

Patrik Wallman

E-HypeWeb: Service for Water and Climate Information - and Future Hydrological Collaboration Across Europe

Some Challenges of the EU Water Framework Directive

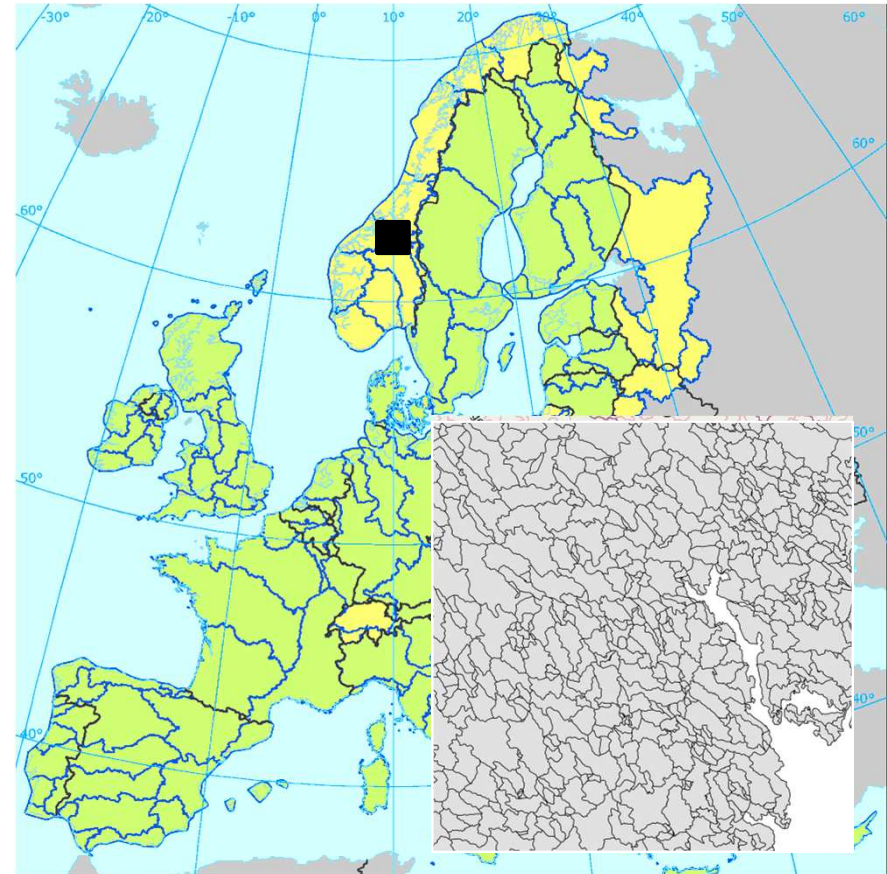
River basins crossing international borders

Natural vs. anthropogenic signals

Prioritise cost-effective measures

Climate change effects

Characterisation of water bodies requires information of high spatial and temporal resolution



