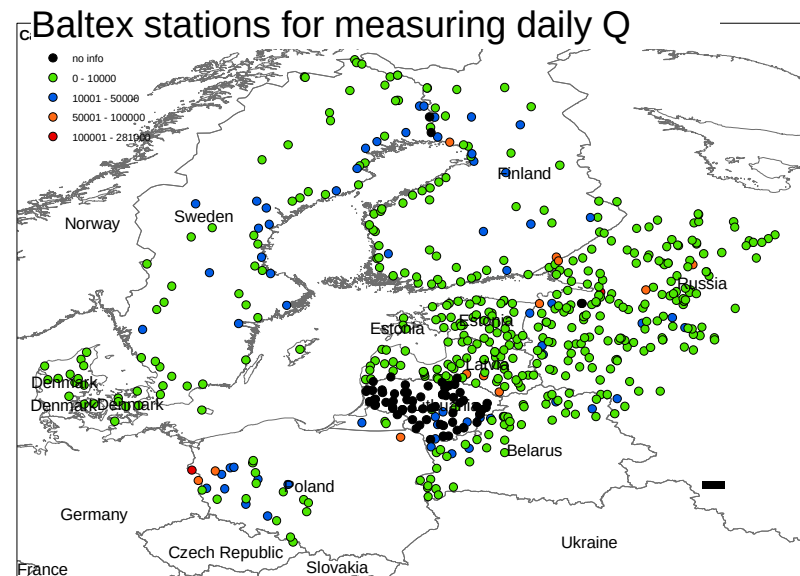
Europe (9.6 million km²) divided into approx. 57 400 subbasins
with median size = 120 km²

The WHIST
Tool: change
model area/
resolution
; compile input
data for
modelling new
areas

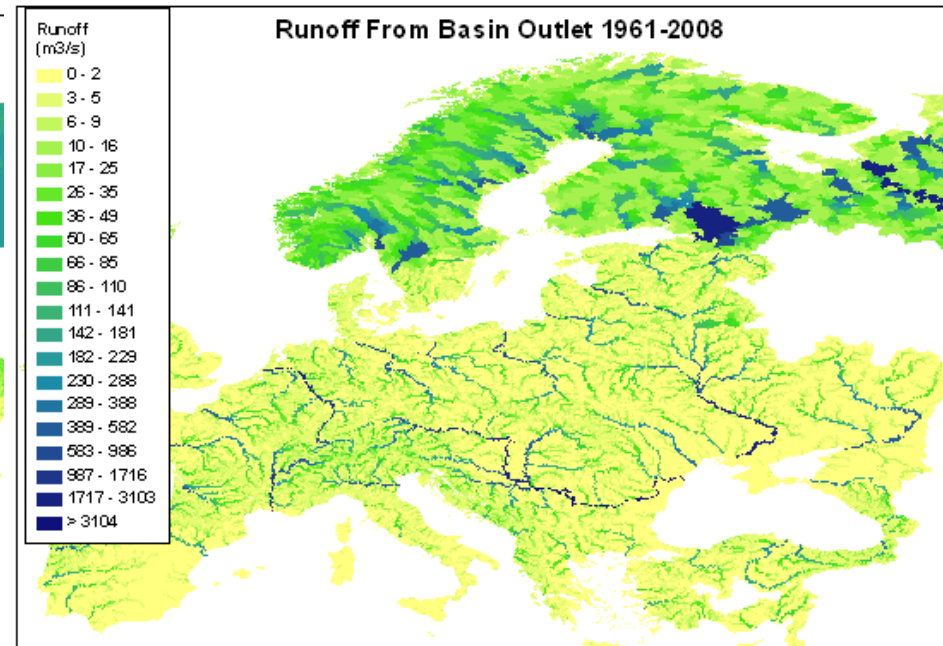
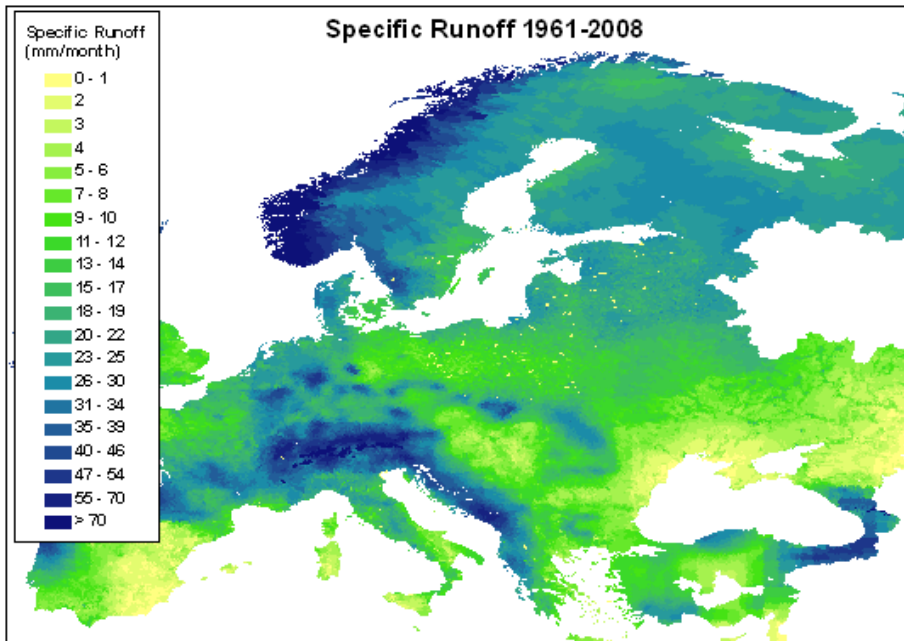


