Friedrich-Schiller-Universität Jena
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UPPER GERA WATERSHED (GERMANY)

AREAL ASSESSMENT OF WATER-QUALITY MONITORING AND ASSOCIATED MODEL APPLICATION

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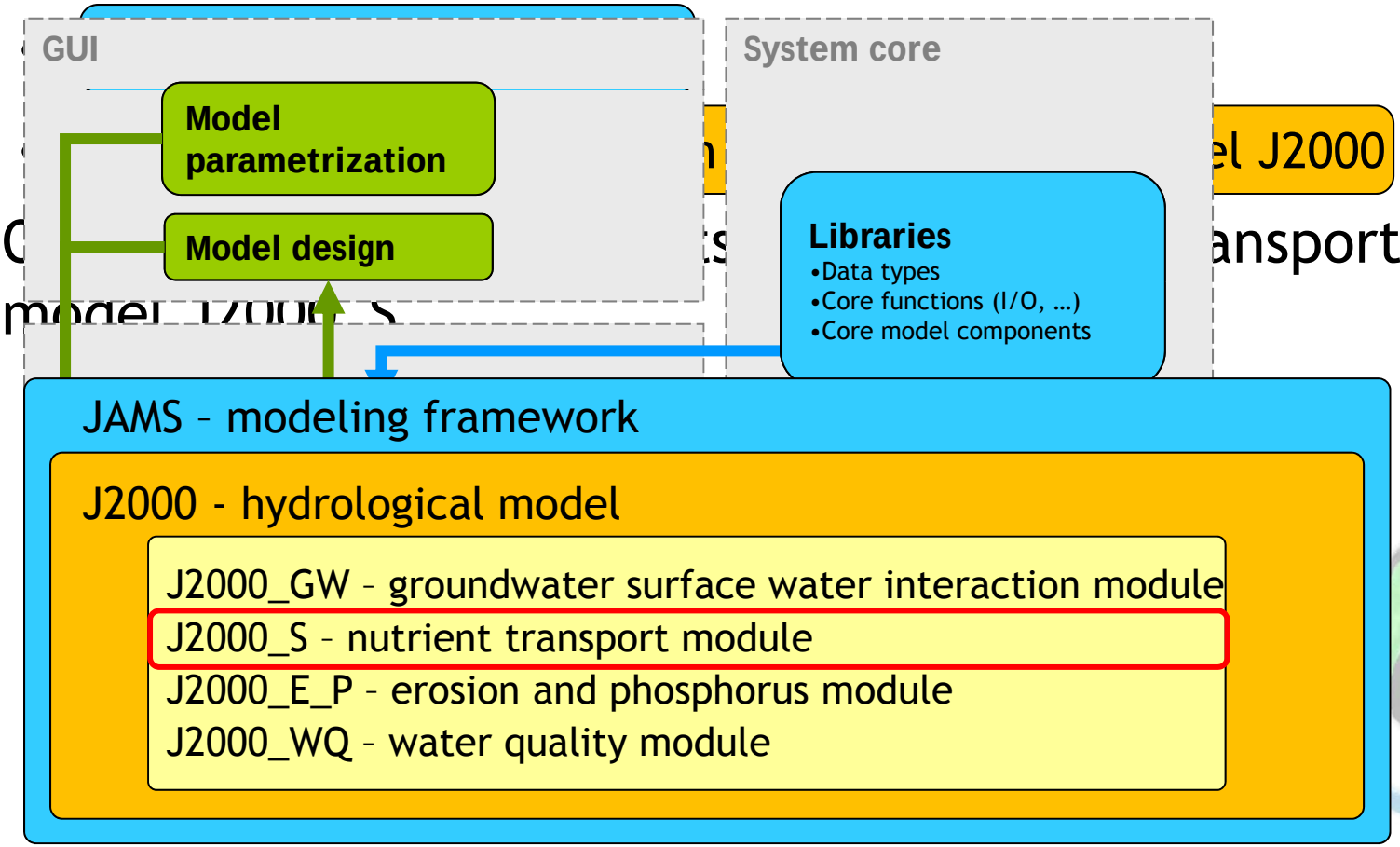
INNOPROFILE
UNTERNEHMEN REGION
Die BMBF-Innovationsinitiative Neue Länder

