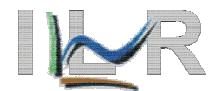


Distributed model structures in catchment scale modeling

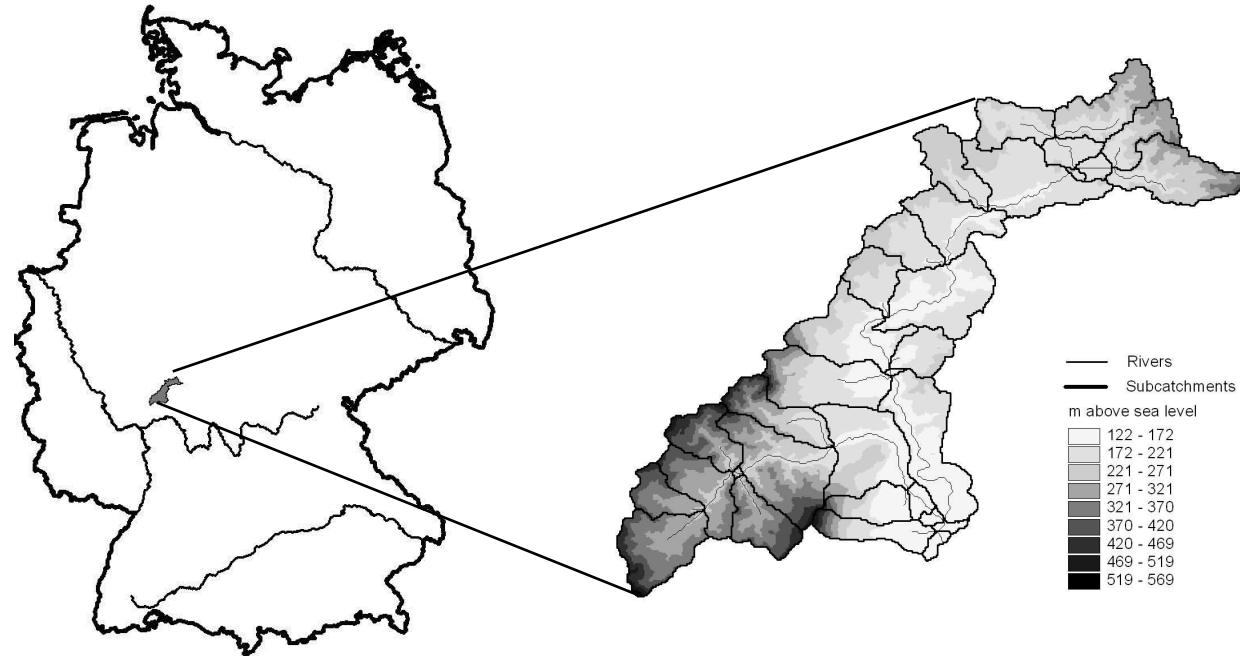
**Stefan Julich, Lutz Breuer, Kellie B. Vachè,
Hans-Georg Frede**



