Comparing SWAT and WetSpa on the river Grote Laak, Belgium

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SWAT

- SWAT 2005
- Only water quantity modeling
- AVSWAT used for delineation of catchment
  - 3 subcatchments
- Sensitivity-analysis
  - LH-OAT
- Automatic Calibration
  - SCE-UA

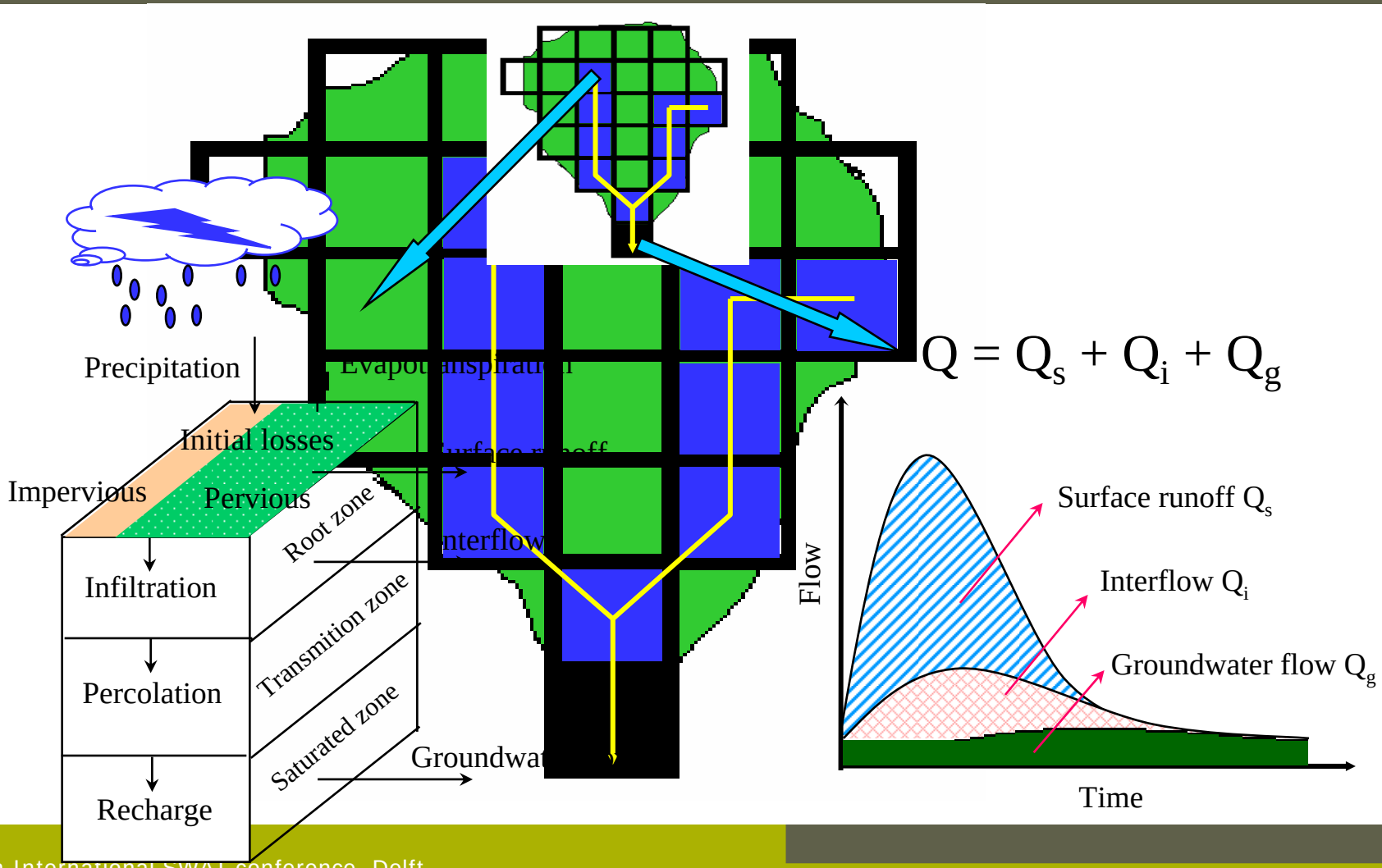
WetSpa

- A distributed parameter GIS-based precipitation-runoff model
  - Flood prediction
  - Scenario analysis
- Development?
  - @ Vrije Universiteit Brussel
  - Department of hydrology and hydraulic engineering
- Automatic calibration
  - PEST (Parameter Estimation)