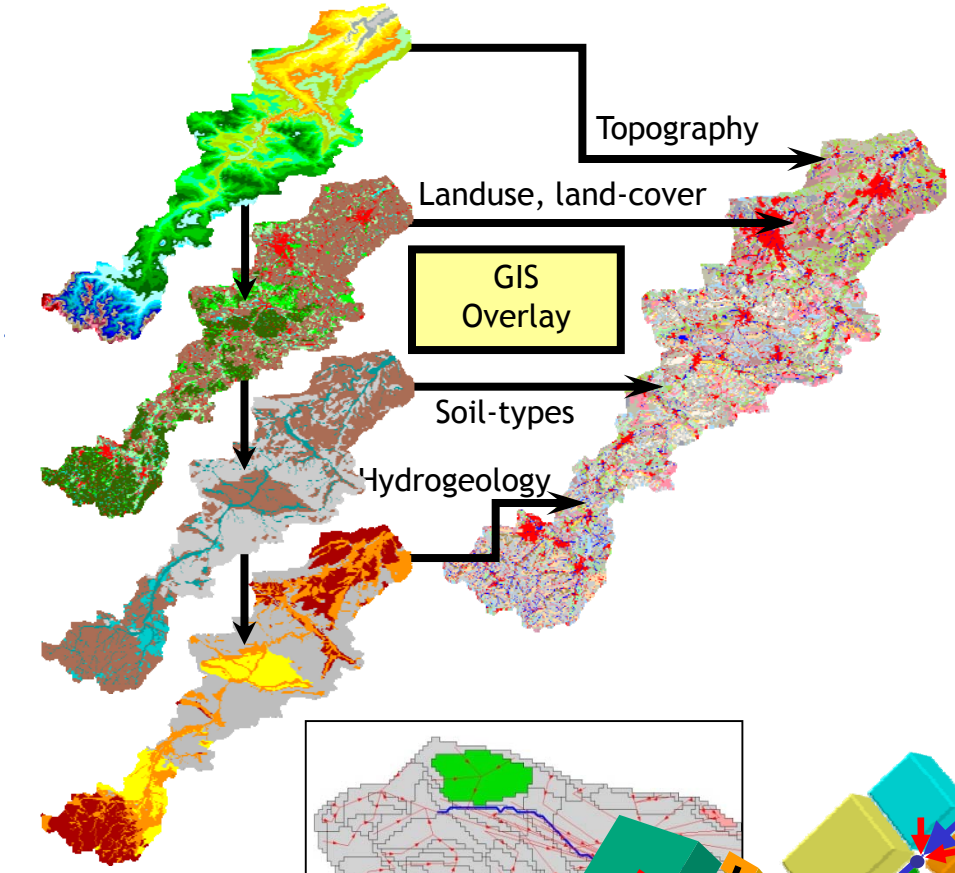
ilms

INTRODUCTION

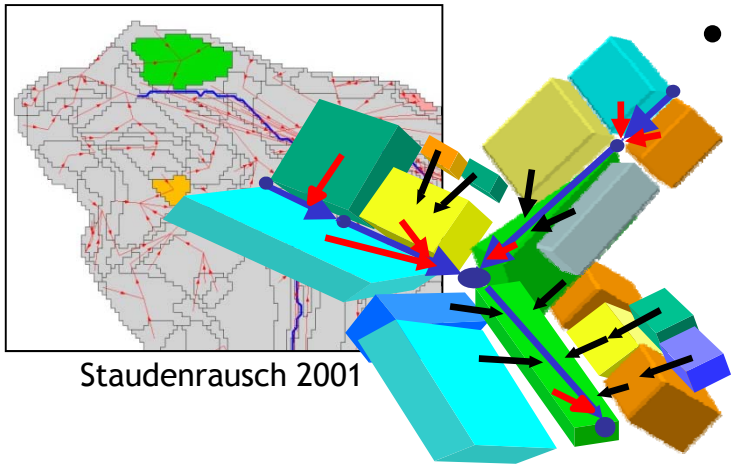
- The ILMS - project (Integrated Landscape Management System)
- Provide a modular structured software system
- C… …ansport model J2000_S