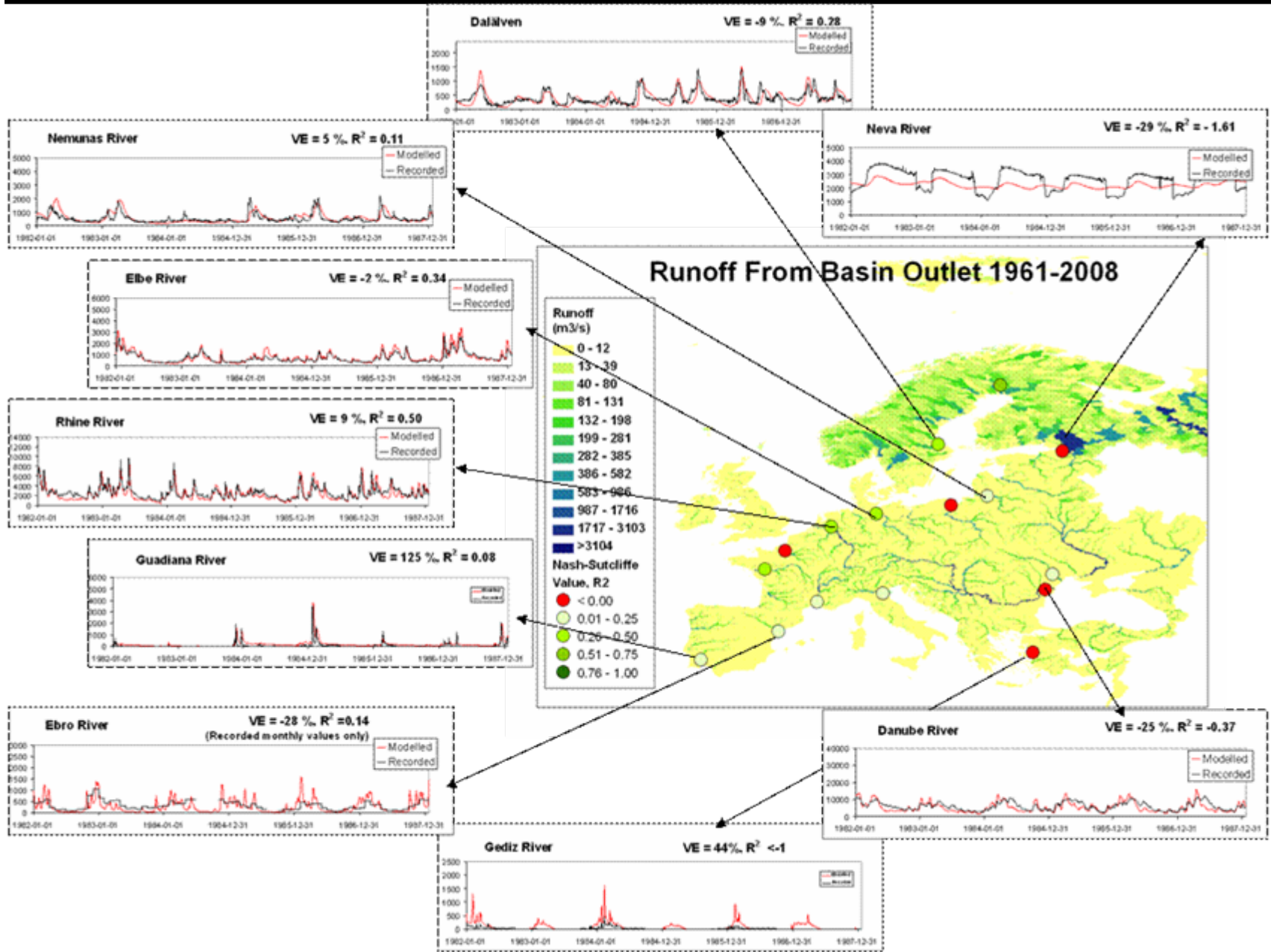
Observations used
for calibrations and
validations.