How Hydrological Models Can Support Decision Making

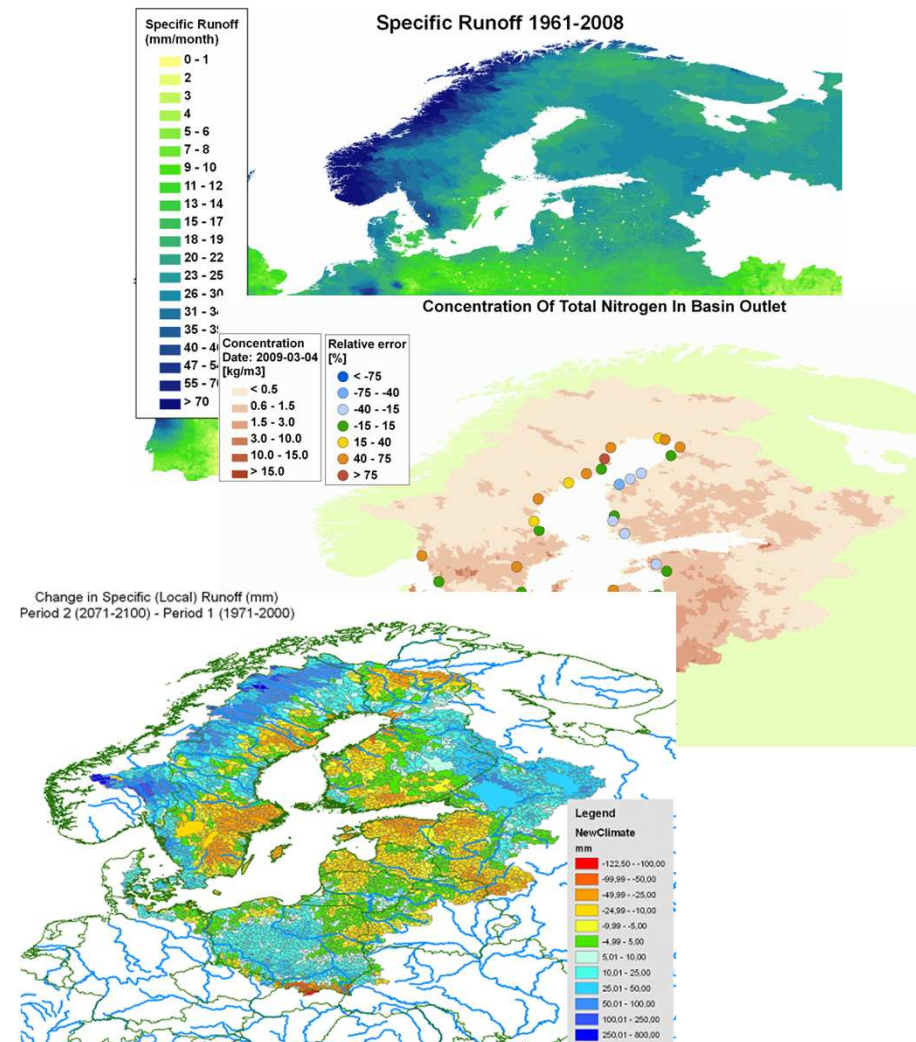
Fill gaps in space and time

Identify problems with measurements

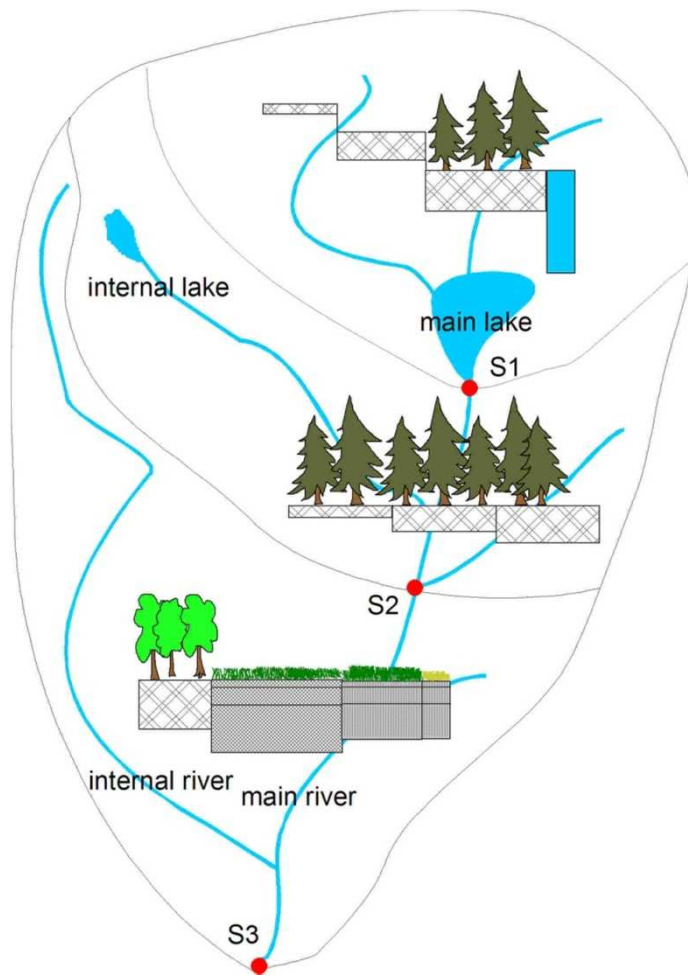
Support monitoring programmes

Calculate source apportionment of emissions

Run scenarios



Introducing HYPE: Hydrological Predictions for the Environment

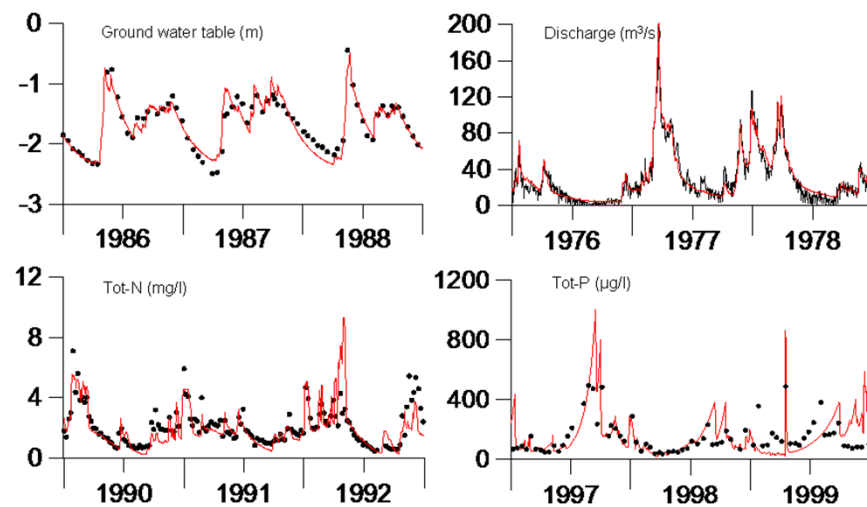


Conceptual model with flow path description.