J2000_S - HRU DELINEATION



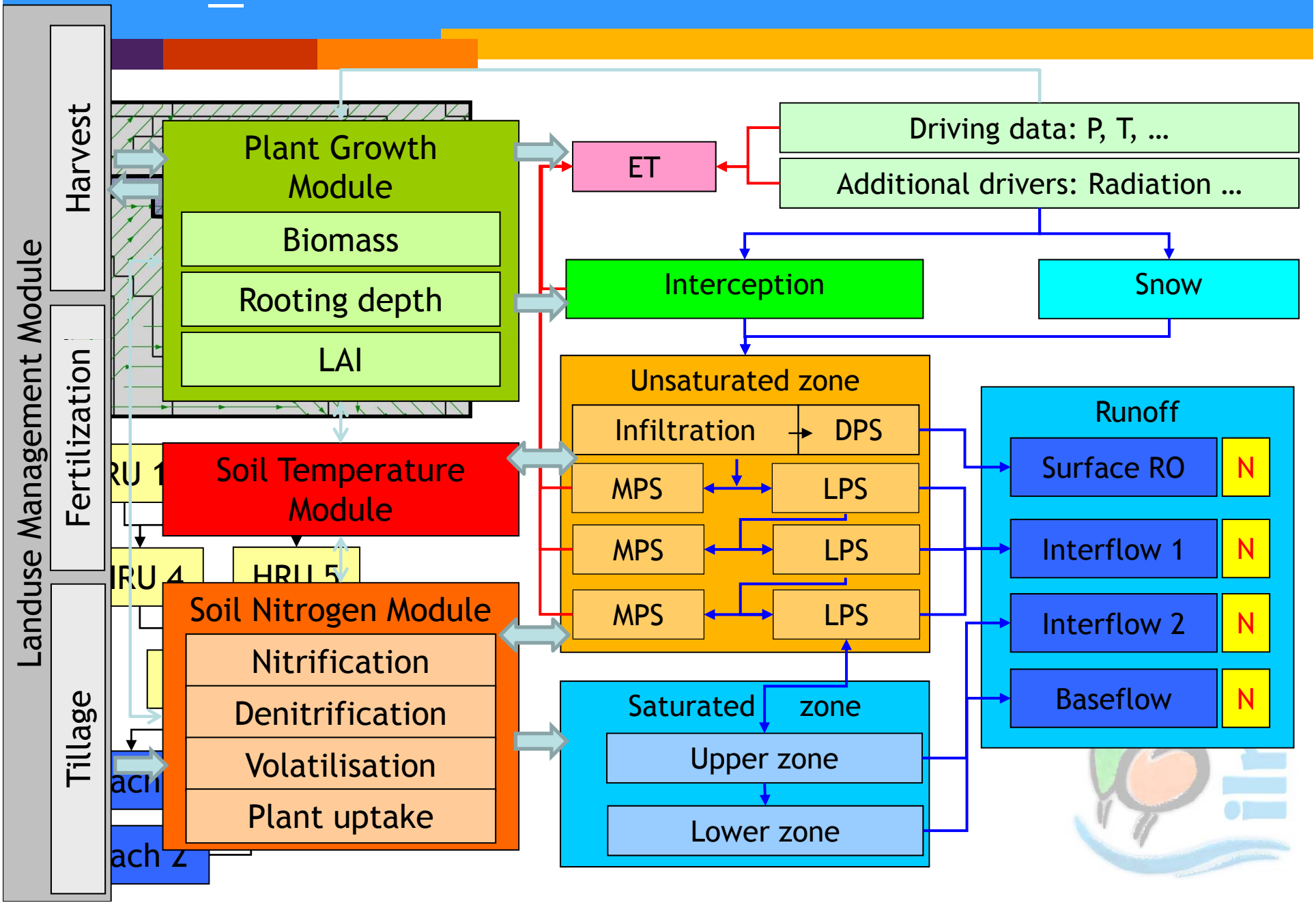
Flügel, 1996
Bongartz, 2001



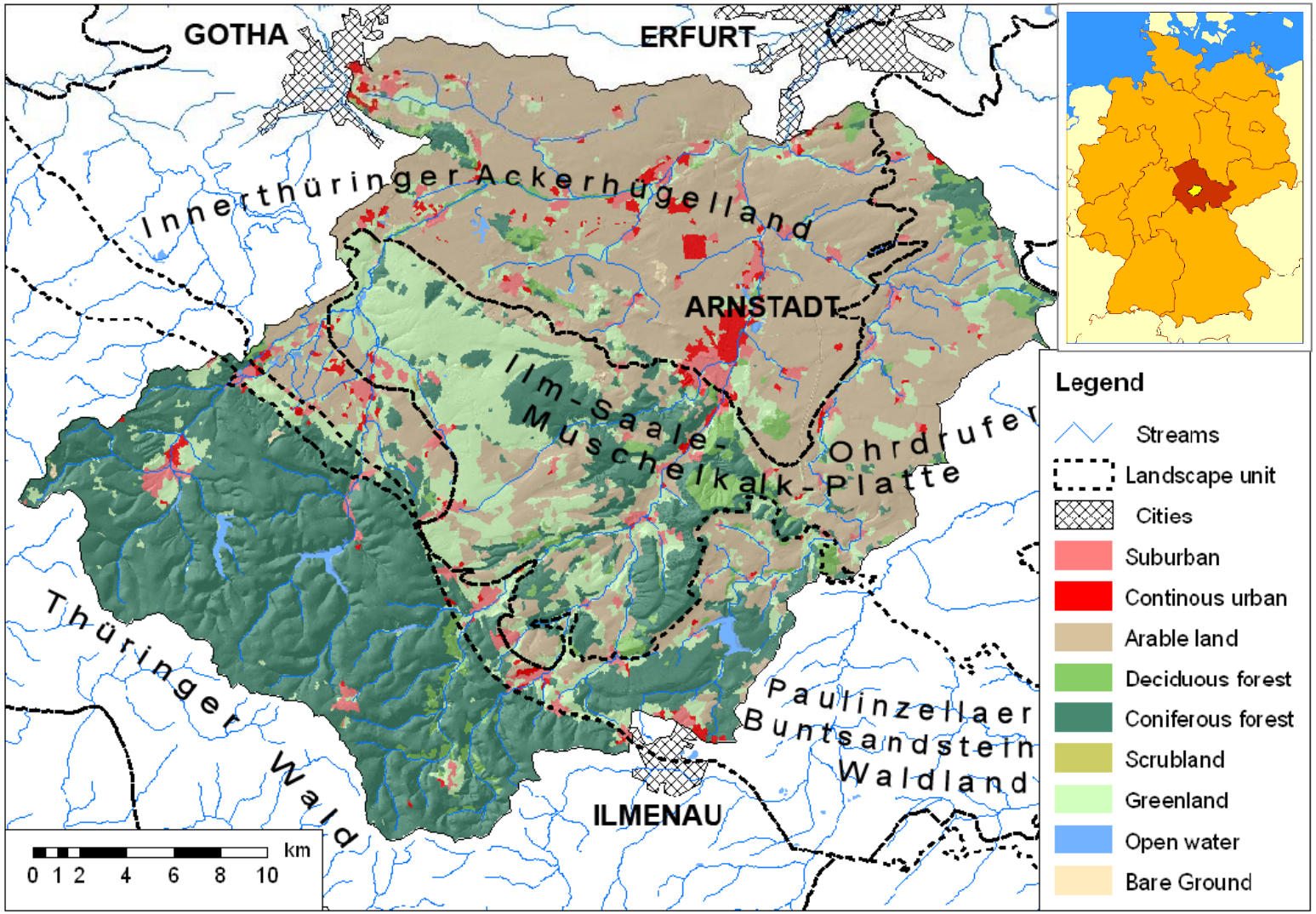
Staudenrausch 2001

- The scalable Response Unit distribution concept allows process oriented classification of catchments without loss of important information
- Combined with a topological routing scheme vertical and lateral processes can be modeled fully distributed

J2000_S PROCESS BASED N-MODEL



UPPER GERA TEST SITE



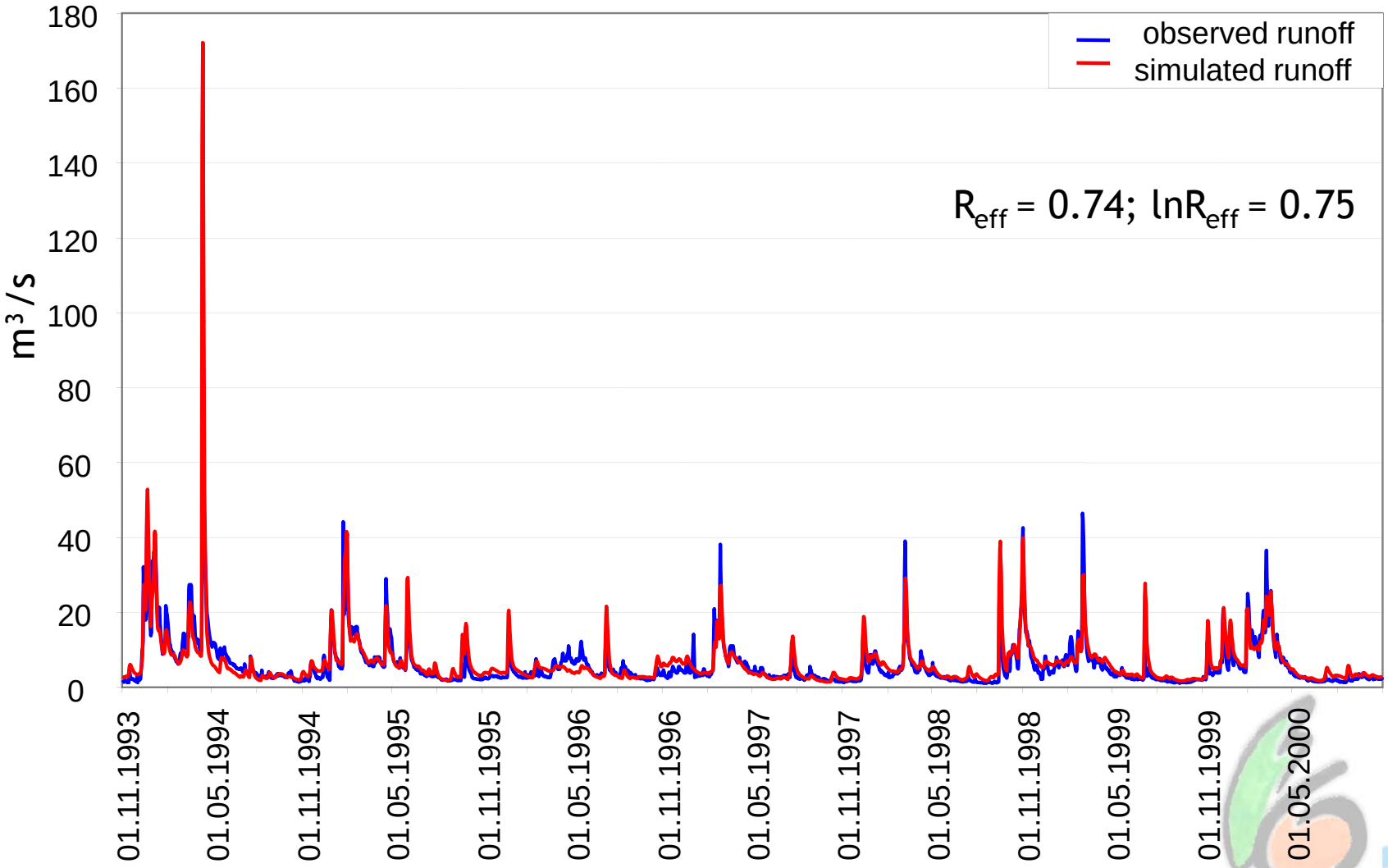
Thuringian Forest:
400 to 980 m a.s.l
P = 1200 mm