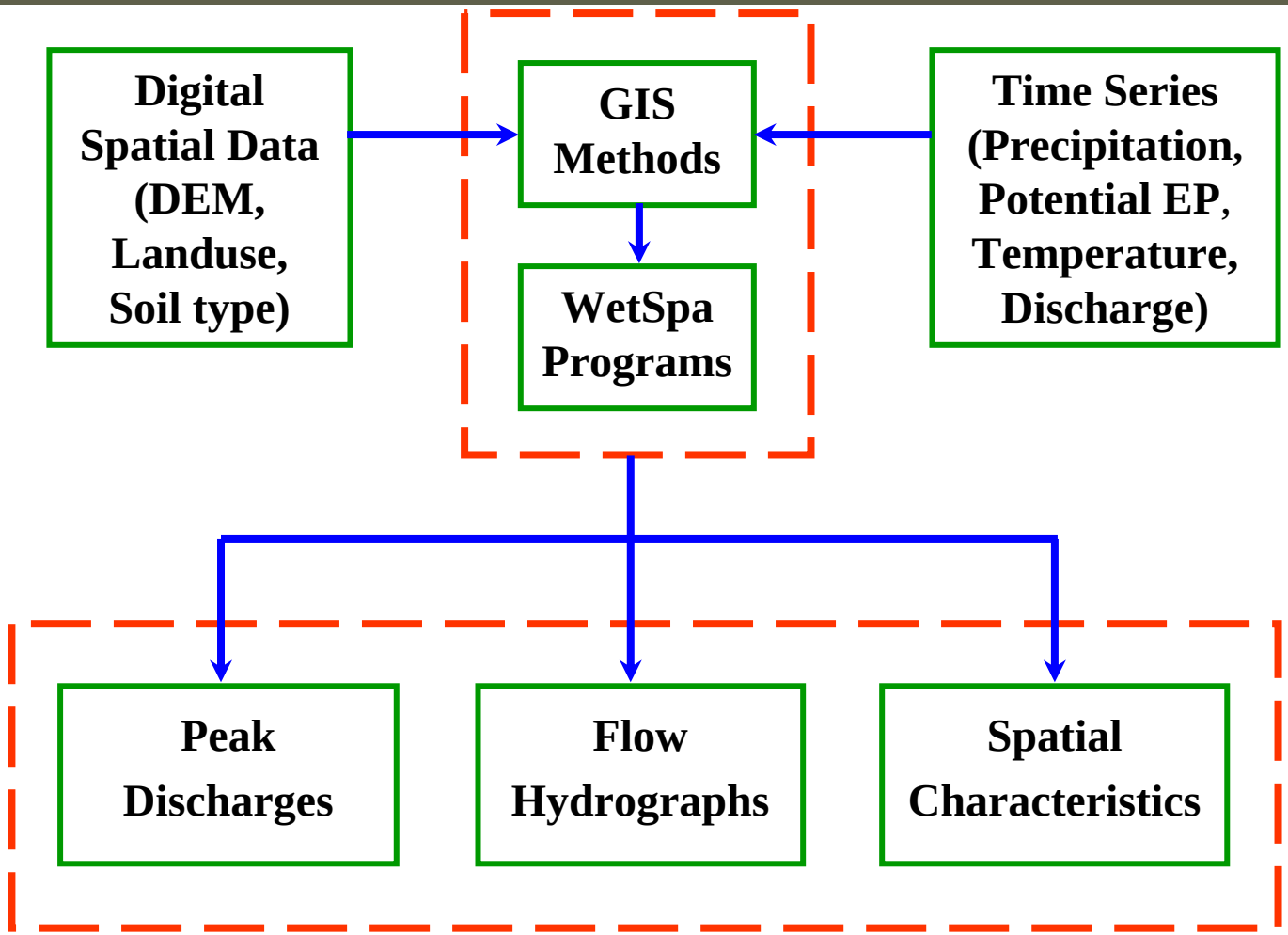
WetSpa (2)