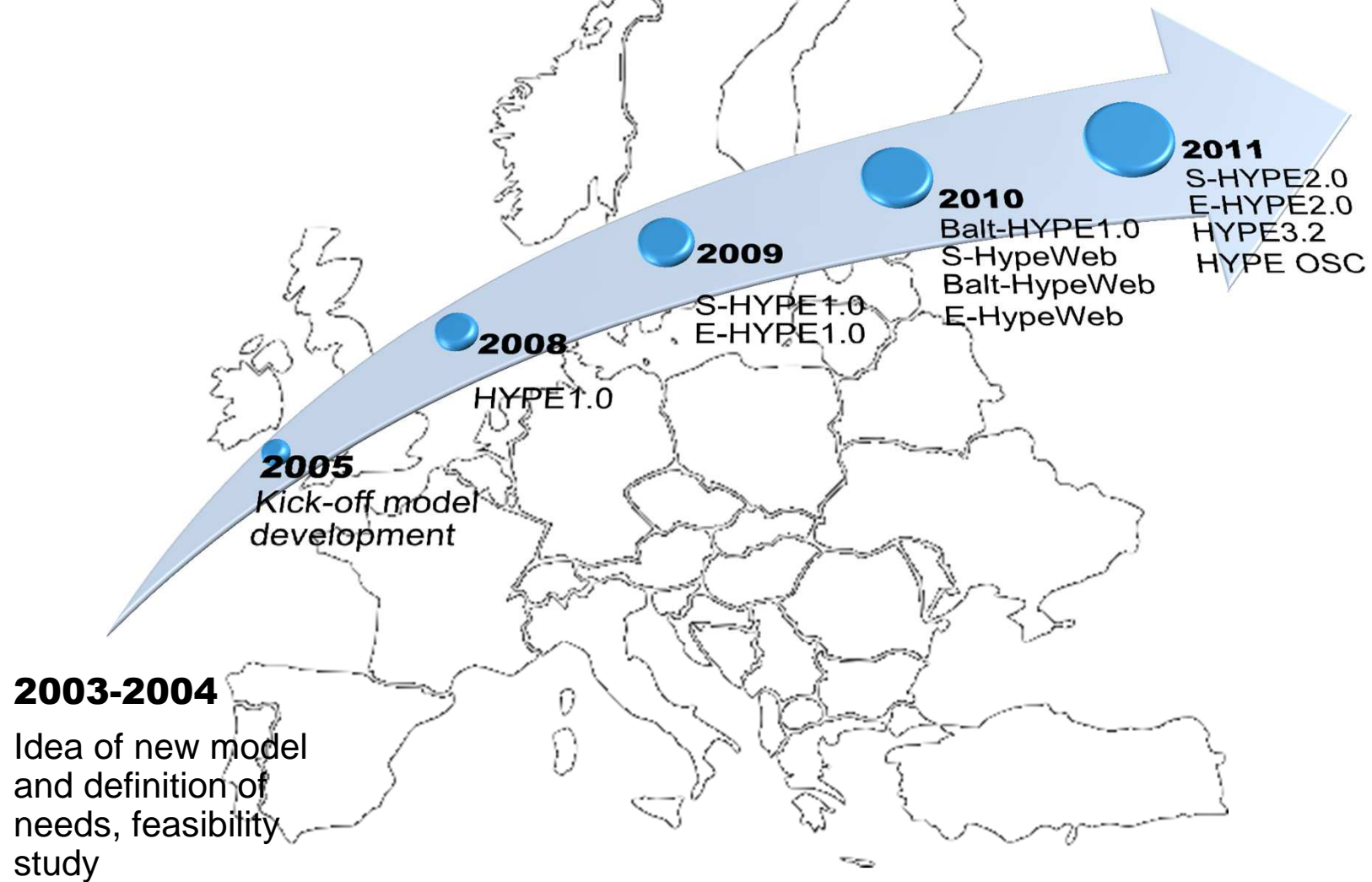
Simulates water and solute transport.