Sonderforschungsbereich 299



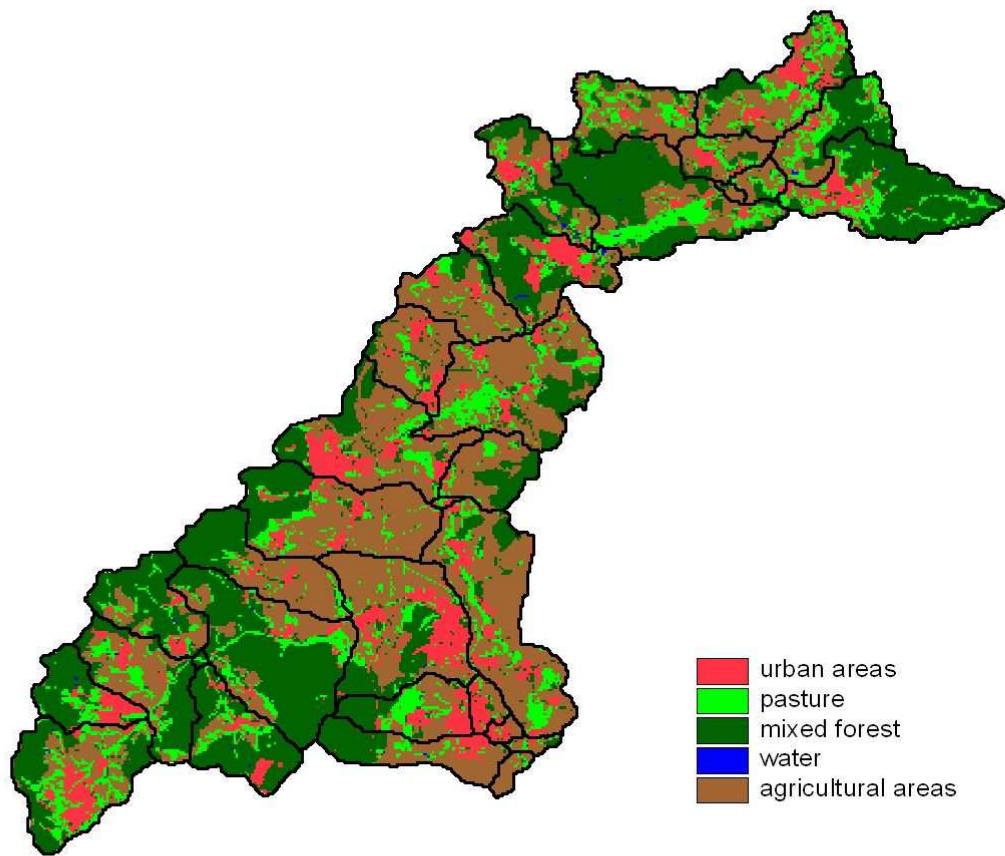
Institute for Landscape Ecology and Resources Management



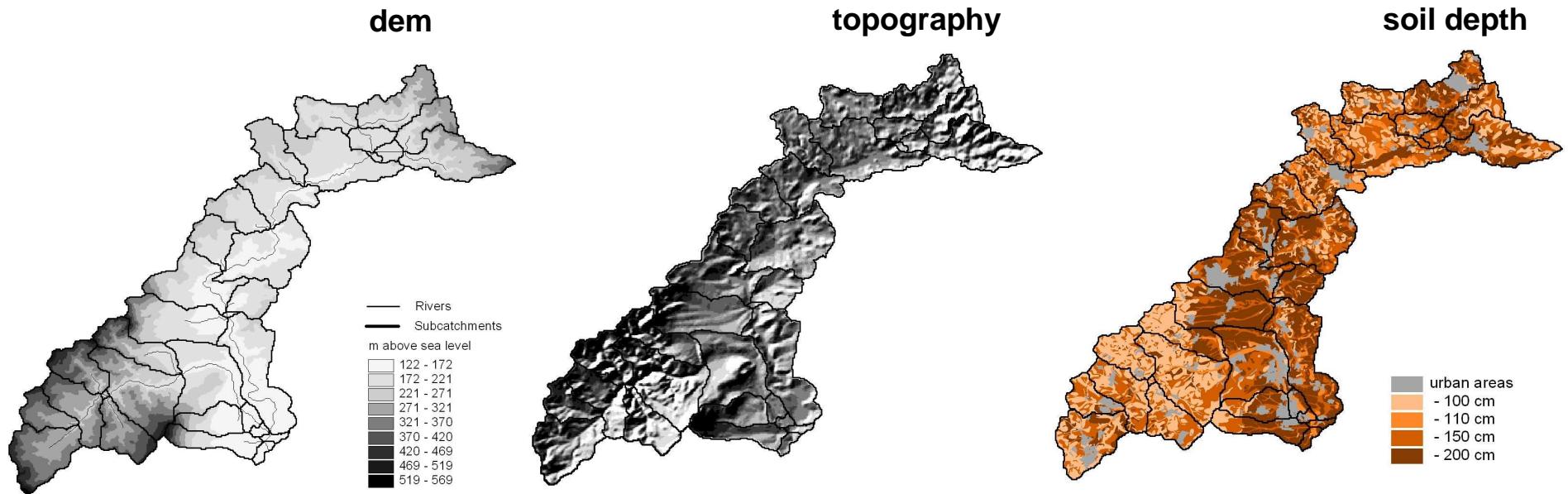
Collaborative Research Center 299: „Land use options for peripheral regions“