(examples)



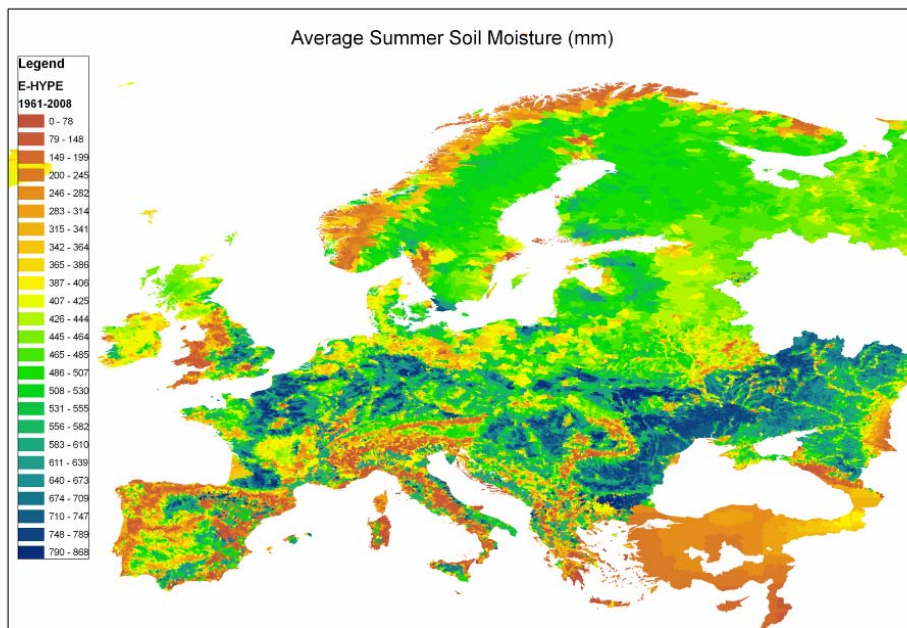
First application of Europe: Water discharge



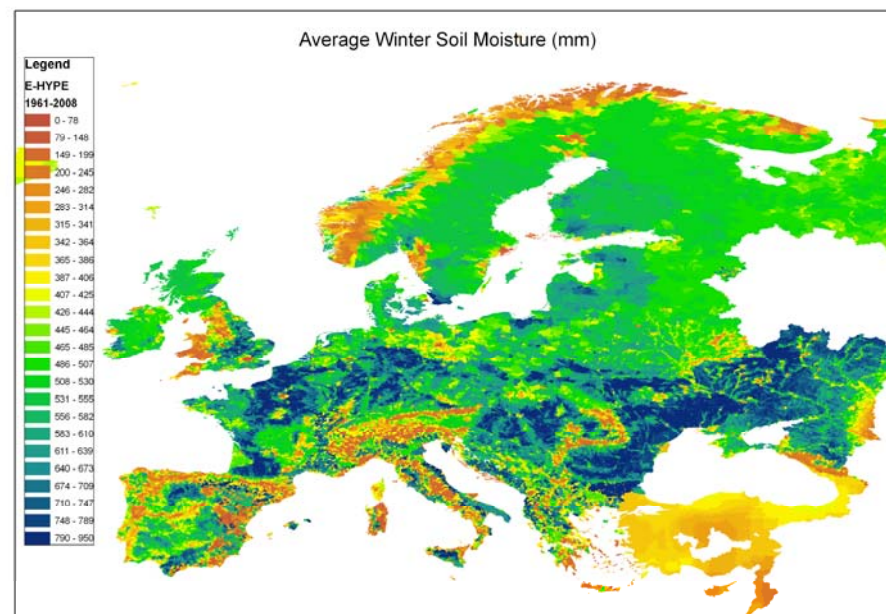


Soil moisture

Summer

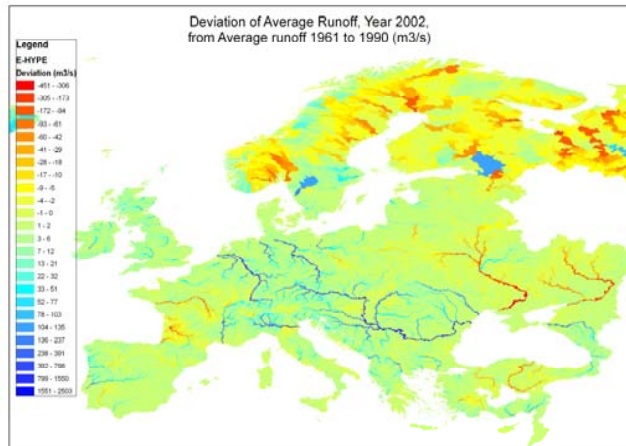


Winter

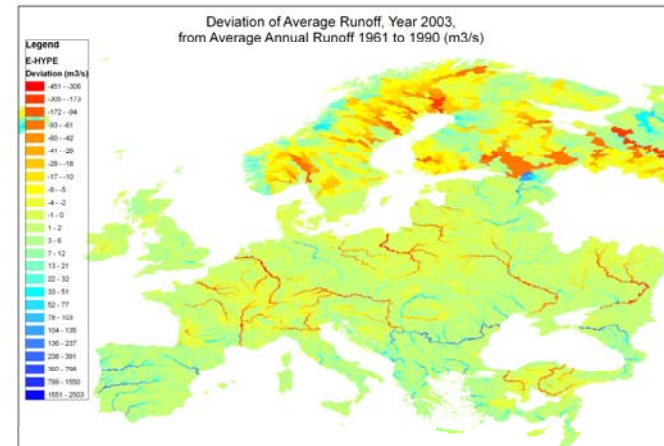


Annual runoff deviation from normal (1961-1990)