Model parameters are linked to land use and soil type instead of specific points

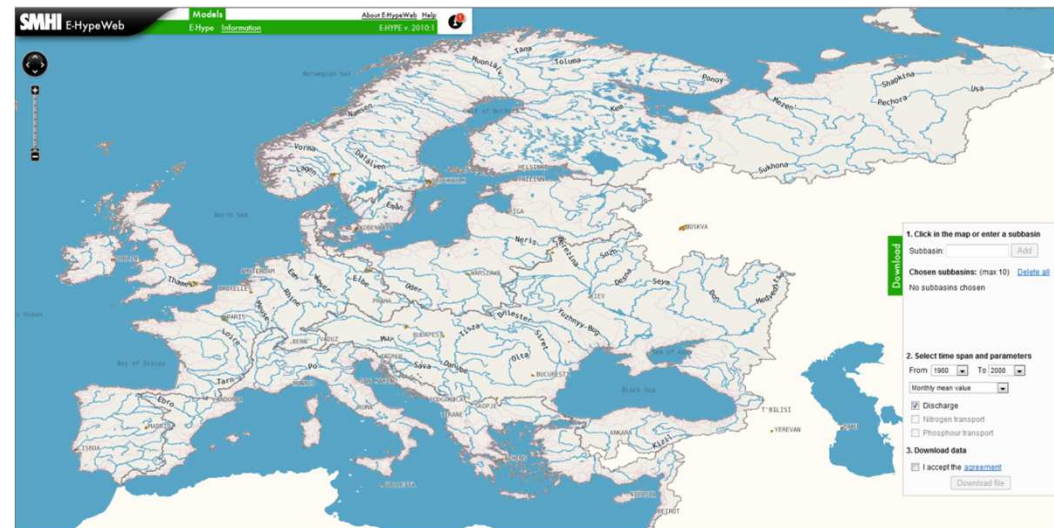
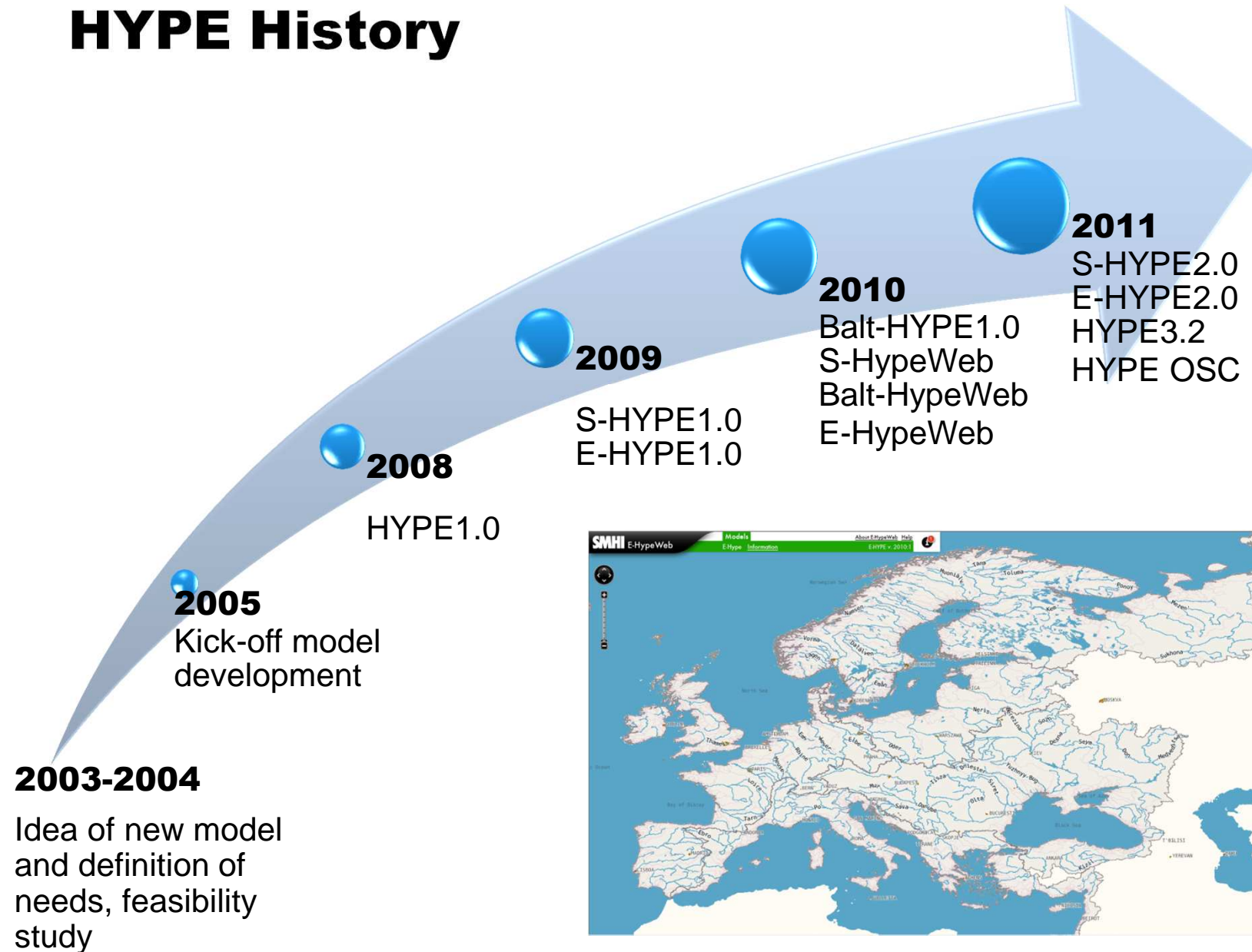
An OpenSource model



