

An integrated impact assessment of climate change, land use, and adaptation policies on water resources in Austria

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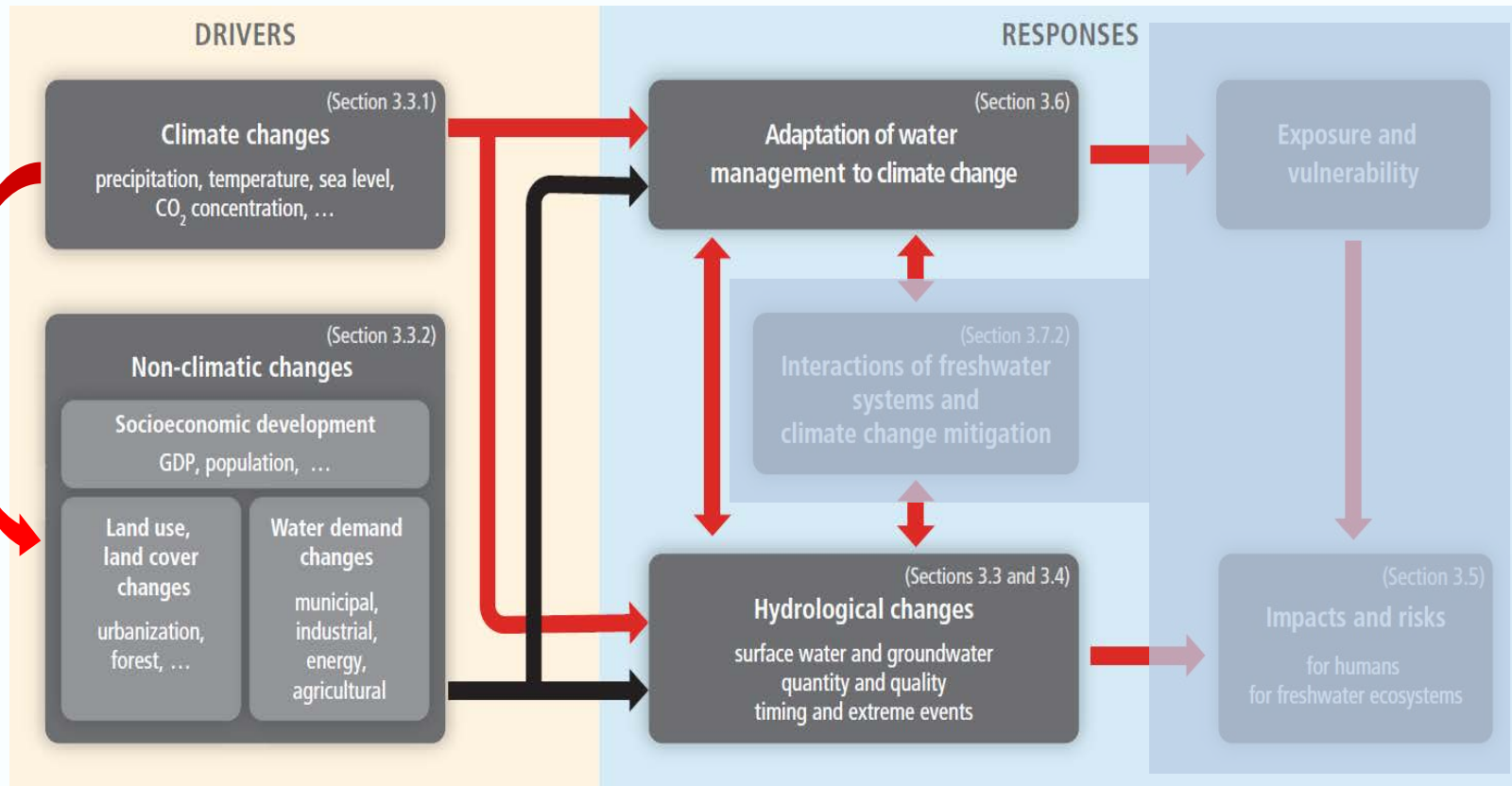
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Problem statement – IPCC perspective