- Users?
  - Research institutes and water authorities interested in hydrological modeling/scenario analysis
- Availability?
  - FREELY AVAILABLE
    (GUI, automated parameter estimation, theoretical & practical manual)
- Applications?
  - Locations: Europe, Asia, America, Africa
  - Scale: watersheds 100 km2 – 10.000 km2

Concept


Precipitation
Initial losses
Impervious
Pervious
Infiltration
Percolation
Recharge
Root zone
Transmition zone
Saturated zone
$Q = Q_s + Q_i + Q_g$
Flow
Surface runoff Q_s
Interflow Q_i
Groundwater flow Q_g
Time

Input & Output

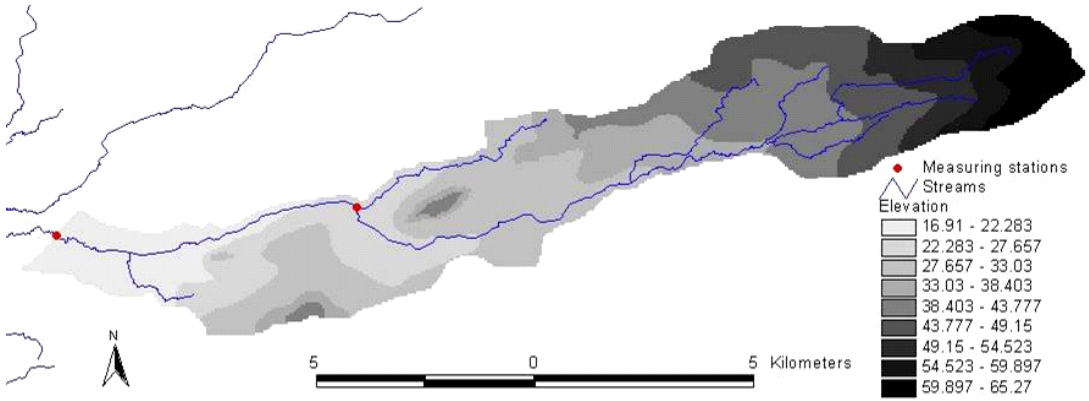


Delineation (WetSpa)

- In order to work with same basin
  - Mask of basin delineated by AVSWAT was used
  - Burn in of streams with secondary elevation map
    - CRWR-prepro-tool (Olivera, 1998)
    - Due to small slopes
    - Due to small differences in altitude
  - Artificial wall around the area
    - To cover the same area as in SWAT

Grote Laak

- Nete catchment
  - Schelde catchment
    - Belgium
- Lowland river
  - Small slopes
  - Small differences in altitude
    - 17m - 65m
- Area: 56 km²
- 900mm precipitation/year