Sandstone Woodland:
400 to 600 m a.s.l
P = 550 – 800 mm

Limestone Plate:
300 to 600 m a.s.l
P = 550 – 750 mm

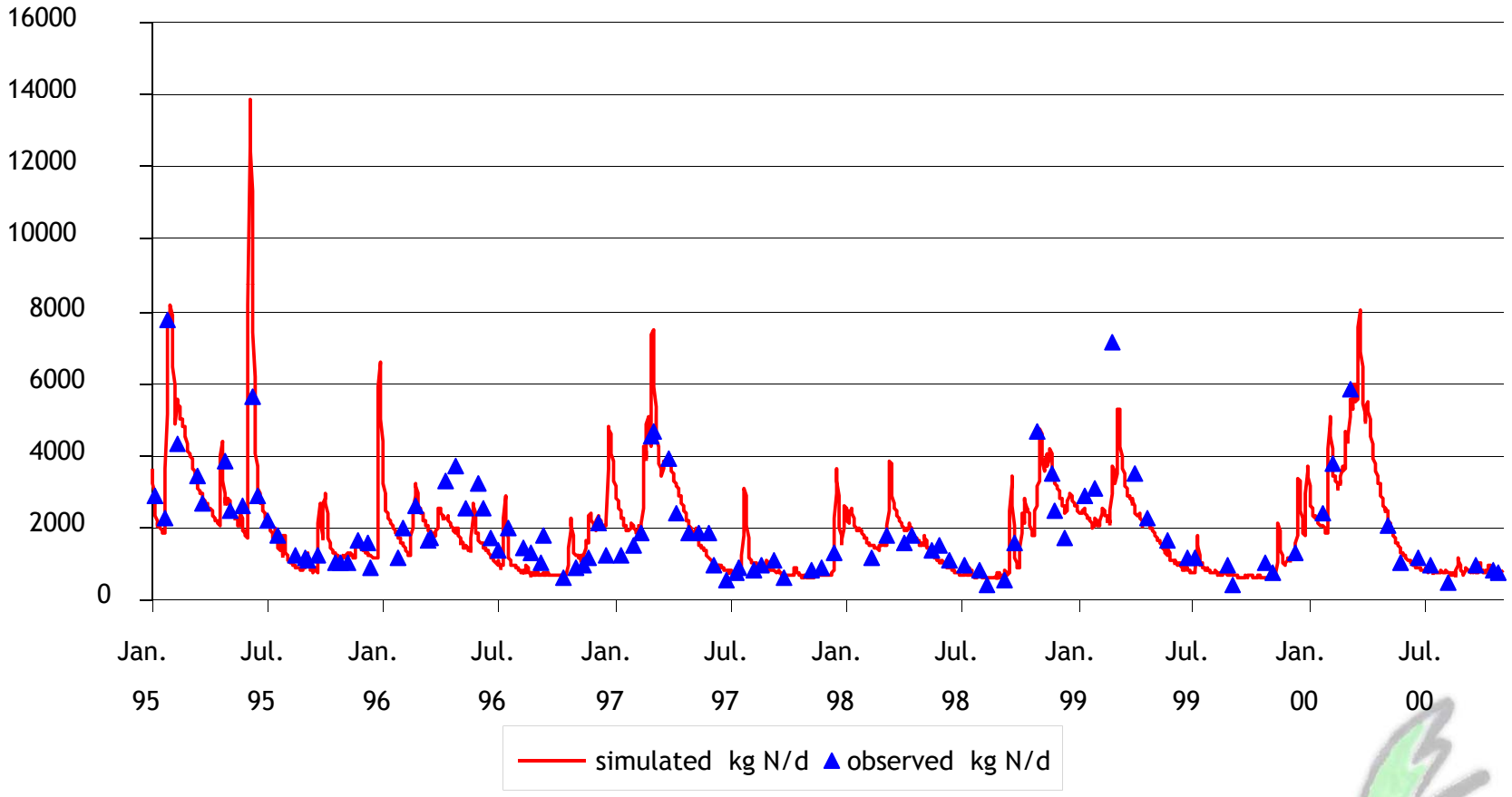
Central Thuringian Farmland:
200 to 400 m a.s.l
P = 500 – 600 mm