→ quantify impacts of landuse change on water balance and nutrient fluxes

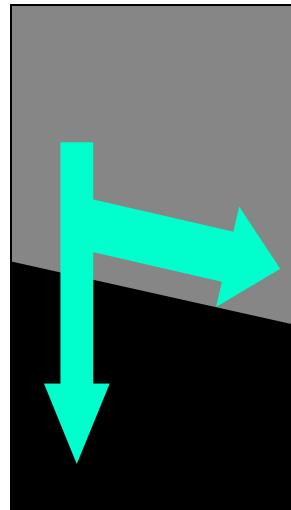
- Wetter catchment 514 km²
- heavily agricultural used



- 40 % agricultural area
- 34 % mixed forest
- 15 % pasture
- 11 % urban areas

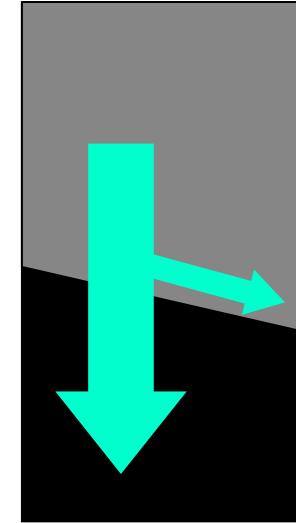


- heterogenous landscape structure
- SW → low mountain area → steep slopes, shallow soils over bedrock
- centre and NE → low land area → shallow slopes, deep loess-born soils
- different landscape structures → different runoff-generation processes