Grote Laak

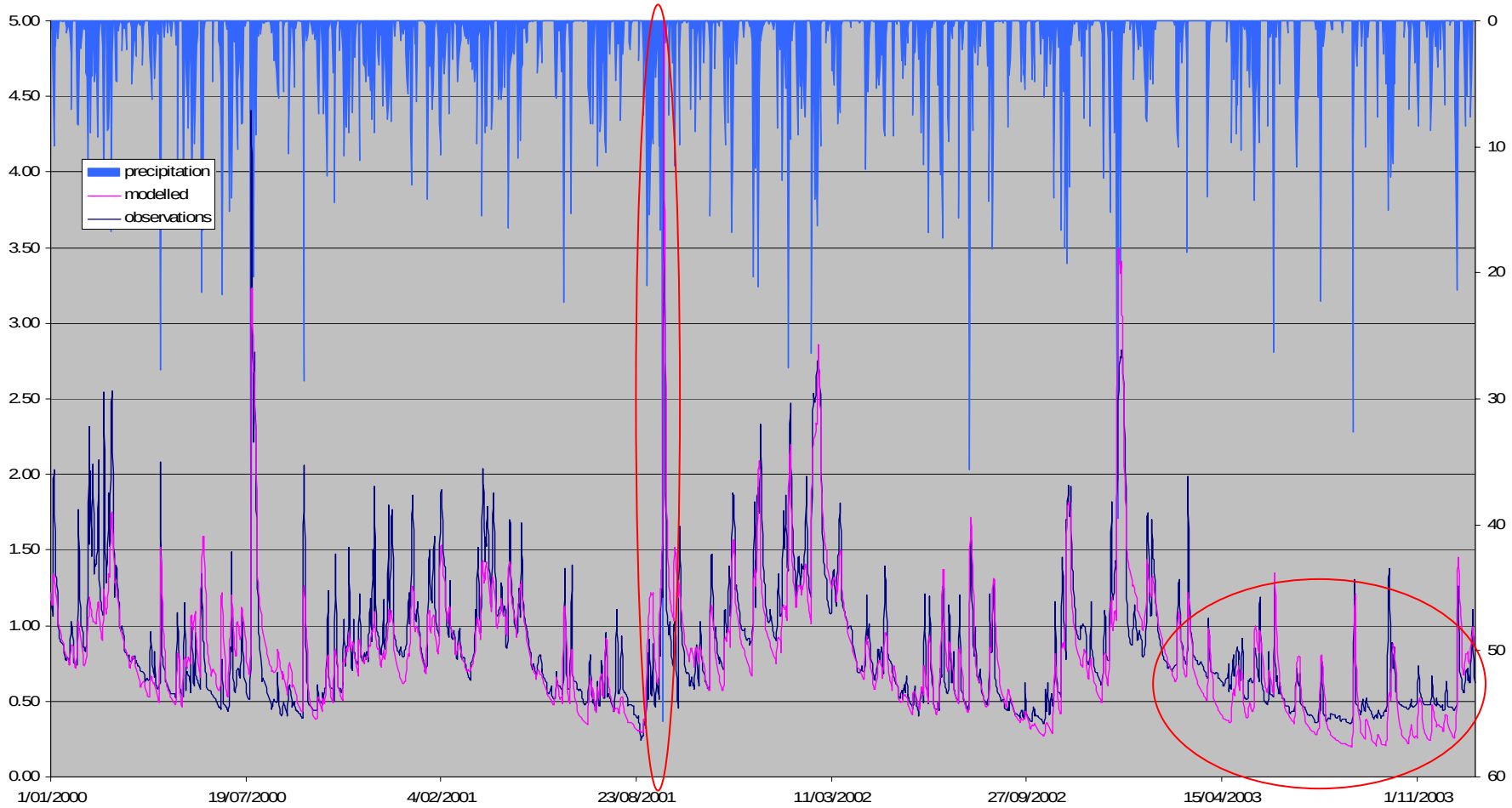
- Landuse
  - Corn
  - Forest
  - Pasture
  - Urban
- Soil
  - Clay
  - Sand (>85%)
  - Sandyloam