J2000 MODEL RESULTS



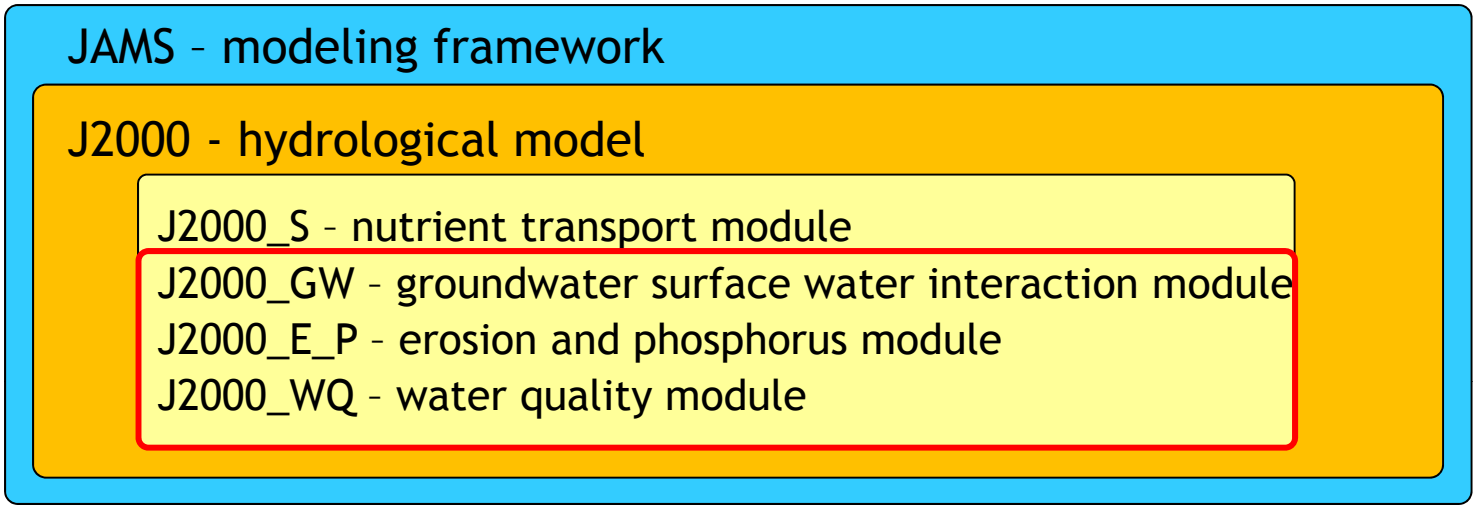
Observed and simulated runoff (m^3/s) at the gauge station Erfurt-Moebisburg (catchment outlet)

J2000_S MODEL RESULTS



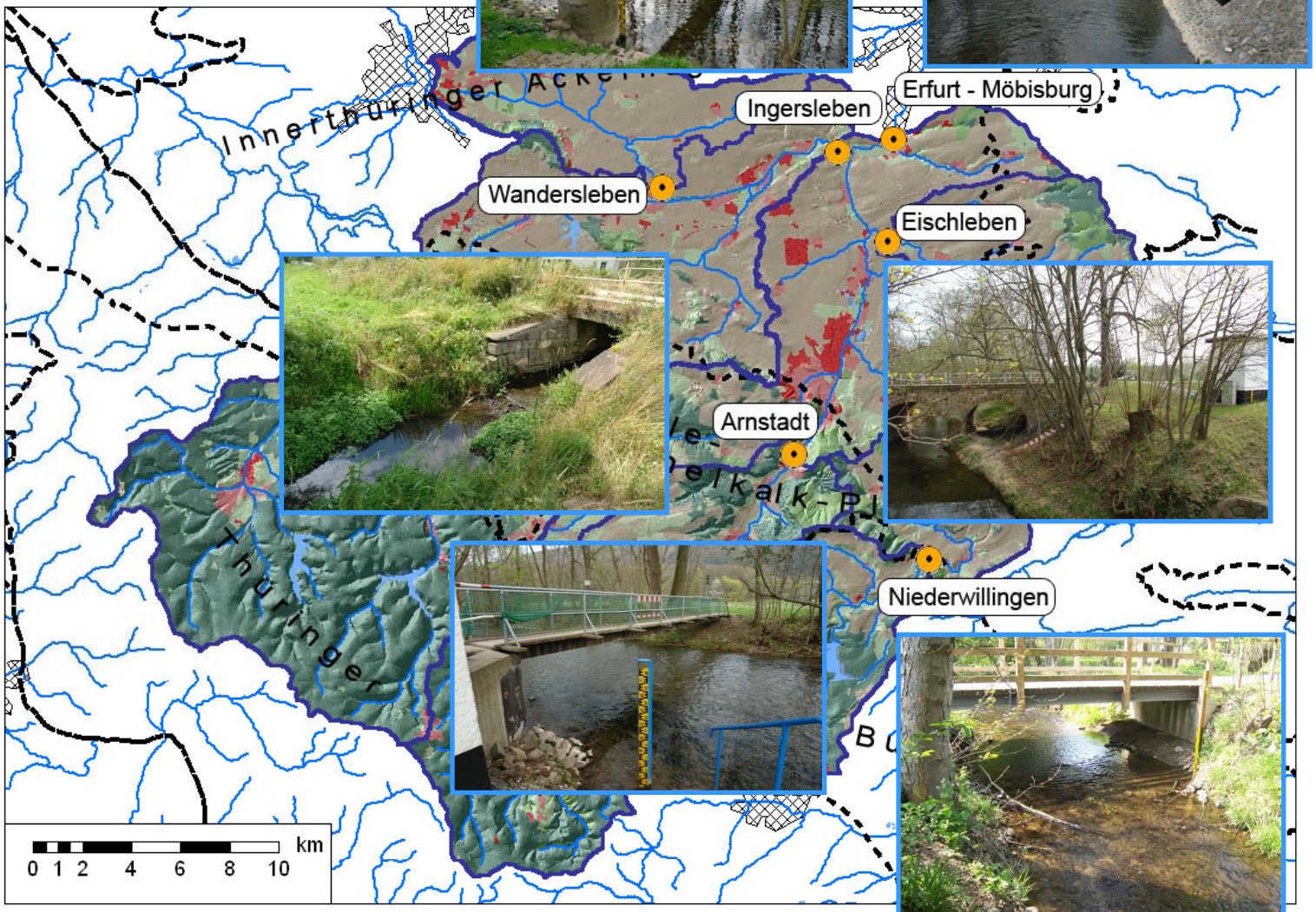
Observed and simulated N-loads (kg/d) at the gauge station Erfurt-Moebisburg (catchment outlet)

FURTHER MODEL DEVELOPMENT



- The application of water quality models is often confronted with a poor basis of calibration and validation data
- Thus a measurement network was installed to provide data for *process identification*, *calibration* and *validation* of water quality models in the mesoscale
- We expect from the use of these field data a substantial improvement of the quality and the reliability for our process-modeling system