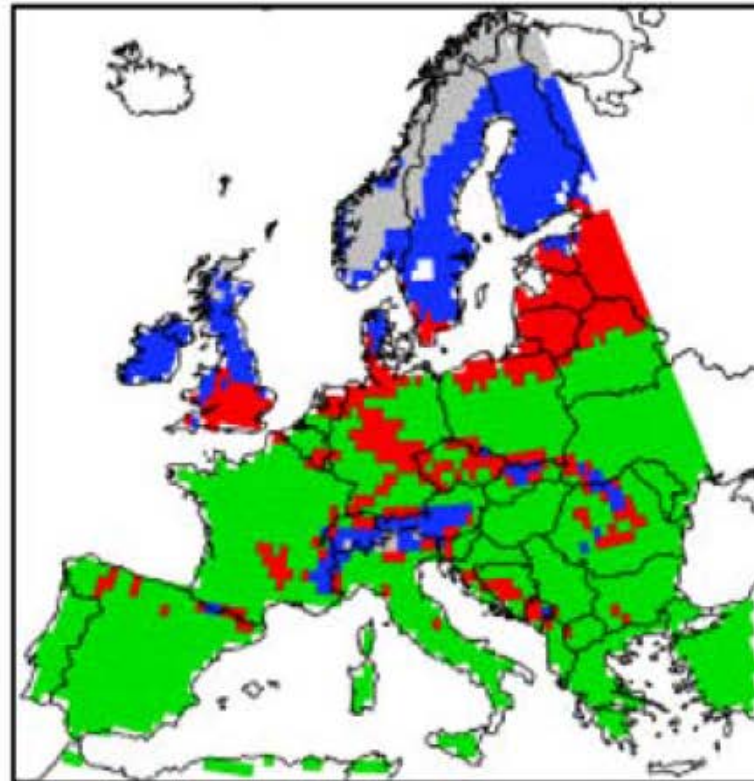
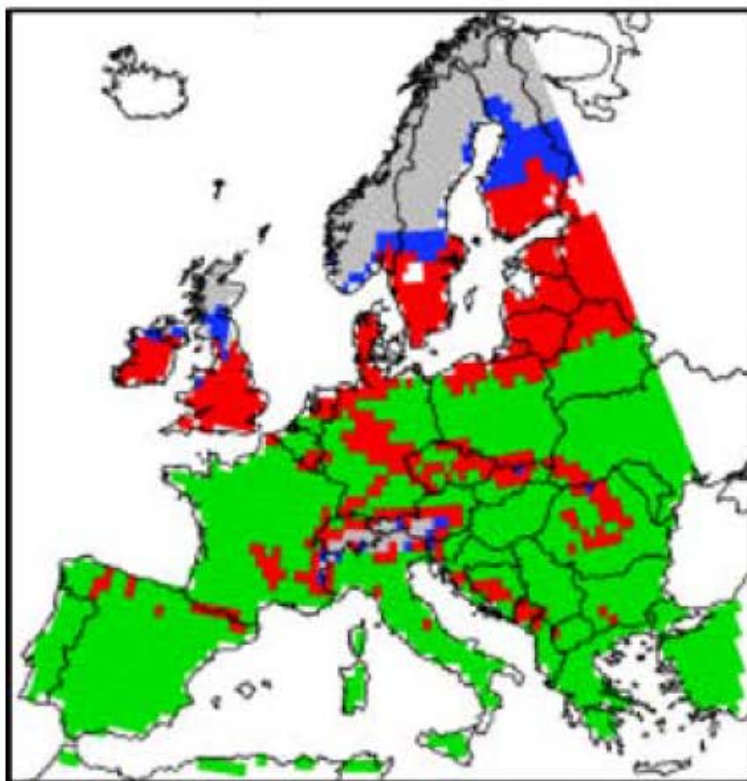


Cisneros et al., 2014

Modelled suitability for grain maize cultivation during 1961–1990 and 2071–2100

7 RCM scenarios (HadAM3H A2)

24 scenarios (6 GCMs for A1FI, A2, B1, B2)