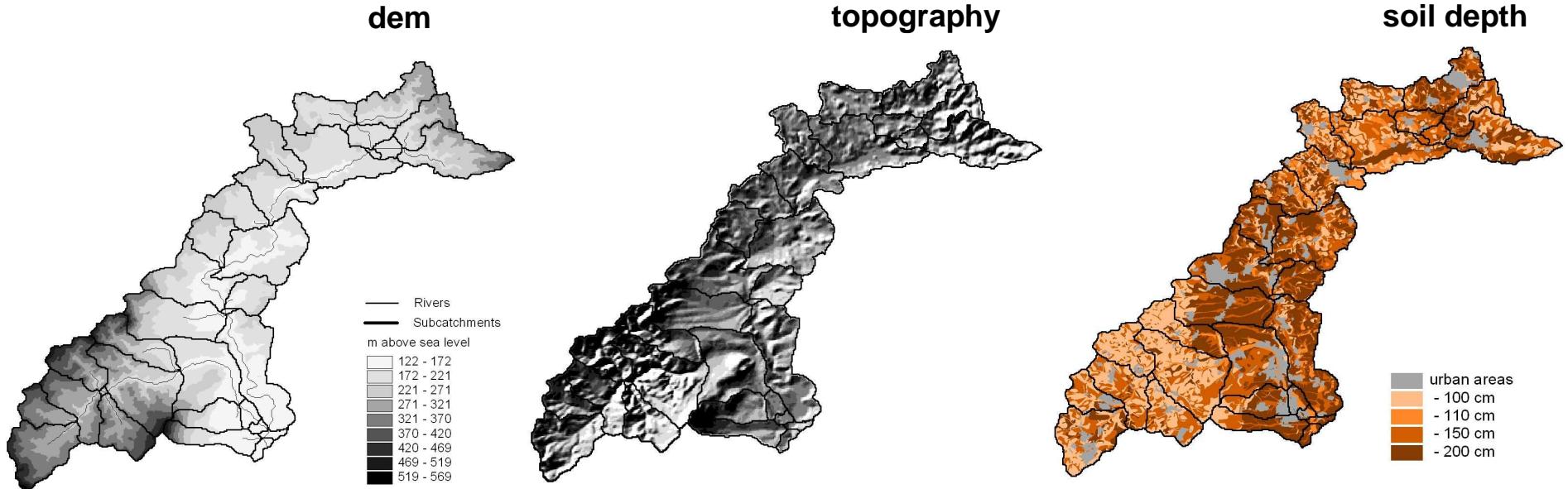
SWAT-G

- mainly lateral subsurface stormflow

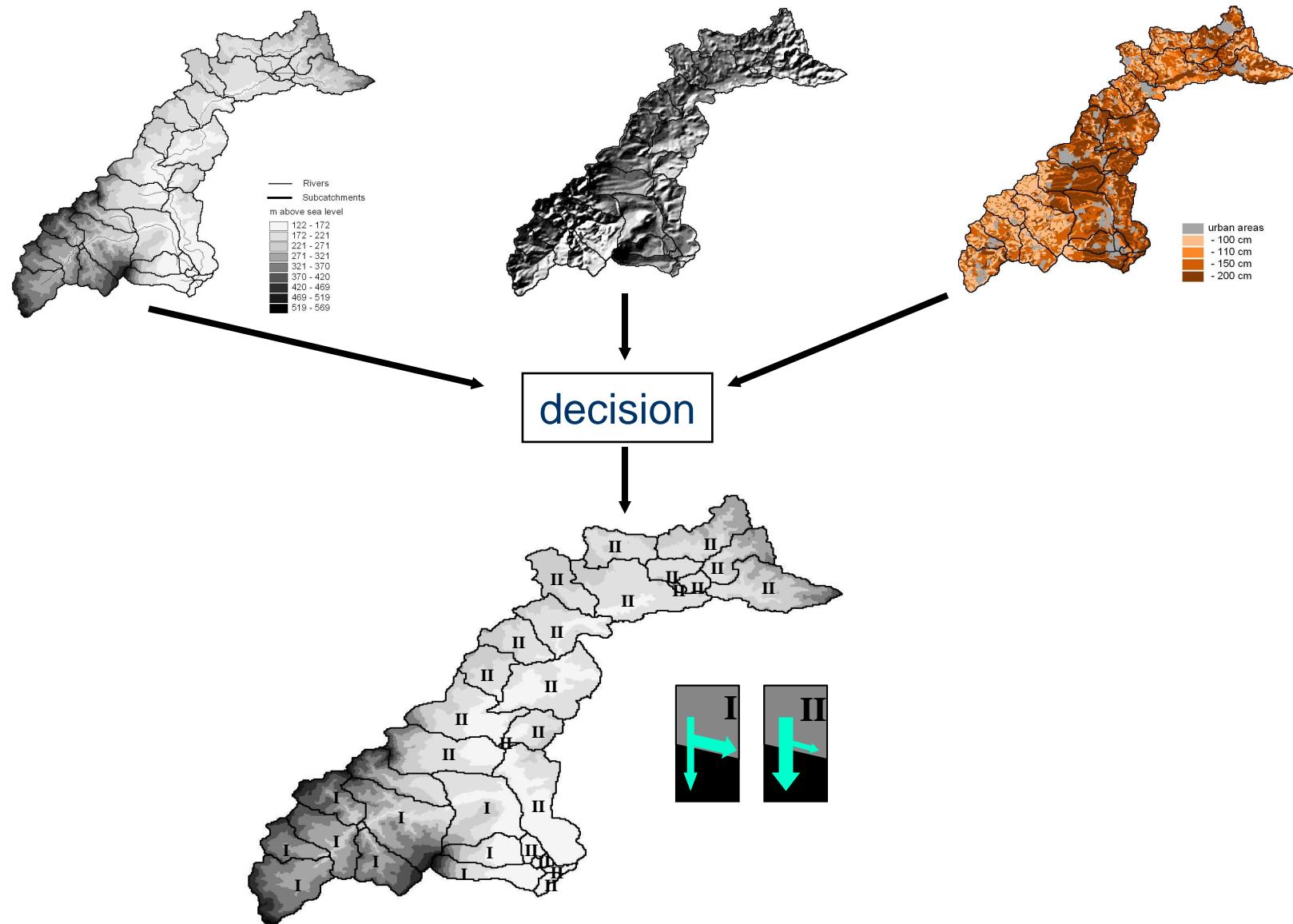
- anisotropy → ratio between
lateral and vertical saturated
hydraulic conductivity