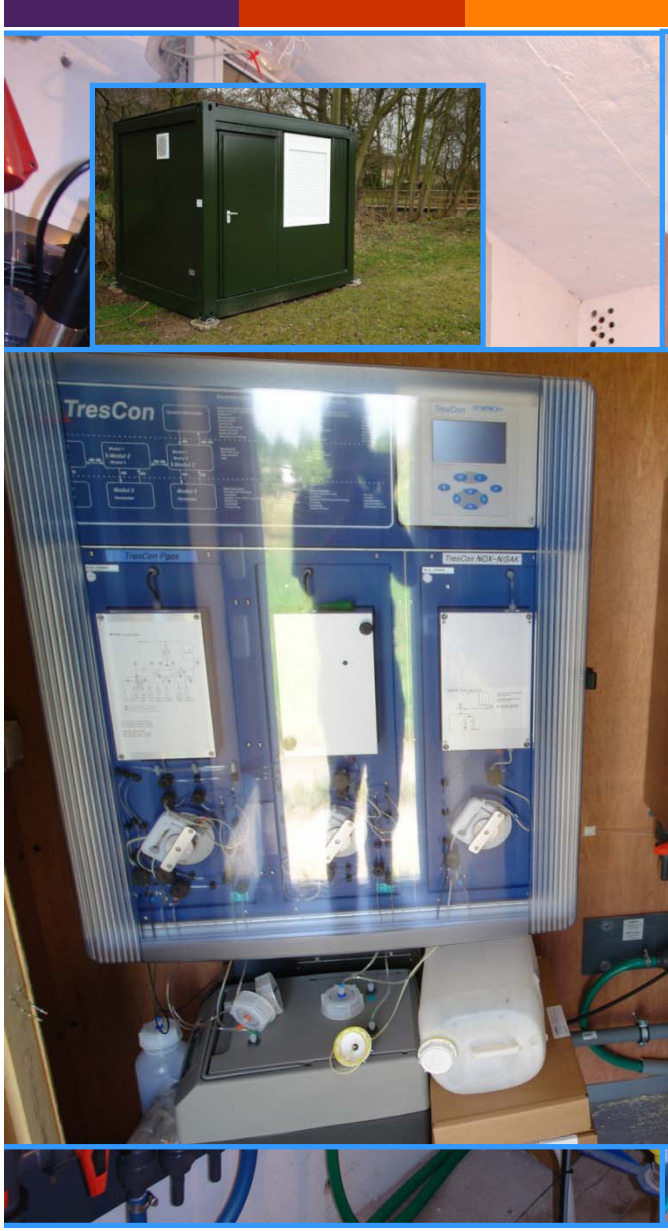
MEASUREMEI K: ity (1)

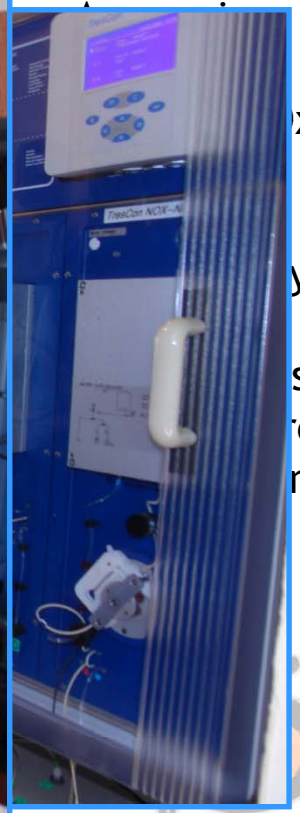


Online stations
(15 minutes)

- Total Phosphorus
- Nitrate
- Ammonium
- TOC/CSB
- Dissolved Oxygen
- pH
- Electrical conductivity
- Turbidity
- Suspended solids
- Temperature
- Redox Potential
- Runoff

MEASUREMENT NETWORK: water quality (2)

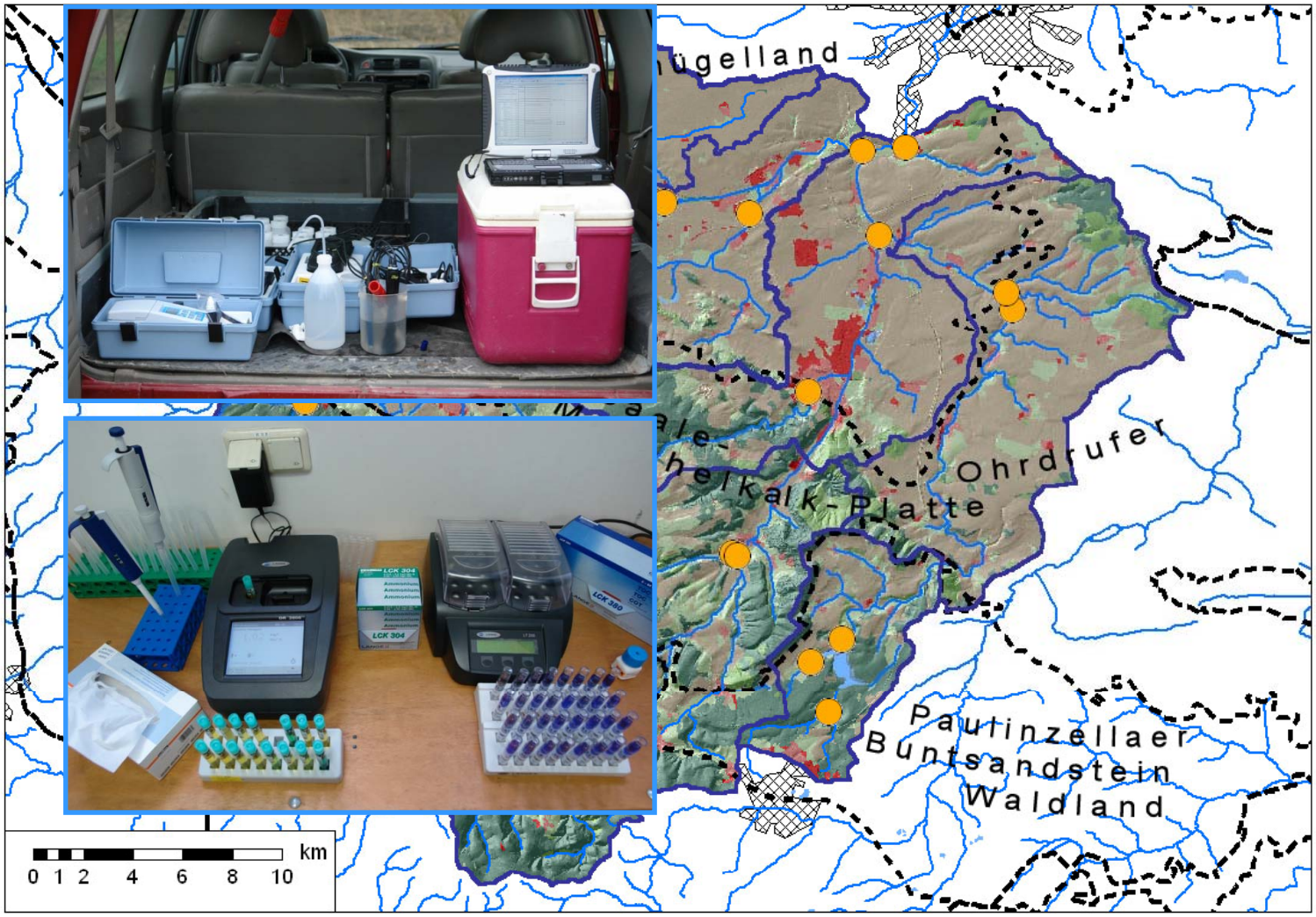




Online stations
(15 minutes)