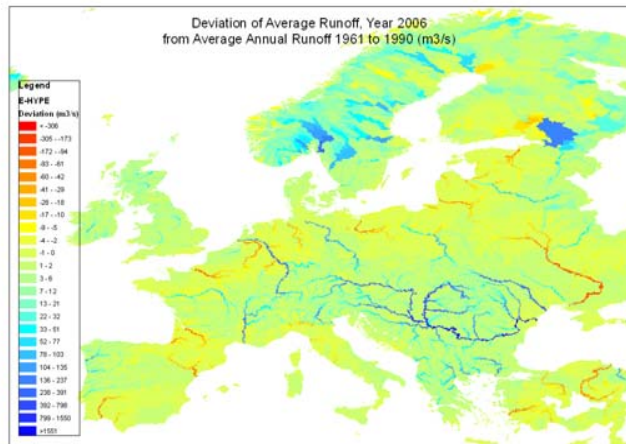
2002



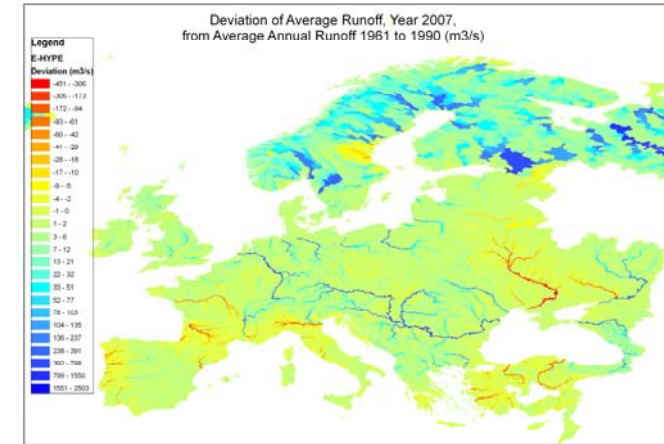
2003



2006



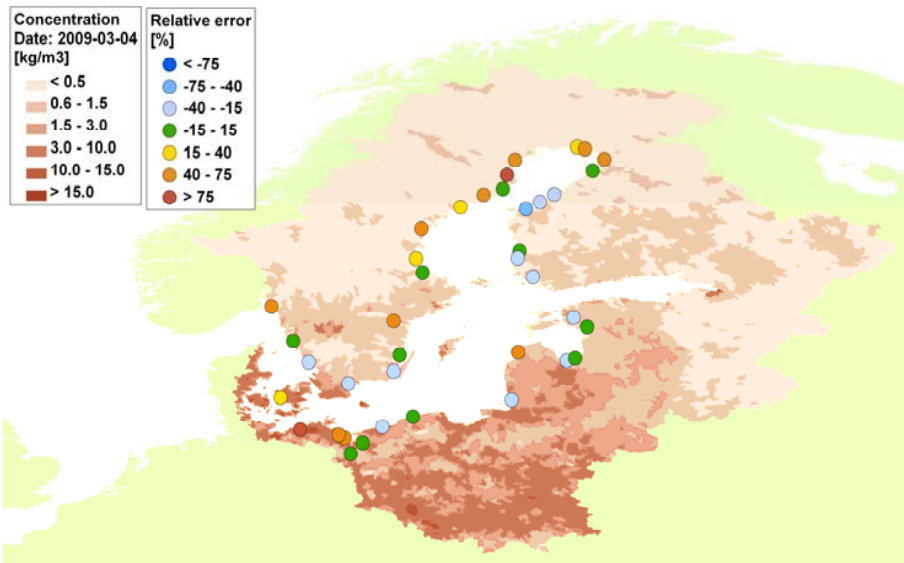
2007



Nutrient concentrations

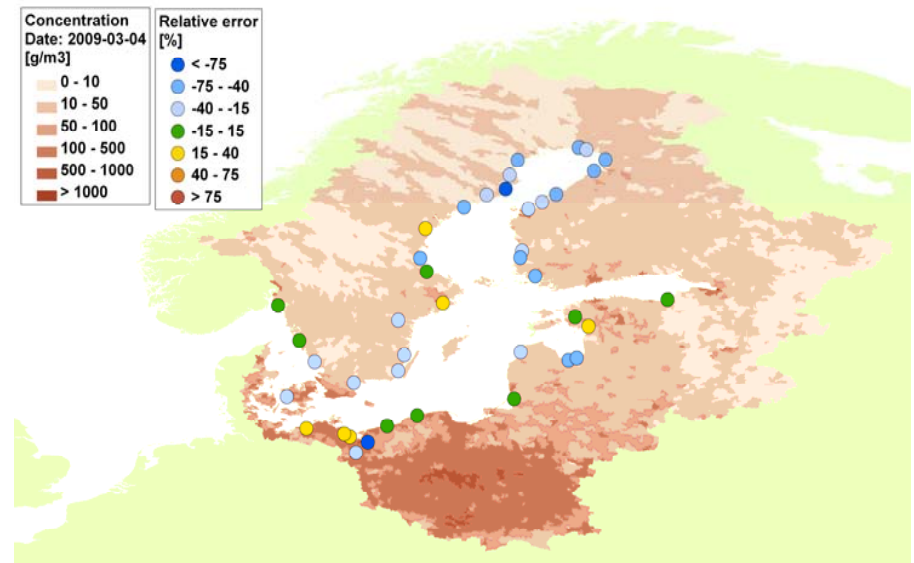
Nitrogen

Concentration Of Total Nitrogen In Basin Outlet

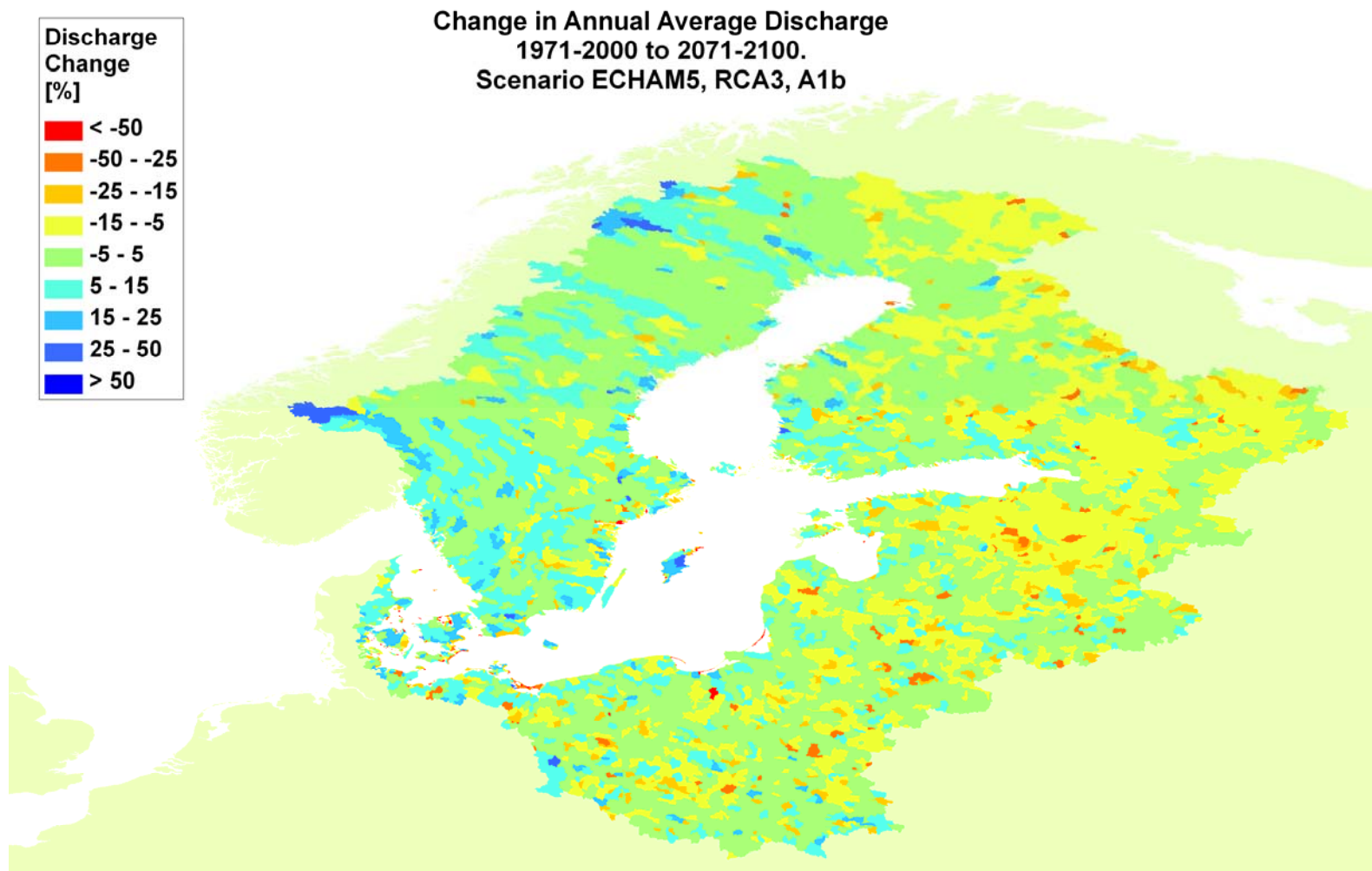


Phosphorus

Concentration Of Total Phosphorus In Basin Outlet



Climate change impact, using one scenario

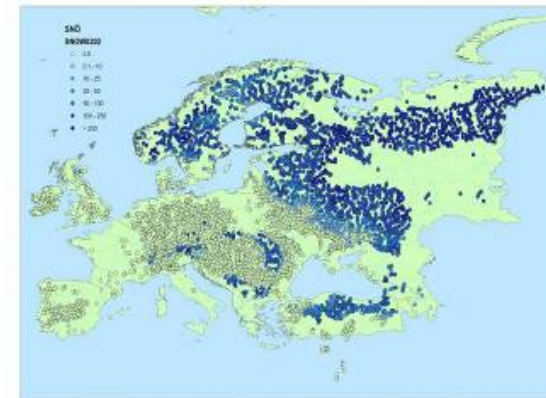
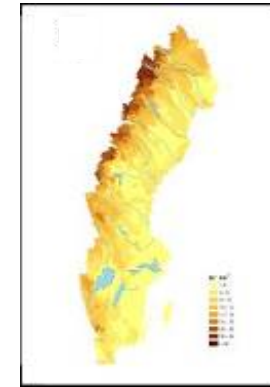


HYPE model applications so far...

- **Sweden (S-HYPE)** 450 000 km²,
17 000 subbasins (18km²), 15 yrs.
- **Baltic Sea basin (Balt-HYPE)** 1.8 milj. km²,
5 000 subbasins (320 km²), 140 yrs.
- **Europe (E-HYPE)** 9.6 milj. km²,
57 400 subbasins (120 km²), 20 yrs.
- **La Plata basin (LPB-HYPE)** 3.6 milj. km²,
4 000 subbasins, 30 yrs.

Possible

- **Arctic (Arc-HYPE)** 2.9 miljoner km²,
290 subbasins, 140 yrs?
- **African continent**



HOME Water – One downstream service

An interactive support system for water quality management to comply with the WFD.