SWAT

- mainly infiltration to groundwater

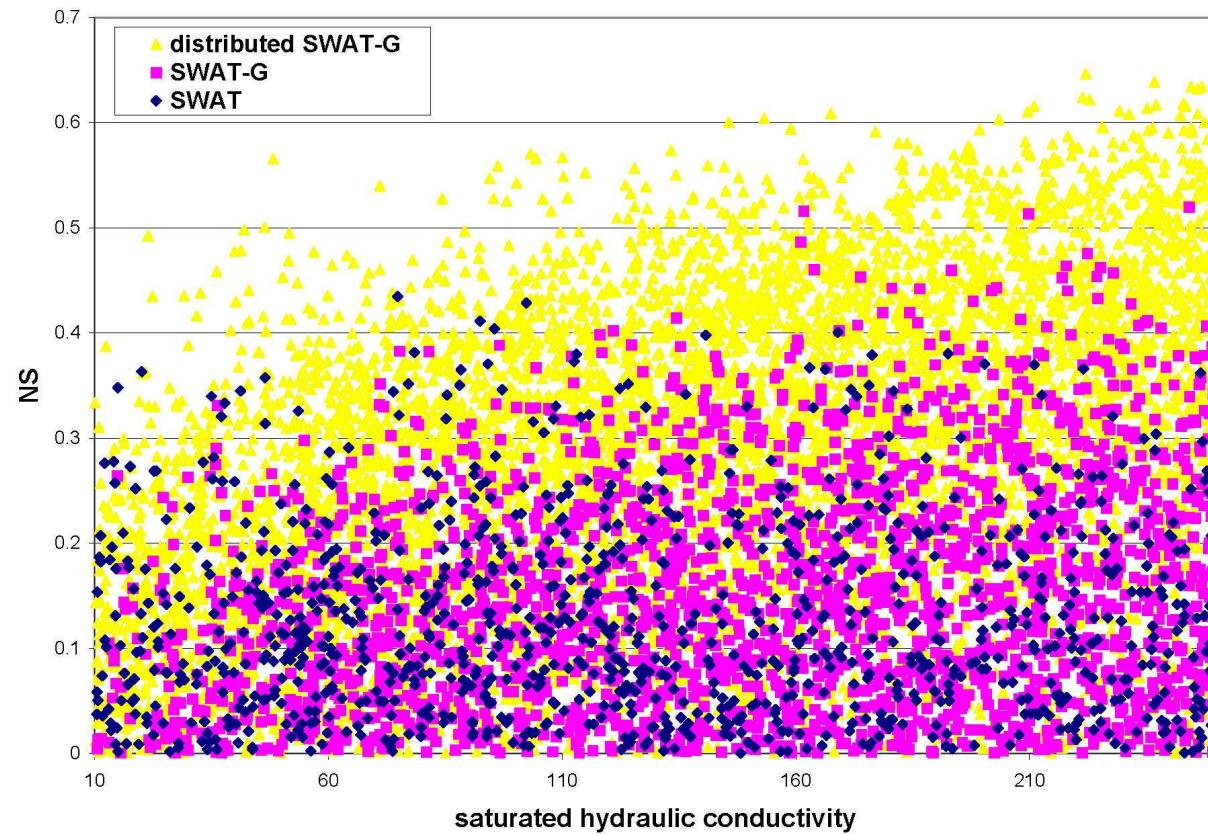


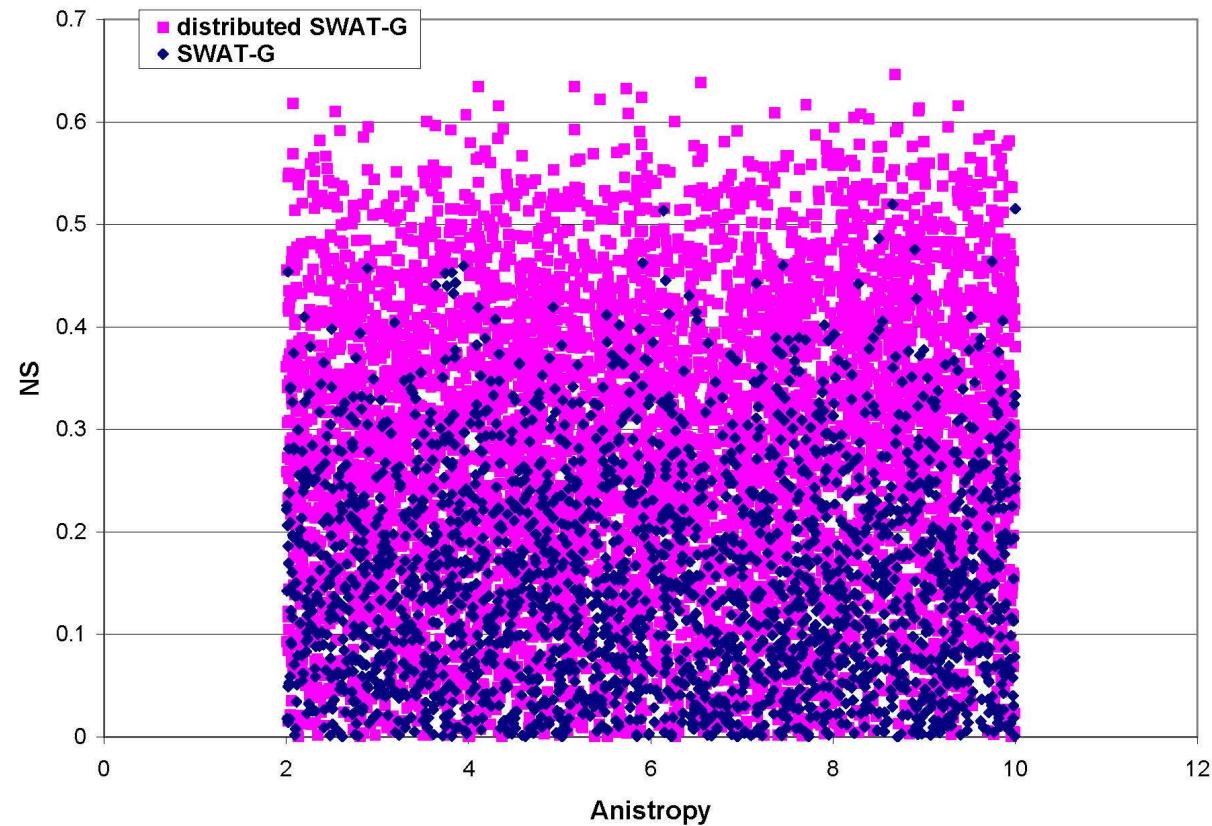
- original SWAT and SWAT- G no good simulation results
- original SWAT → no anisotropy to capture runoff-generation processes in SW
- SWAT-G → anisotropy defined for certain soil types across whole catchment but lateral subsurface stormflow only dominant in SW