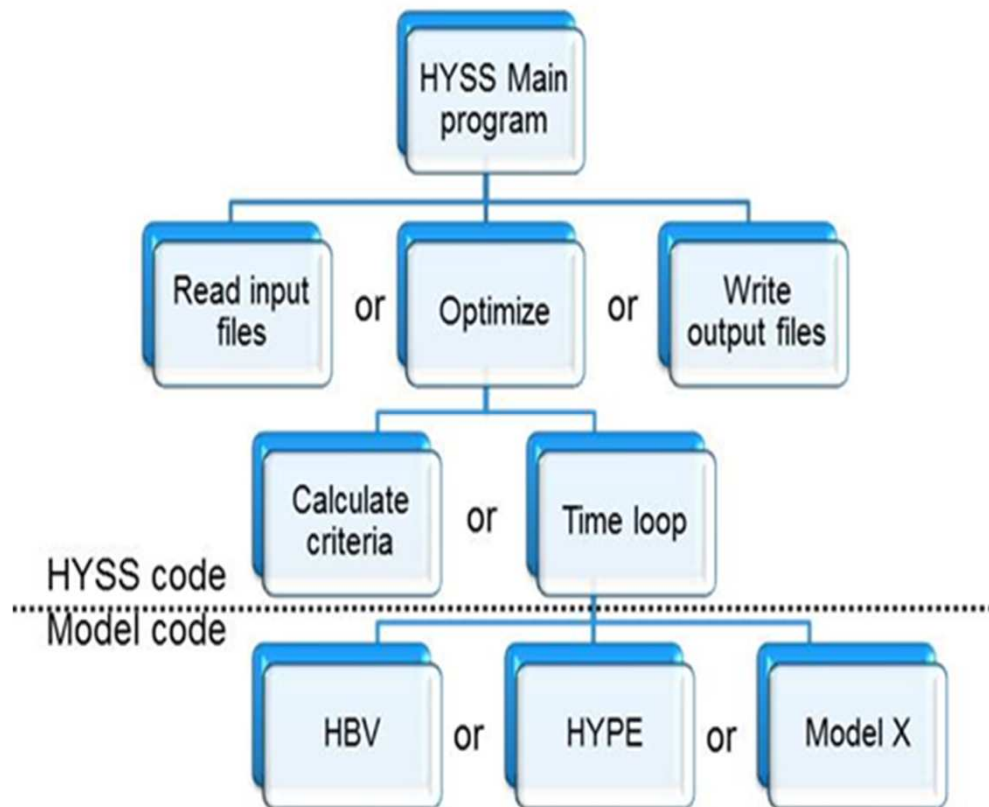
HYPE History



HYPE History



HYSS – Hydrological Simulation System



Infrastructure part of the source code

Reads input files

- Simulation instructions
- Initial state variable values
- Parameter values
- Forcing data

Calculates optimization criteria

Keeps track of time in simulation

Writes output files

Setting up HYPE for Europe

- The **World Hydrological Input Set-up Tool (WHIST)** has been developed to set up HYPE for any watershed by extracting data from available global geographic databases:

Global data set	Database	Resolution
Topographic data	Hydro1k, Hydrosheds (USGS)	1 km
Land use	Corinne, ECOCLIMAP	Approx. 1km
Soil type	Soil map of the world (UNESCO)	10 km
Up-dated landcover, phenology	Satellite data (GMES)	
Precipitation and temperature:		
1957-2002	ERA-40 (ECMWF)	120 km
1989-2007	ERA-interim (ECMWF)	80 km
2008-forecasts	ECMWF	
Climate scenarios	SMHI, Ensembles-project, IPCC	25/50 km
Hydrological observations:	Water discharge: 3700 gauging stations (GRDC)	Daily/monthly
	Satellite data: hydrometeorology, hydrology (GMES)	

Setting up HYPE for Europe

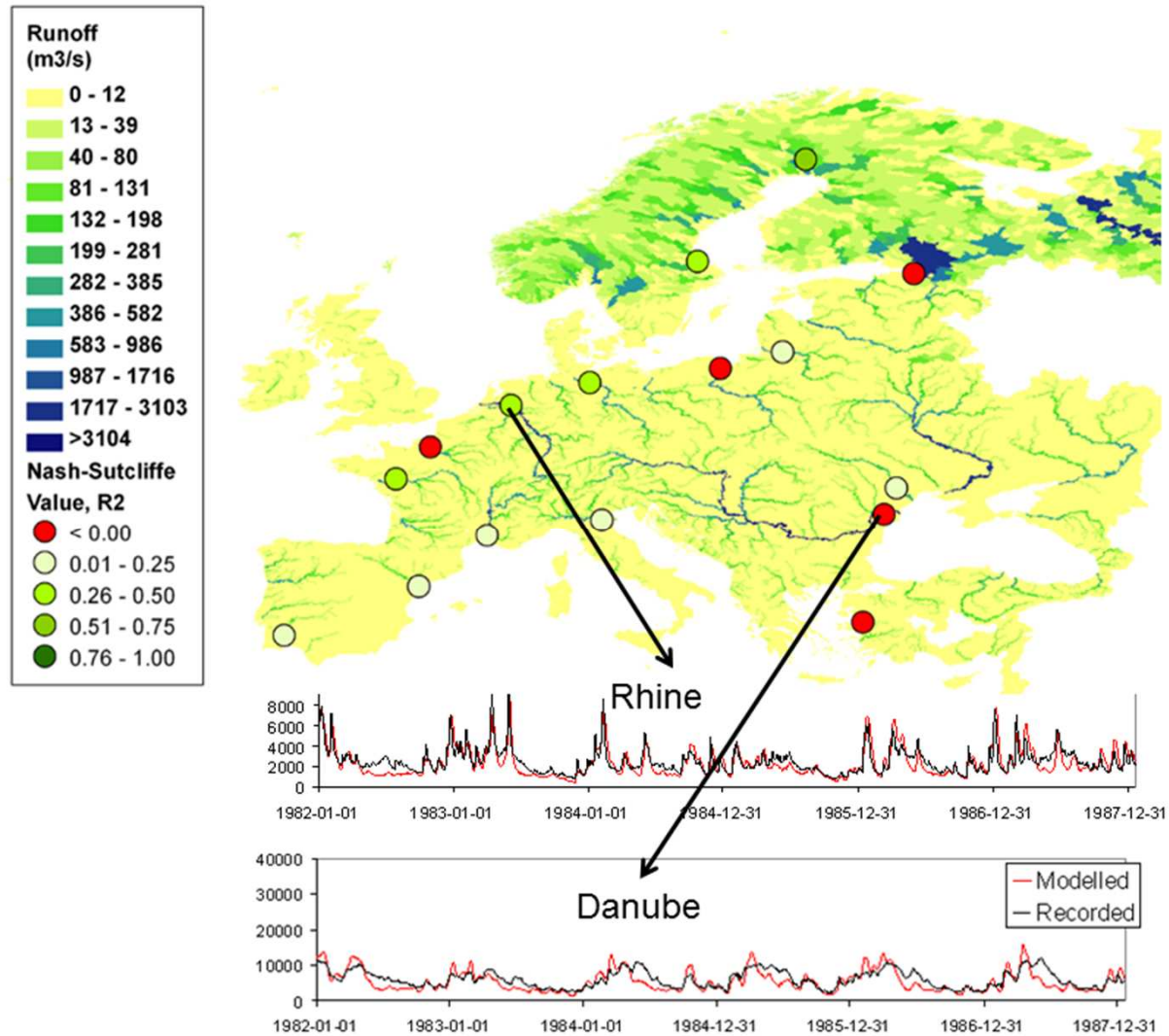
	Balt-HYPE	E-HYPE1.0 ¹
Areal extent	1.8 million km ²	9.6 million km ²
Med. Sub basin area	325 km ²	120 km ²
No. Sub-basins	5 128	57 436
Topography/routing	Hydro1K [17]	Hydrosheds [16], (Hydro 1K for latitude > 60°)
Forcing Data	ERAMESAN 1980-2004 [18], Resolution = 11 km.	ERAMESAN 1980–2004 [18], Resolution = 11 km.
Landcover	Globcover 2000	Globcover 2000
Soil-types	ESDB [19]	ESDB [19]
Runoff data	GRDC [20], BHDC [21]	GRDC. EWA [22], BHDC [21]
# calibration stations	35	Not calibrated
# validation stations	121	16 (river mouths only)