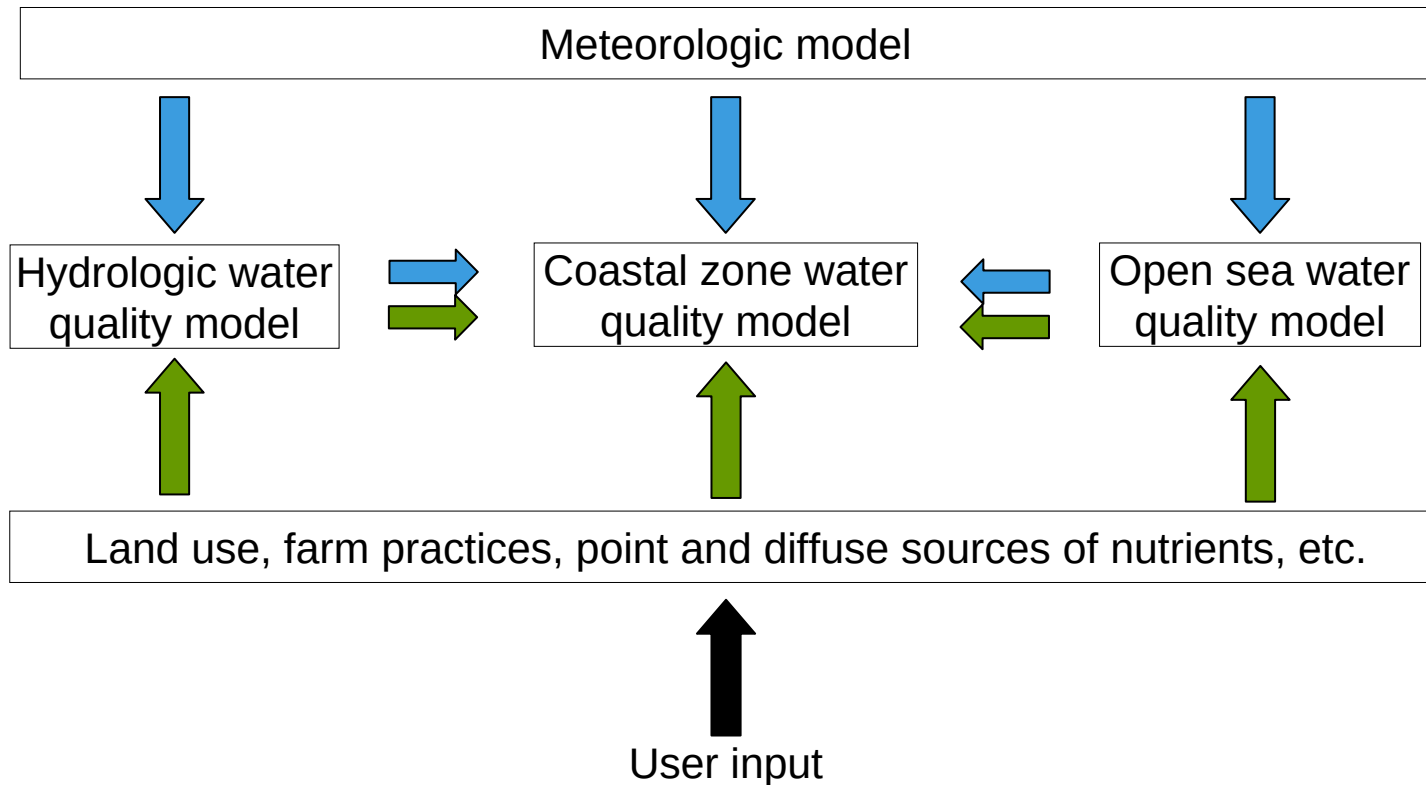


HOME Water at present

- Six regional Water Mgm Areas
- Approximately 17 000 sub-basins for inland waters.
- 550 water bodies for coastal waters.

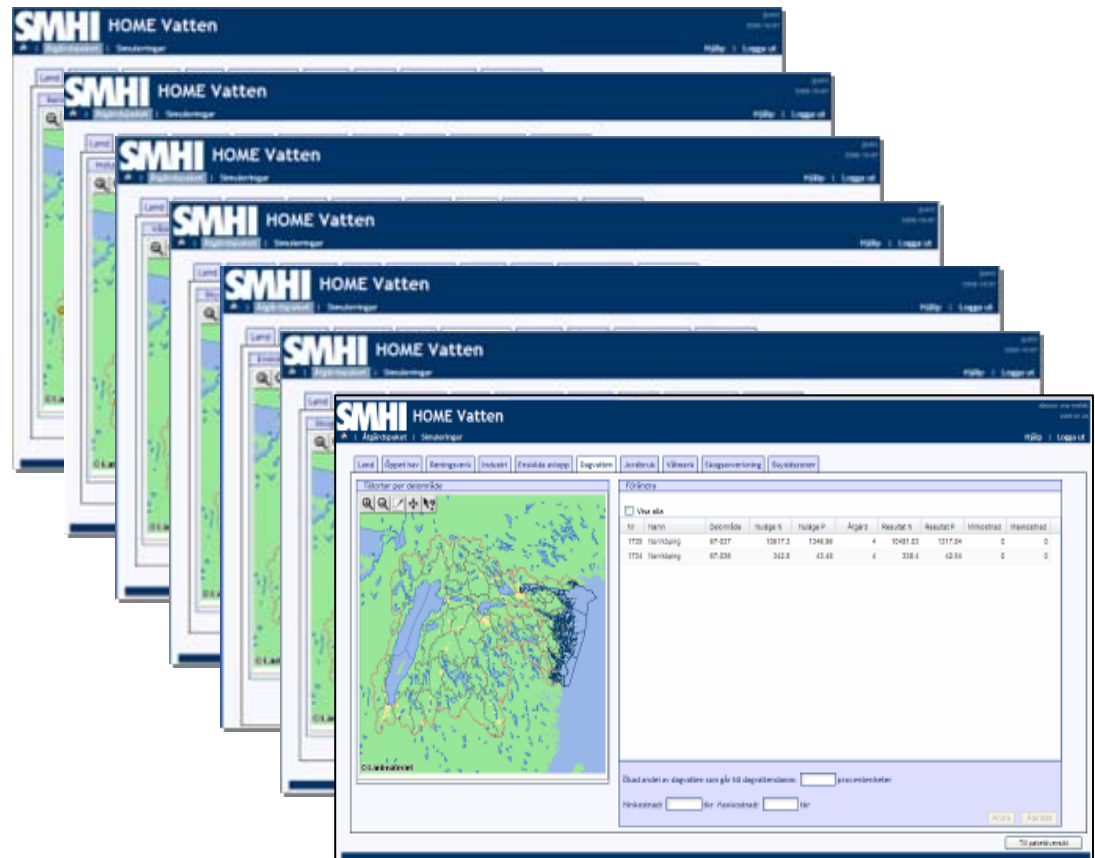


HOME Water modelling system



HOME Water user interface

- Waste water treatment plants.
- Industries.
- Wetlands.
- Buffer Zones.
- Rural sewage systems
- Cleared forest area.
- Storm water from hard surfaces.
- Economy.