- Current
- Expansion
- Uncertain

Research questions

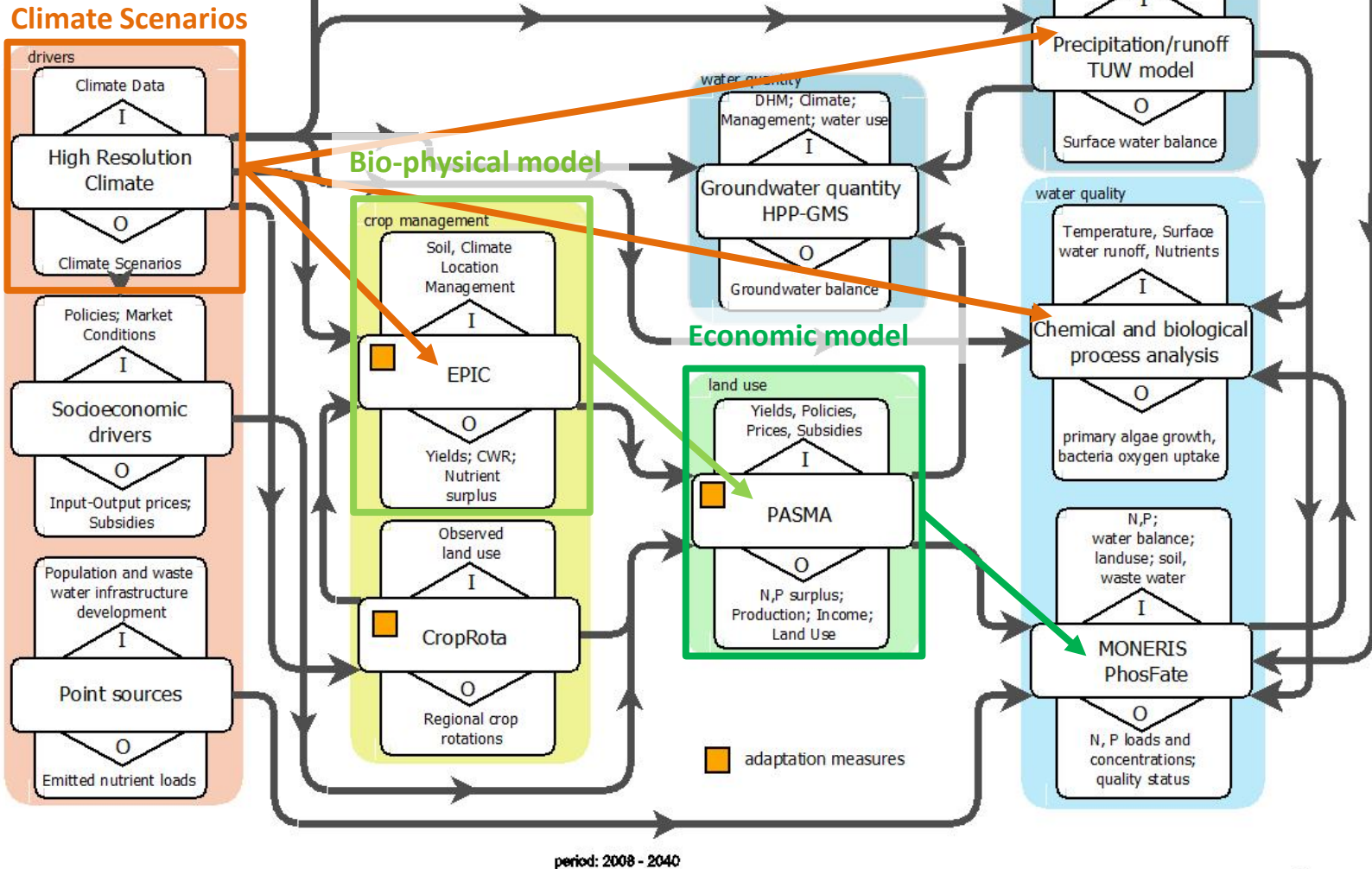
- How do climate and socio-economic changes affect Austrian **land use, nutrient losses** as well as the **low flow** and **quality** of water bodies?
- What are the impacts on **chemical and biological processes** in surface water?
- Which agricultural **adaptation** measures can cost-effectively counteract adverse impacts?