¹Version 2.0 will cover 8.9 mill km², 36 314 sub basins and use Corine land cover [23]

E-HYPE set-up and input data

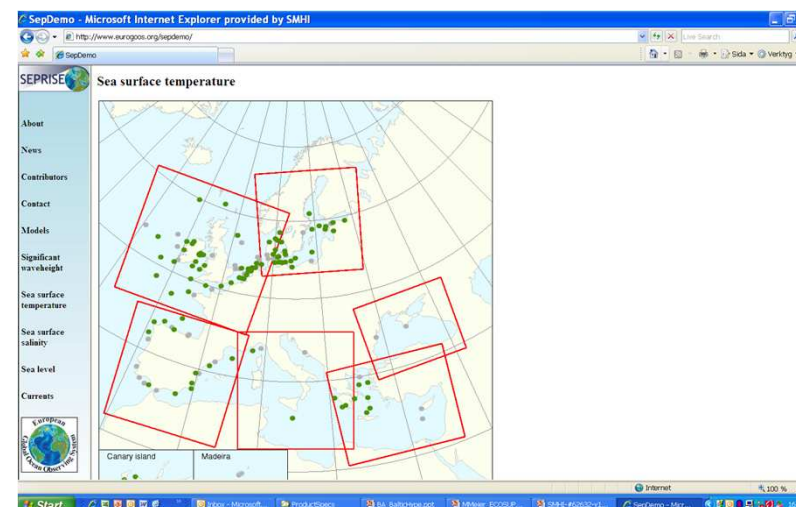
	1.0	2.0
Areal extent	10 200 000 km ²	8 824 781 km ²
Median Subbasin resolution	120 km ²	214 km ²
No of Subbasins	57 436	35 436
Topography Routing	Hydrosheds Hydro1K for latitude >60°	Hydrosheds Hydro1K for latitude >60°
Forcing Data	Era-Interim 1980-2004, resolution = 11 km ERA-40 = 120 km	1961-1979: ERA40 1980-2002.08.31: ERA40 + ERA-Interim 2002.09.01-2011.02.28: ERA-Interim
Land Cover	Globcover 2000	Corine Globcover 2000
Soil types	European Soils Database	European Soils Database Digital Soil Map of the World
Discharge measurements	GRDC, EWA	GRDC, EWA, Baltex

Results



HYPE requests so far...

- Swedish water authorities, S-HYPE - WFD (Government)
- EuroGoos - Oceanographic forecasting (MyOcean + EU FP7)
- Core Service information of Pan-European Water Resources (Geoland2, SUDPLAN)
- Eutrophication combatement of Baltic Sea (BONUS ECOSUPPORT)
- Adaptation to climate change in the Baltic Sea region – environmental strategy (EU Interreg / Government Baltadapt)
- Water allocation (EU FP7 Sirius) Pilot basins in Spain, Italy, Romania and Turkey
- Climate service, regionally and pan-European (EU FP7, ECLISE, Impact2C)