HOME Water is available online

<https://homevatten.smhi.se/homevatten/home.do>
take contact for log-in details



Proposal for co-op



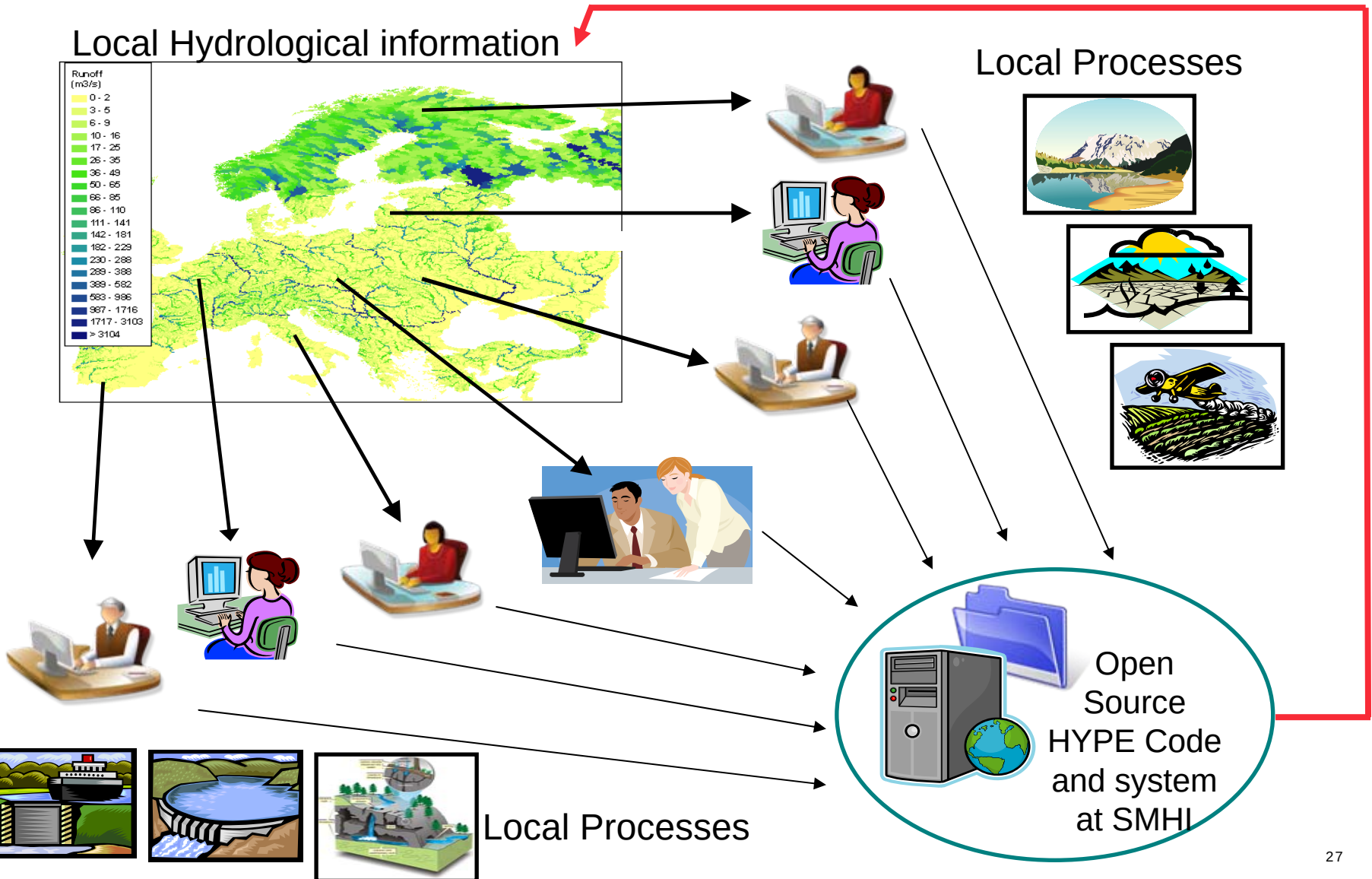
Why hydrological cooperation in Europe?

- **Many challenges with water in focus:** e.g. environmental issues, climate change, EU directives...
- Opens for creation of more harmonised and more accepted systems; matching local, pan-European and transboundary issues.
- Give a platform for research & business opportunities outside the own area
- Higher quality – more brains developing the same system!
- More effective production – lower cost!

Levels of cooperation

1. Ensemble modelling – *deliverable*: a common result database
2. Model development – *deliverable*: a common code or coupled models
3. Production system – *deliverable*: operational system with products and external users

E-HYPE vision



Win-Win

- Access to open source model codes, operational production systems and some readily available products
- Knowledge exchange
- Access to new and more resources
- Cooperative development with specialisation
- Common service for local *and* pan-European issues and demands
- Platform for EU financial proposals (e.g. FP-7, ERA-net, Interreg, GMES, EU commission, etc)
- Platform for SME business development

What are we looking for now

1. To form a team of developers with complementary focuses

- We open up the code in search of excellence
- Look for local and EU needs – forming consortia

2. To form an operational base for the Hype system – a net-work of production capacities

- Operational local use, different focus
- Team-up for an operational pan-european use

3. To offer a base for Down Stream products – alongside or competitive to HOME

- Thru 1. and 2. creating an operative platform to build applications and products on

Thank you!



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Poster

Poster exhibition

Web

Slides available on:

<http://www.smhi.se/GMES-HYPE>