Research process

- Formation of stakeholder process
- Scenario development
 - land use and waste water management measures
 - climate and policy scenarios until 2040
- Model development
 - Austria at 1km² resolution/367 catchments
 - 2 Case study applications
- Scenario application

Integrated modelling framework

spatial scale: 1km² - national scale



Climate & policy scenarios

Reference scenario

REFerence

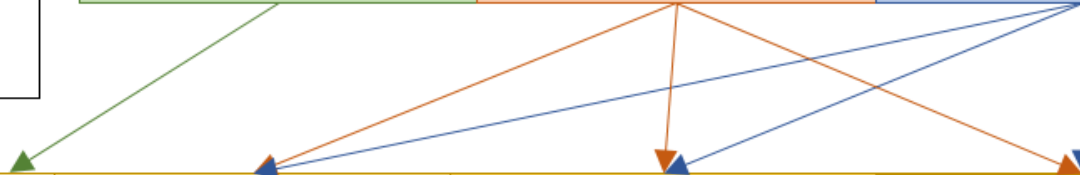
Observed land use based on current market situation and policies; serves calibration purposes

Climate change scenarios (2040)

Similar (precipitation) Temperature: +1.5 C° Precipitation: observed	Dry (low precipitation) Temperature: +1.5 C° Precipitation: decline	Wet (high precipitation) Temperature: +1.5 C° Precipitation: increase
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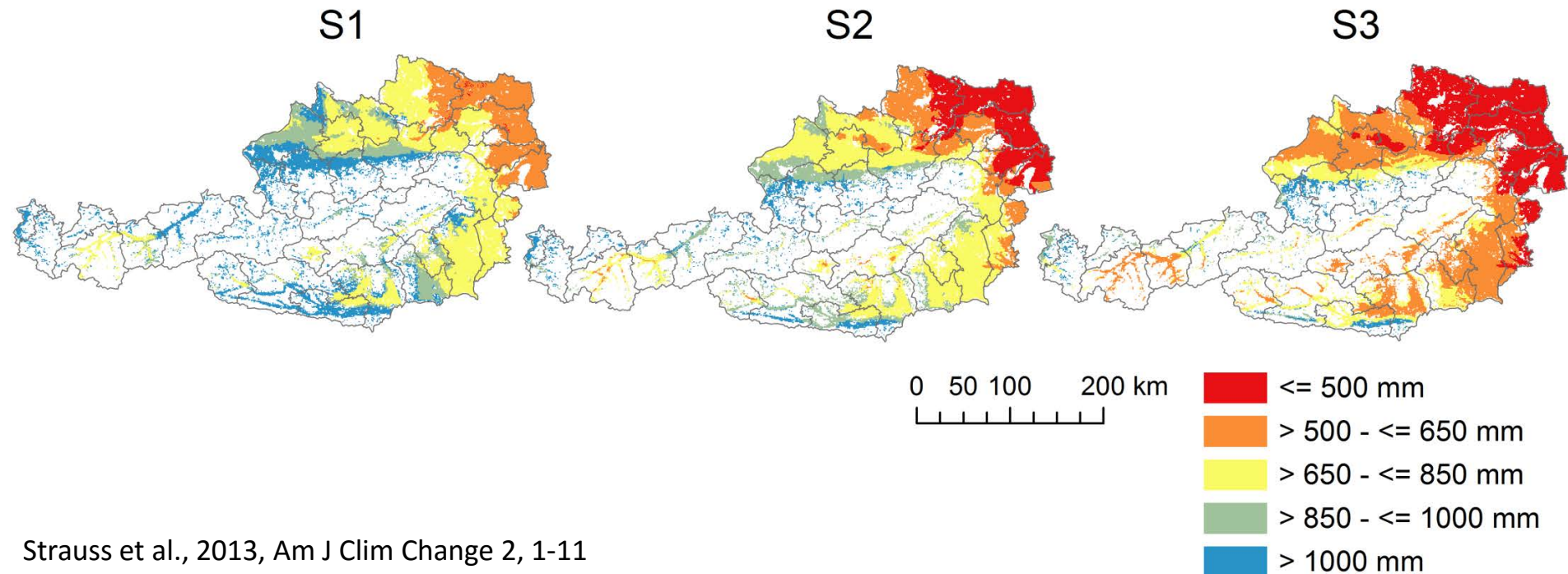
Policy scenarios