» 23 HRU's in SWAT

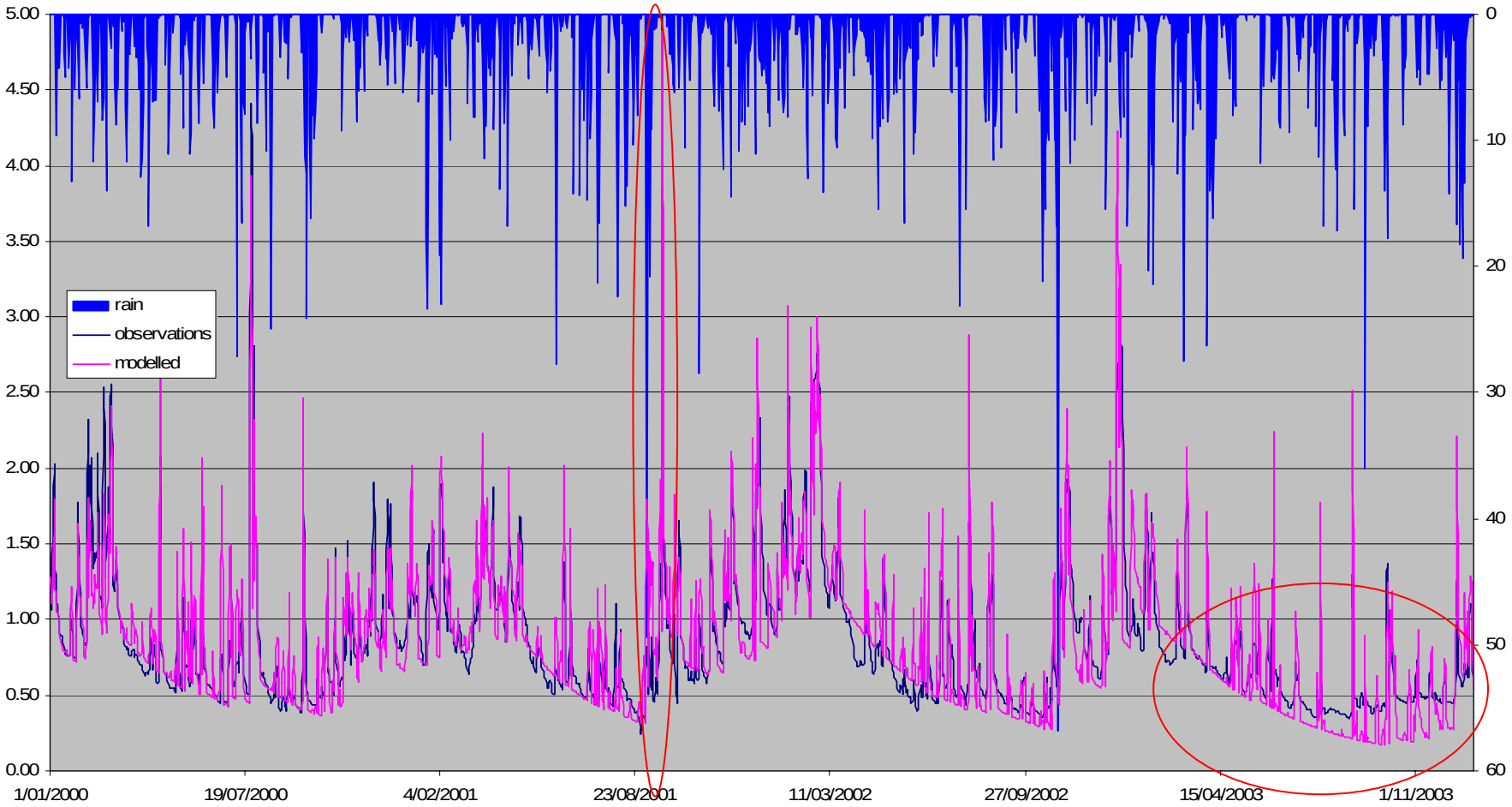
Data & Evaluation

- Daily discharge data
  - Calibration: January 2000 – December 2003
  - Validation: 1999
- Parameters
  - SWAT: 12
  - WetSpa: 8
- Evaluation of the model performance
  - NSE
  - Log NSE (low flows)
  - Adapted NSE (high flows)

Results SWAT



Results WetSpa



In numbers

- Calibration

	NSE	LNSE	ANSE
SWAT	0.739	0.658	0.788
WetSpa (manual)	0.701	0.588	0.752
WetSpa (automatic)	0.701	0.588	0.752

- Validation

	NSE	LNSE	ANSE
SWAT	0.563	0.580	0.809
WetSpa	0.752	0.690	0.919

Calculation and calibration time

- Calculation time
  - WetSpa four times higher
    - Distributed
    - Acceptable and workable because of limited area
- Calibration time
  - WetSpa: four hours
  - SWAT: four days
    - Different algorithms
    - SWAT more parameters

Conclusions

	SWAT	WetSpa
Calibration		
NSE	0.739	0.701
Validation		
NSE	0.563	0.752

- Both acceptable results
  - Problems with low flows (extreme dry event)!
- WetSpa more stable
  - Less calibration parameters
    - Less calibration time
  - More appropriate for predictions? (Validation)
  - Possibility for better results when changing input databases

Future work

- Similar studies on other catchments
- With results
  - Analyze processes of both models
- Search for advantages
- Improve model by incorporating advantages from other models

Research

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  - Department of hydrology and hydraulic engineering
  - Prof. Dr. ir. Willy Bauwens
  - PhD-research

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Questions

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