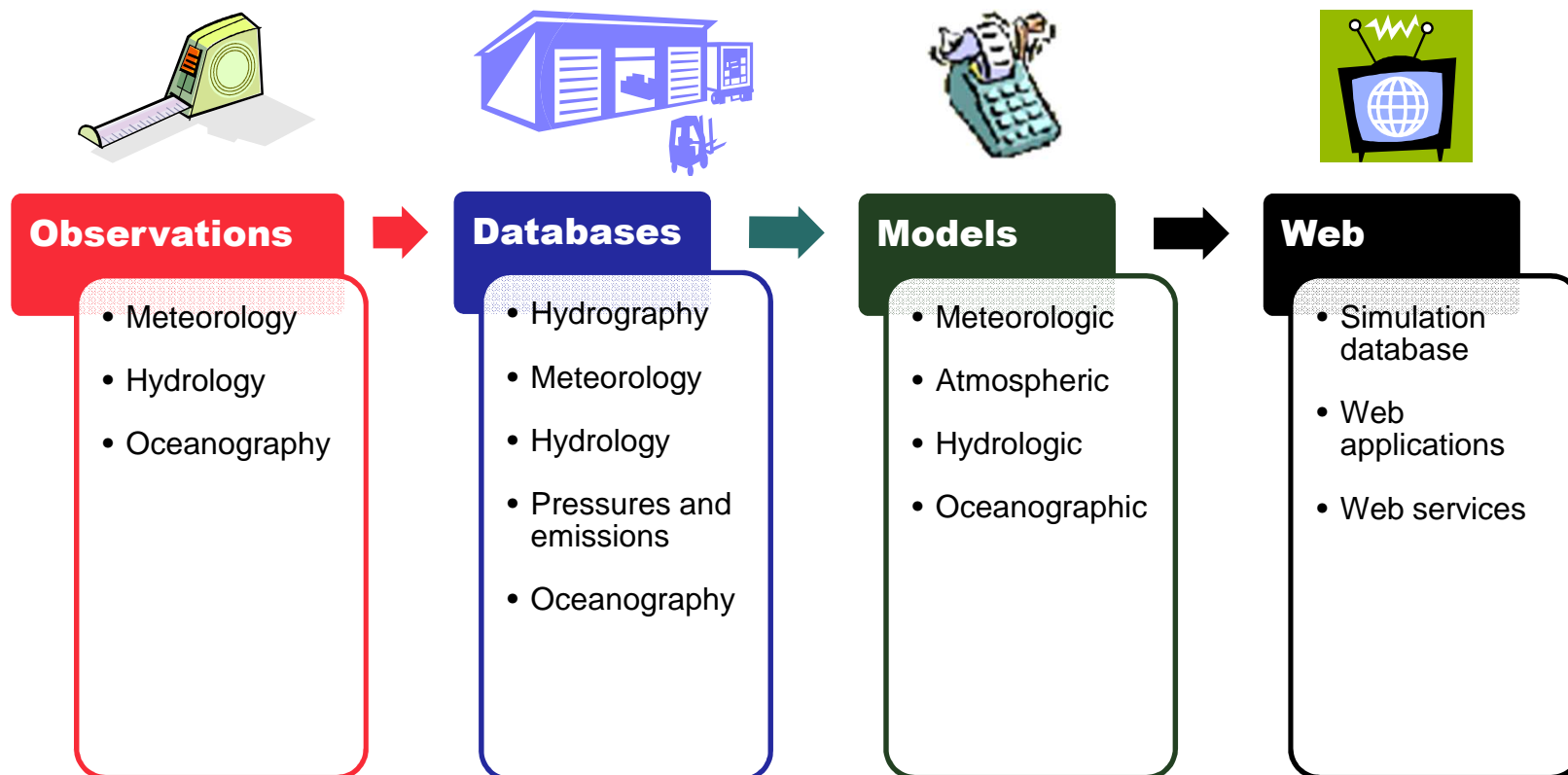
SMHI



MISTRA



From Science to Practice: Production Line



E-HypeWeb

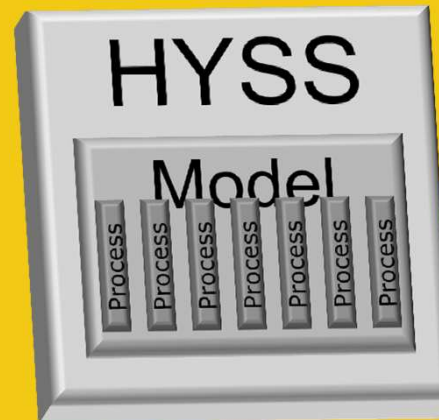
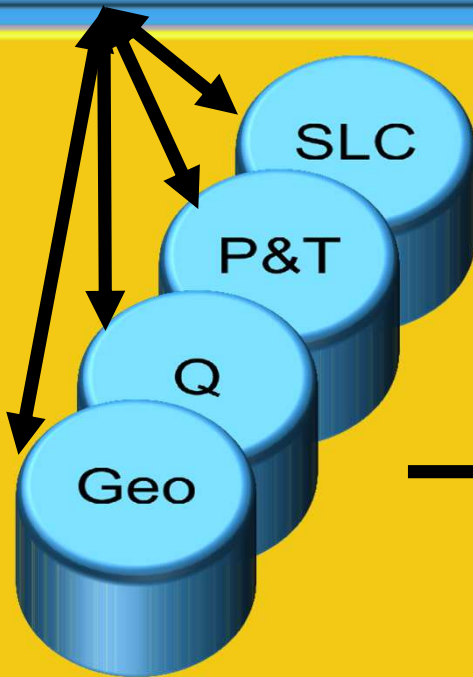


SMHI

Server
cloud

OGC Services

Hydrological Simulation Service



Results

Server
cloud

Hydrological Simulation Container

Hydrological cooperation – Why?