BAU Current and foreseeable policy changes and autonomous adaptation on climate scen. Similar	IMPact wet/dry Same as BAU	WATER Protection I Water protection policies to improve compliance to the WFD	WATER Protection II Water protection policies to further improve compliance to the WFD
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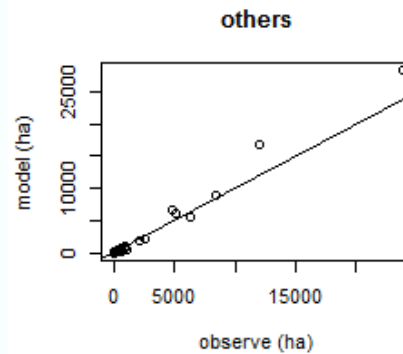
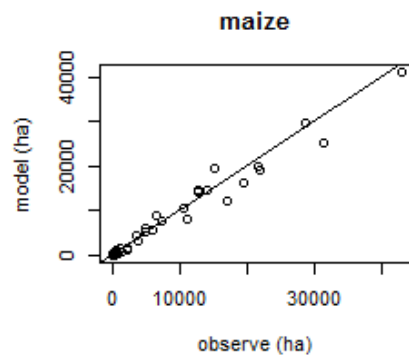
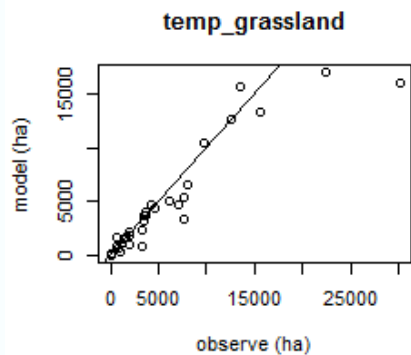
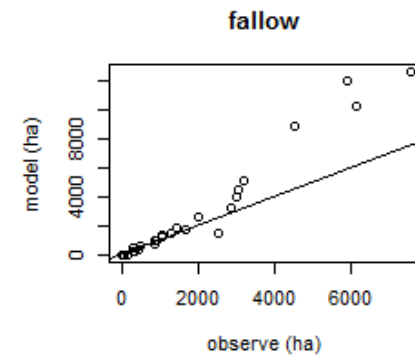
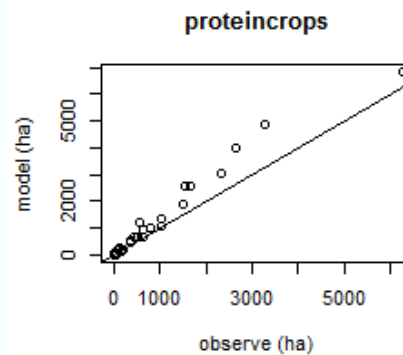
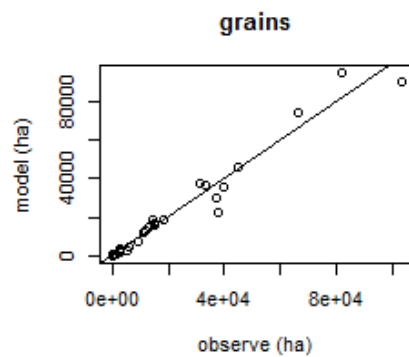
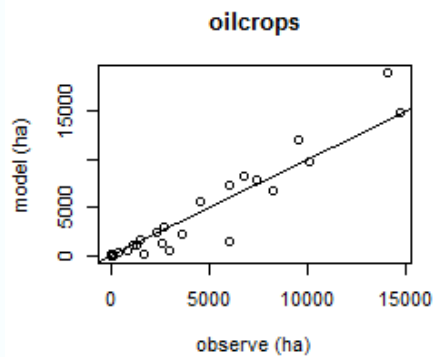