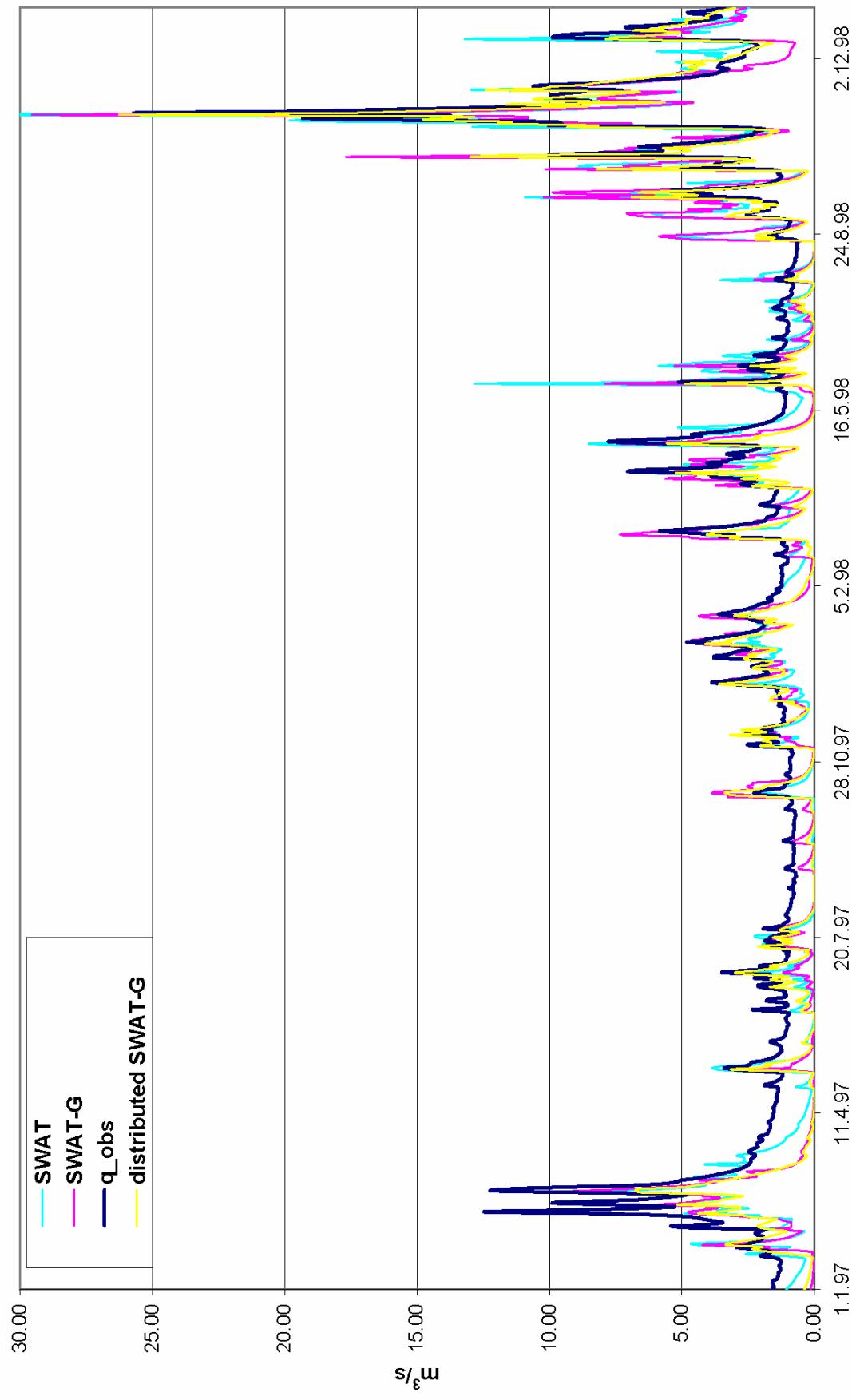


- all structures calibrated for 3 years; first year as warm up period
- Hargreaves evapotranspiration
- Monte Carlo framework
- 7500 runs