- Total Phosphorus
- Nitrate
- xygen
- y
- solids
- e
- ntial

MEASUREMENT NETWORK: water quality (3)



Sample points (monthly)

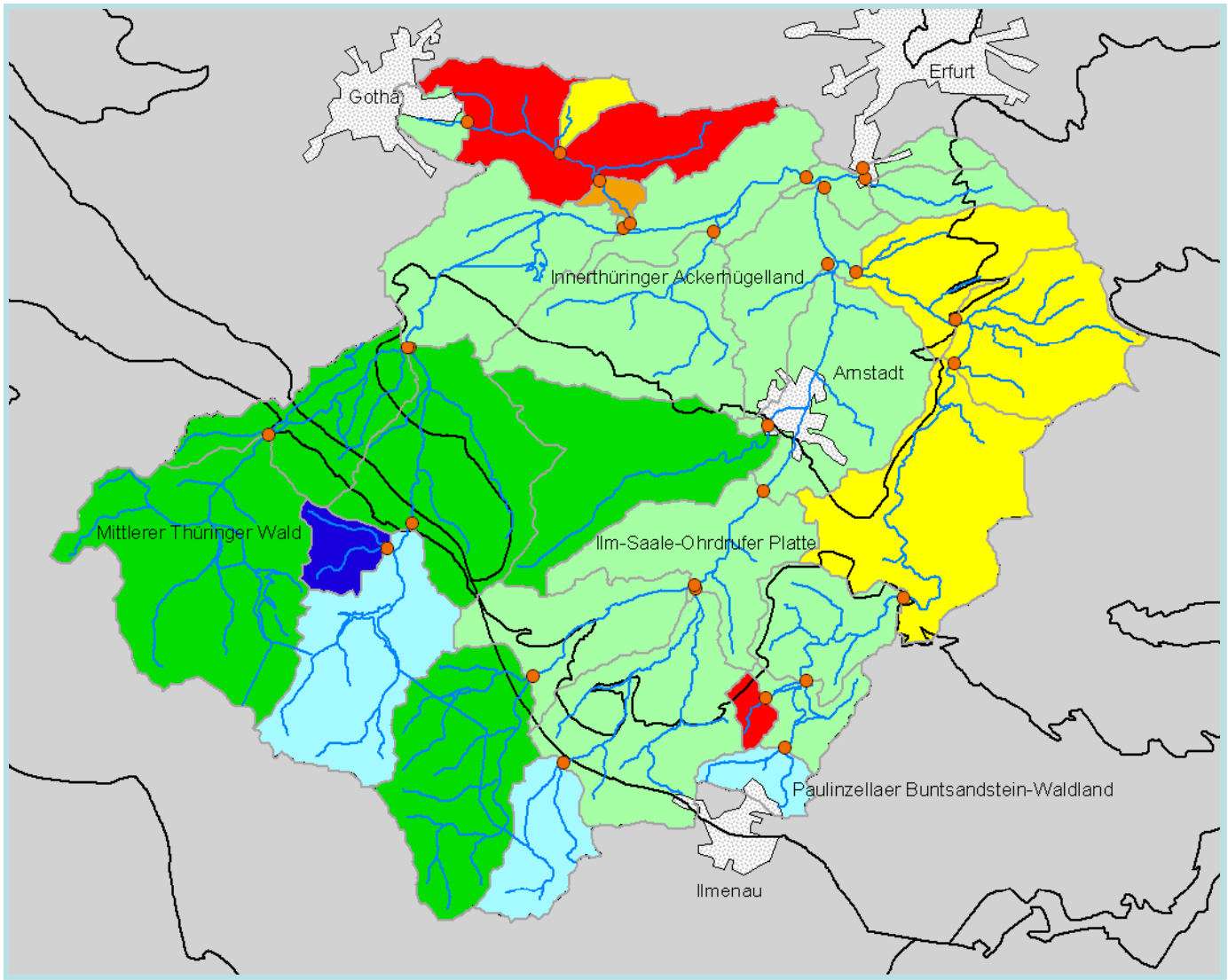
- Total Phosphorus
- Nitrate
- Nitrite
- Ammonium
- TOC
- CSB
- Dissolved Oxygen
- pH
- Electrical conductivity
- Turbidity
- Calcium
- Magnesium
- Temperature
- Redox-Potential
- Potassium

MEASUREMENT NETWORK: water quality (4)

chemical water quality classification of the german federal states working group (LAWA 1998)

Quality class	Color assignment	description	NH4-N (mg/l)	NO3-N (mg/l)	Total P (mg/l)
I		No anthropogenic pollution: Geogenic background	≤ 0,04	≤ 1	≤ 0,05
I – II		Very low pollution: Up to half the target value	≤ 0,1	≤ 1,5	≤ 0,08
II		Moderate pollution: Compliance of the target value	≤ 0,3	≤ 2,5	≤ 0,15
II – III		Significant pollution: Up to twice the target value	≤ 0,6	≤ 5	≤ 0,3
III		Increased pollution: Up to four times the target value	≤ 1,2	≤ 10	≤ 0,6
III – IV		High pollution: Up to eight times the target value	≤ 2,4	≤ 20	≤ 1,2
IV		Very high pollution: Greater then eight times the target value	> 2,4	> 20	> 1,2

MEASUREMENT NETWORK: water quality (5)