Results – Climate change scenarios

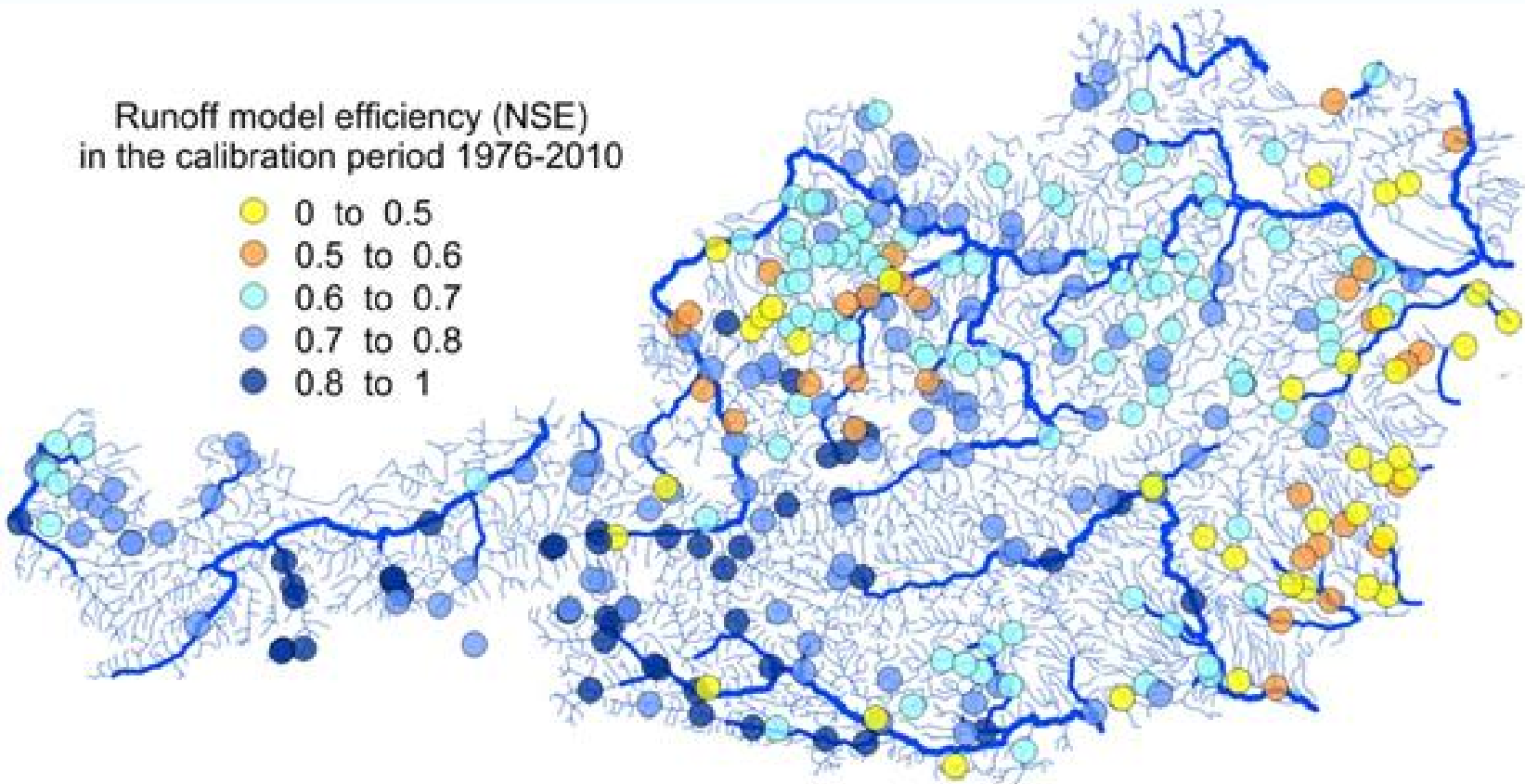
Average annual precipitation sums of three drought scenarios S1 (baseline), S2, and S3 for cropland in Austria



Results – PASMA



Results – TUW Model



Parajka et al, 2015, J Hydrol Hydromech (63), 228–234)

Results - MONERIS

- Update of important input parameters in the MONERIS model for the reference period 2005 to 2010
 - Population and connected inhabitants to sewer system by literature research
 - Total runoff, precipitation and evapotranspiration from TUW Model
 - Arable land, grassland and soil sediment loss from EPIC/PASMA
- Aggregation of input parameters from PASMA (1 km²) and TUW Model to 367 catchments in MONERIS model

Conclusions & Outlook

- Strong stakeholder demand for guidance on joined land use and water policies
 - Challenge to explain differences between forecasts and scenarios
 - Contextualization of climate change scenarios to SRES/RCPs
 - Trade-off between representation of water protection measures and model capabilities
- Integrated modelling framework to link climate change, land use, policies and environmental outcomes
 - Scenario application with contrasting policies shall indicate robust policies
- Interfaces as major challenge of coupling disciplinary models
 - Thorough definition of parameters required
 - Relative changes superior to absolute parameters due to independent model histories, data demand, and calibration techniques



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