Many challenges with water in focus: e.g. environmental issues, climate change, EU directives...

Opens for more harmonised and more accepted systems; matching local, pan-European and trans boundary 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!

One voice in Europe – although no one group have all answers!

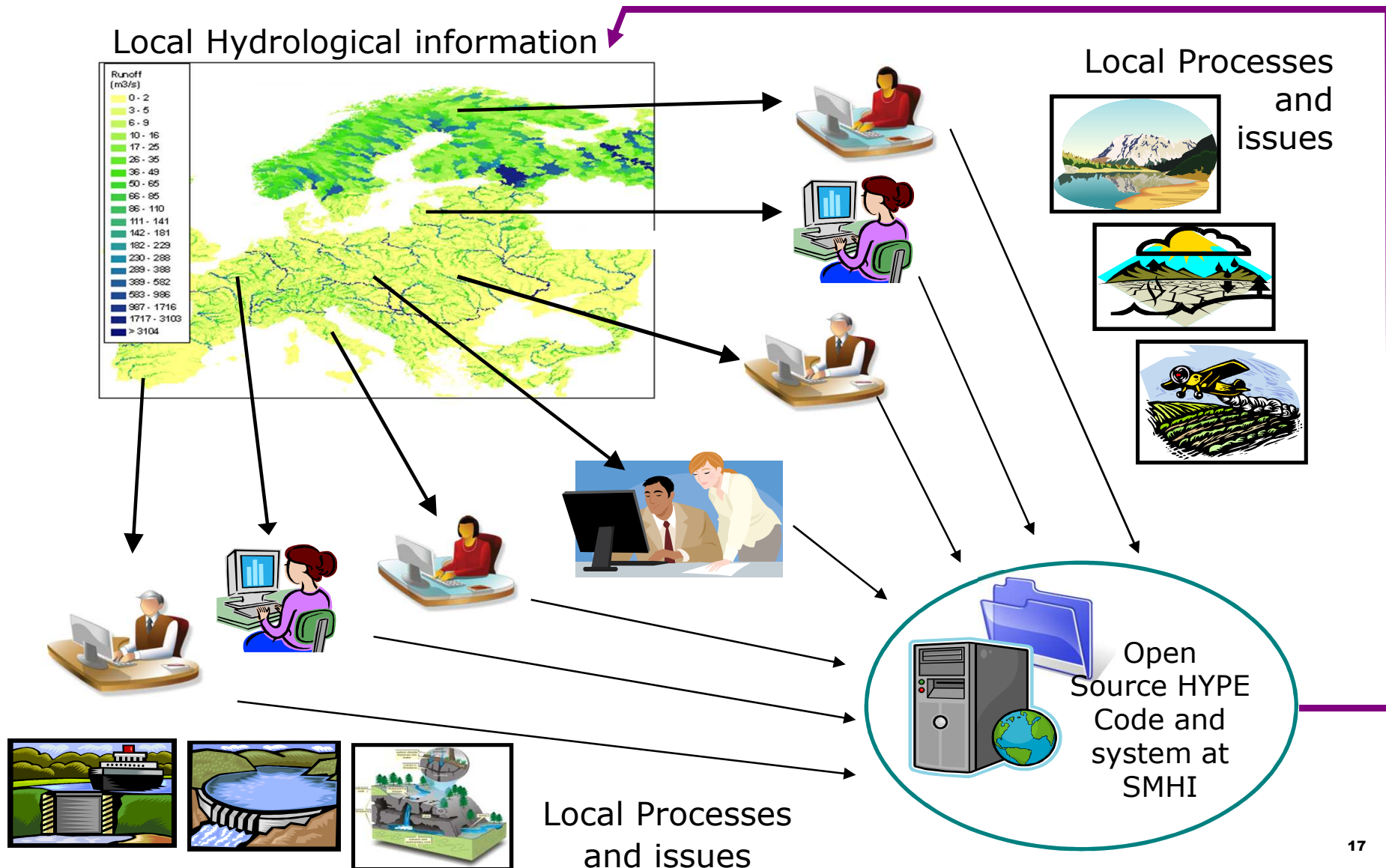
Different Levels of Cooperation

Ensemble modelling – *deliverable*: a common result database

Model development – *deliverable*: a common code or coupled models

Production system – *deliverable*: an operational system with products and external users

E-HYPE vision



What's the gain?

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

Preliminary

- Workshop
23 November,
Stockholm
- HYPE course
24-25 Nov,
Norrköping



HYPE Open Source Community

hype.sourceforge.net

www.smhi.se/e-hype

www.smhi.se/balt-hype

www.smhi.se/tema/vattenforvaltning

Free Downloads...

Source code:

- hype.sourceforge.net

Modelled data:

- www.smhi.se/e-hype
- www.smhi.se/balt-hype
- www.smhi.se/tema/vattenforvaltning