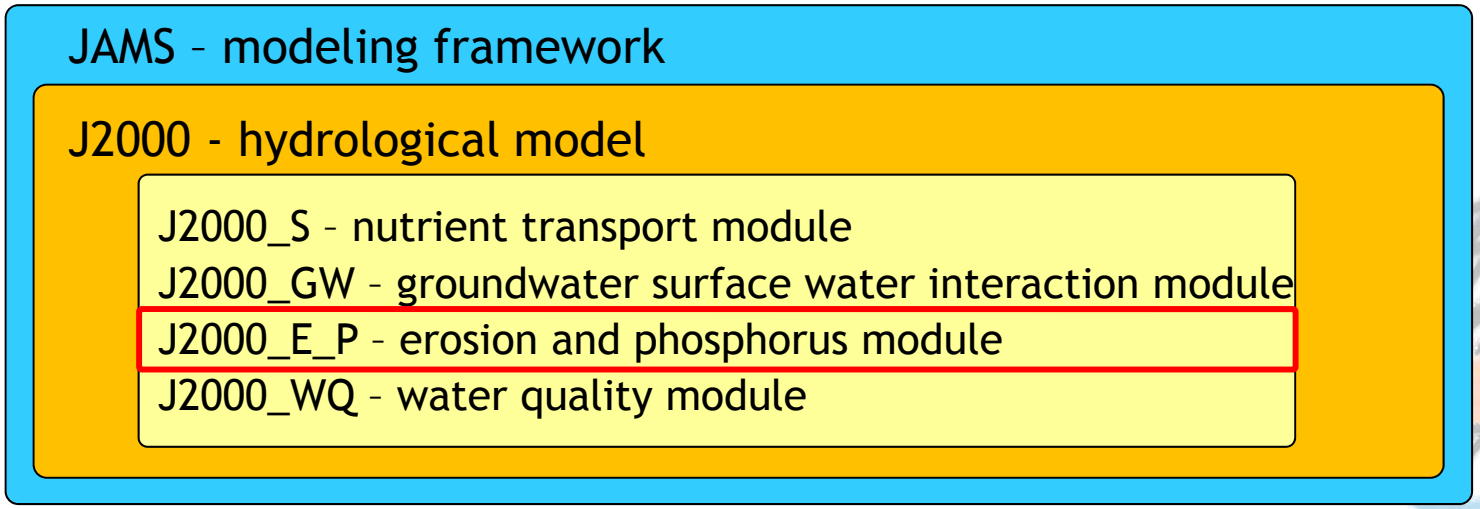


quality class	color assignment
I	
I - II	
II	
II - III	
III	
III - IV	
IV	

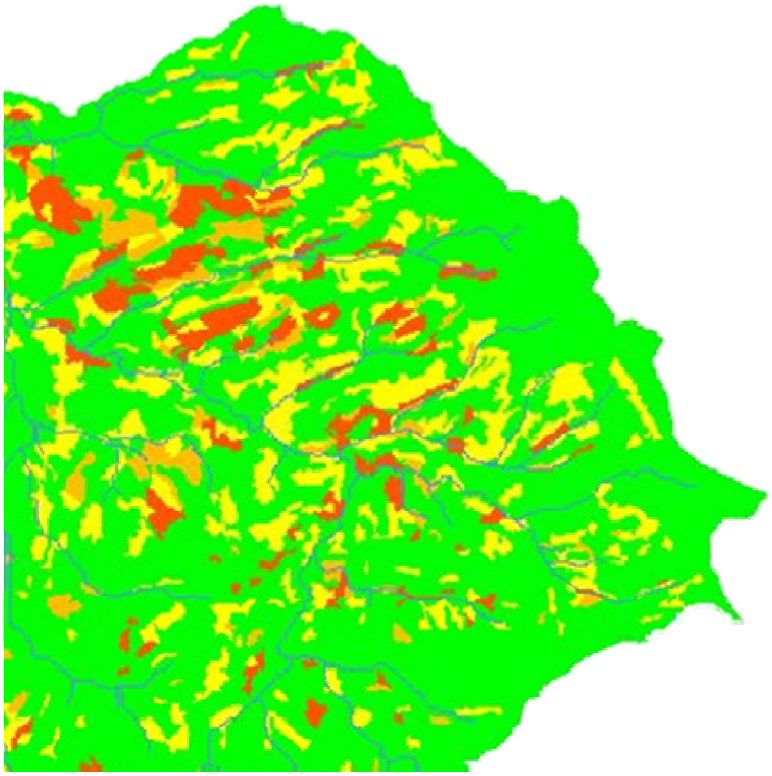
90th percentile total phosphorus (January 2008 until December 2009)

MEASUREMENT NETWORK: water quality (6)

- The measurement network was designed to capture the influences of the different landscape types on the water quality
- The first results show that the most important influences of landscape on the water quality could be identified
- The data gathered from this measurement network will be used for further model development and validation



J2000_E_P FIRST RESULTS

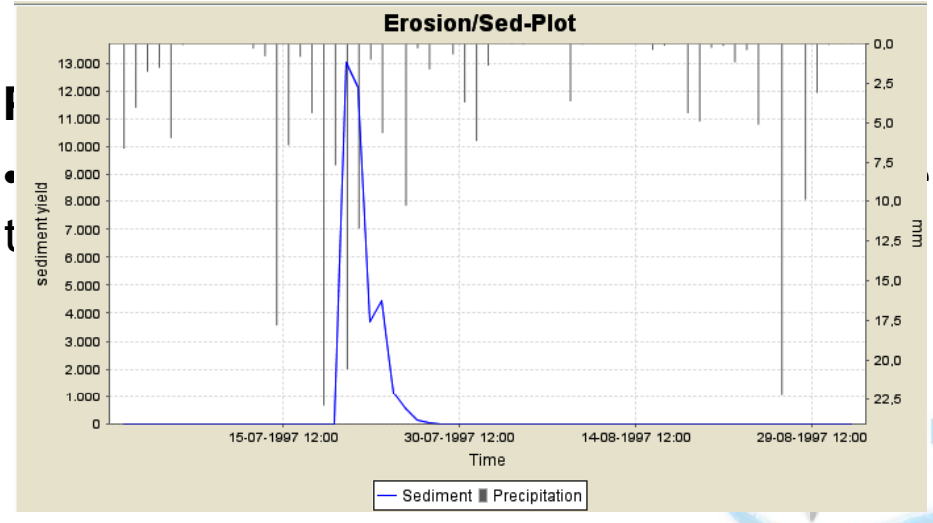


Soil loss (t/ha/yr)

0
0 - 1
1 - 50
50 - 100
> 100

Present work:

- The erosion module is also integrated in the J2000 HRU linkage approach
- For the calculation of sediment yield the Modified Universal Soil Loss Equation (MUSLE) with a dynamic surface runoff factor is used
- The equation calculates sediment yield / soil loss from every rainfall event and in every temporal resolution



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Thank you for your attention!

Acknowledgement

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