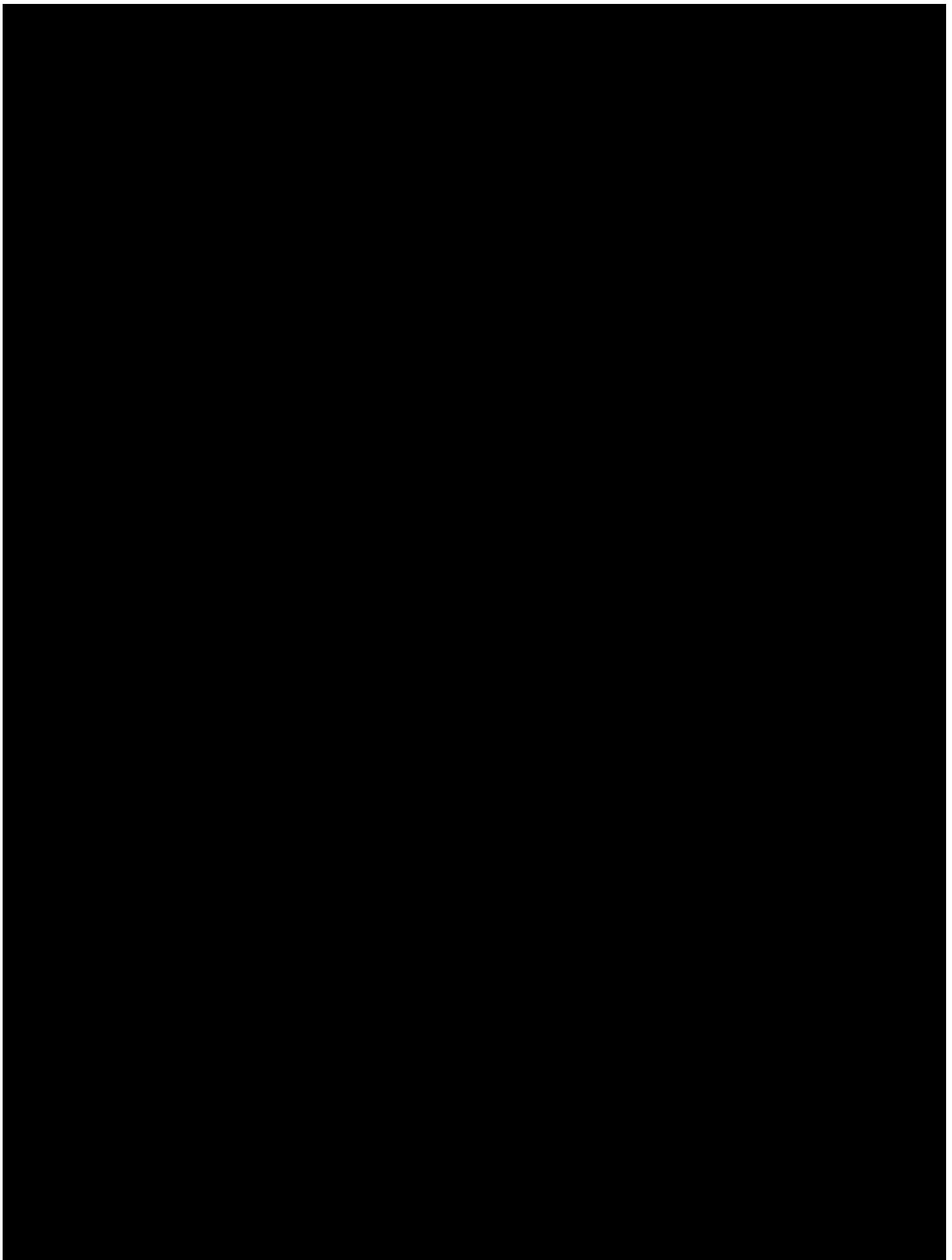
	model parameter	lower bound	upper bound
Snow	Snowfall temperature (SFTMP)	-1	2
	Snow melt base temperature (SMTMP)	-1	2
	Melt factor for snow on June 21 (SMFMX)	4	7
	Melt factor for snow on Dec 21 (SMFMN)	1.4	4
	Snow pack temperature lag factor (TIMP)	0.01	1
Hydrology	Surface runoff lag time (SURLAG)	1	4
	Manning's n value for main channel	0.014	0.3
	Baseflow alpha factor (ALPHA_BF)	0.01	0.07
	Groundwater delay (GW_DELAY)	1	25
	Groundwater „revap“ coefficient (GW_REVAP)	0.3	0.5
	Deep aquifer percolation fraction (RCHRG_DP)	0.01	0.8
	Lateral flow travel time (LAT_TIME)	1	4
Soil	Manning's „n“ value for overland flow (OV_N)	0.2	0.5
	Bulk density (SOL_BD)	1	1.4
	Available water content (SOL_AWC)	0.1	0.7
	Saturated hydraulic conductivity (SOL_K)	10	250
Landuse	Anisotropy factor (ANISO)	2	10
	Albedo for landuse pasture (SOLA LB)	0.2	0.3
	Albedo for landuse mixed forest (SOLA LB)	0.1	0.17
	Albedo for landuse urban (SOLA LB)	0.2	0.3
	Maximum canopy storage for landuse pasture (CANMX)	2	7
	Maximum canopy storage for landuse mixed forest (CANMX)	4	30
	Maximum canopy storage for landuse urban (CANMX)	0.01	0.12
	Curve number, general for landuse pasture (CN2)	45	60
	Curve number, general for landuse mixed forest (CN2)	38	60
	Curve number, general for landuse urban (CN2)	85	98







- further research to improve model performance in base-flow periods
- calibration with smaller parameter set (not influenced by landuse)
- running of landuse scenarios to evaluate impacts of landuse-change on water and nutrient balance



soil depth

