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

M. SCHÖNHART[1], M. ZESSNER[2], A.P. BLASCHKE[3], J. PARAJKA[3], E. FEUSTHUBER[1], G. HEPP[2], M. KIRCHNER[1], H. MITTER[1], B. STRENN[2], H. TRAUTVETTER[2], E. SCHMID[1]

[1]Institute for Sustainable Economic Development, University of Natural Resources and Life Sciences Vienna

[2]Institute for Water Quality, Resources and Waste Management, Vienna University of Technology

[3]Institute of Hydraulic Engineering and Water Resources Management, Vienna University of Technology

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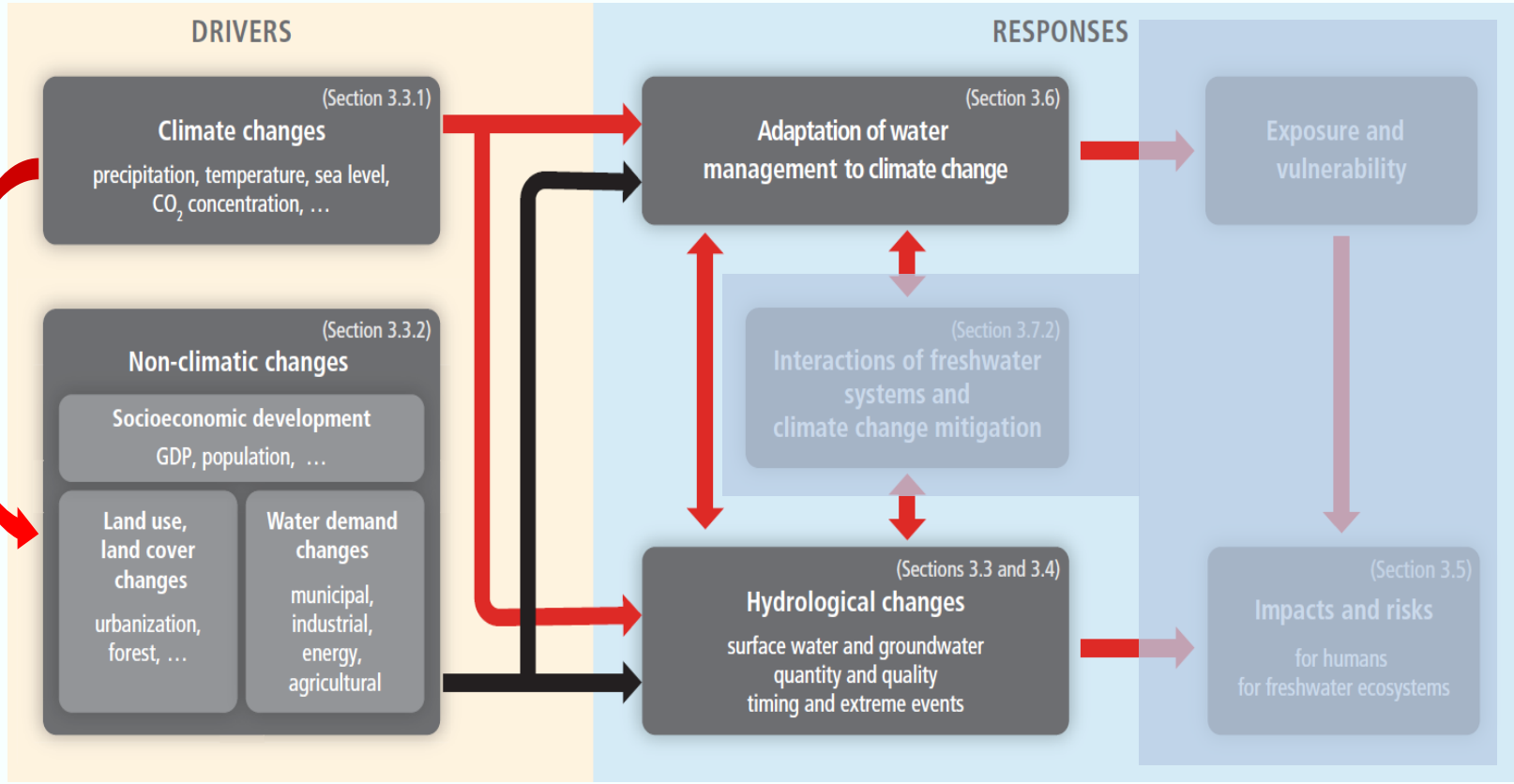
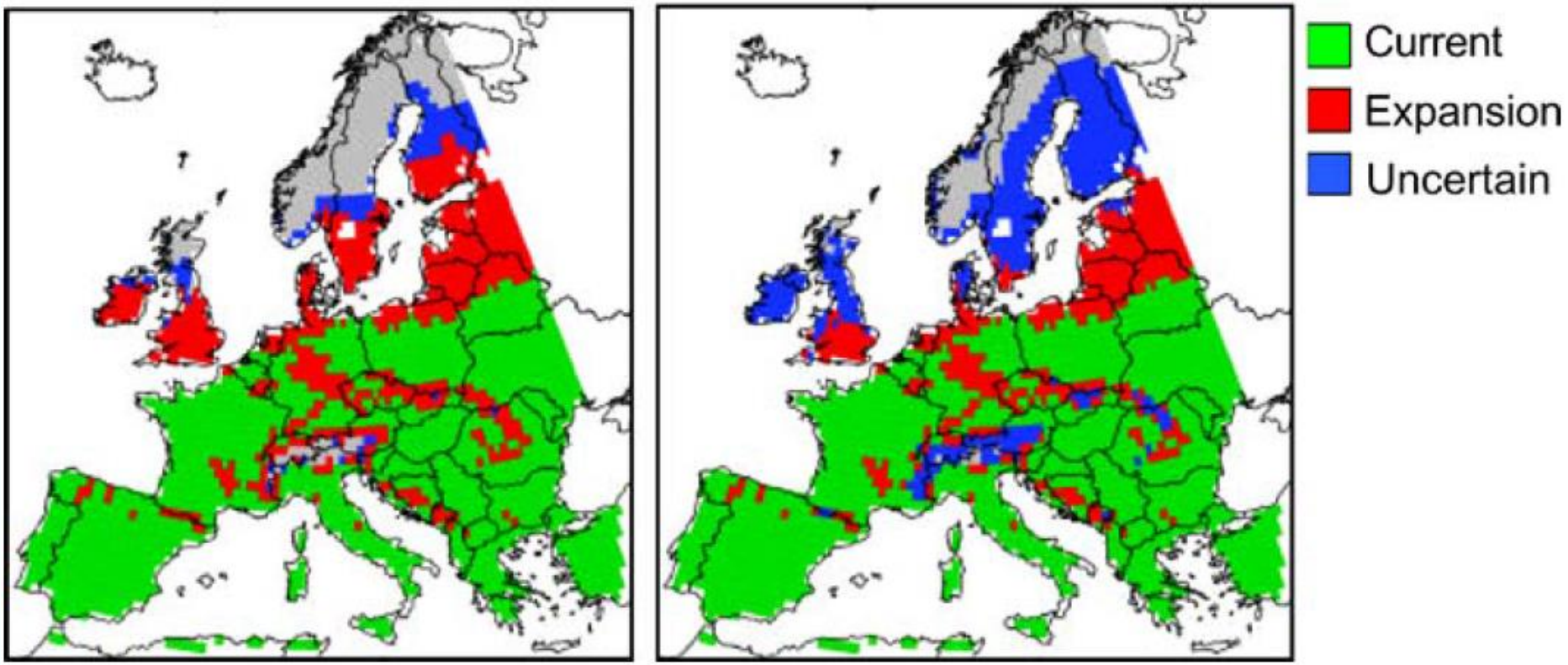
Problem statement – IPCC perspective



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)*



Olesen et al. 2007, Clim Change (81) 123-143.

Research questions

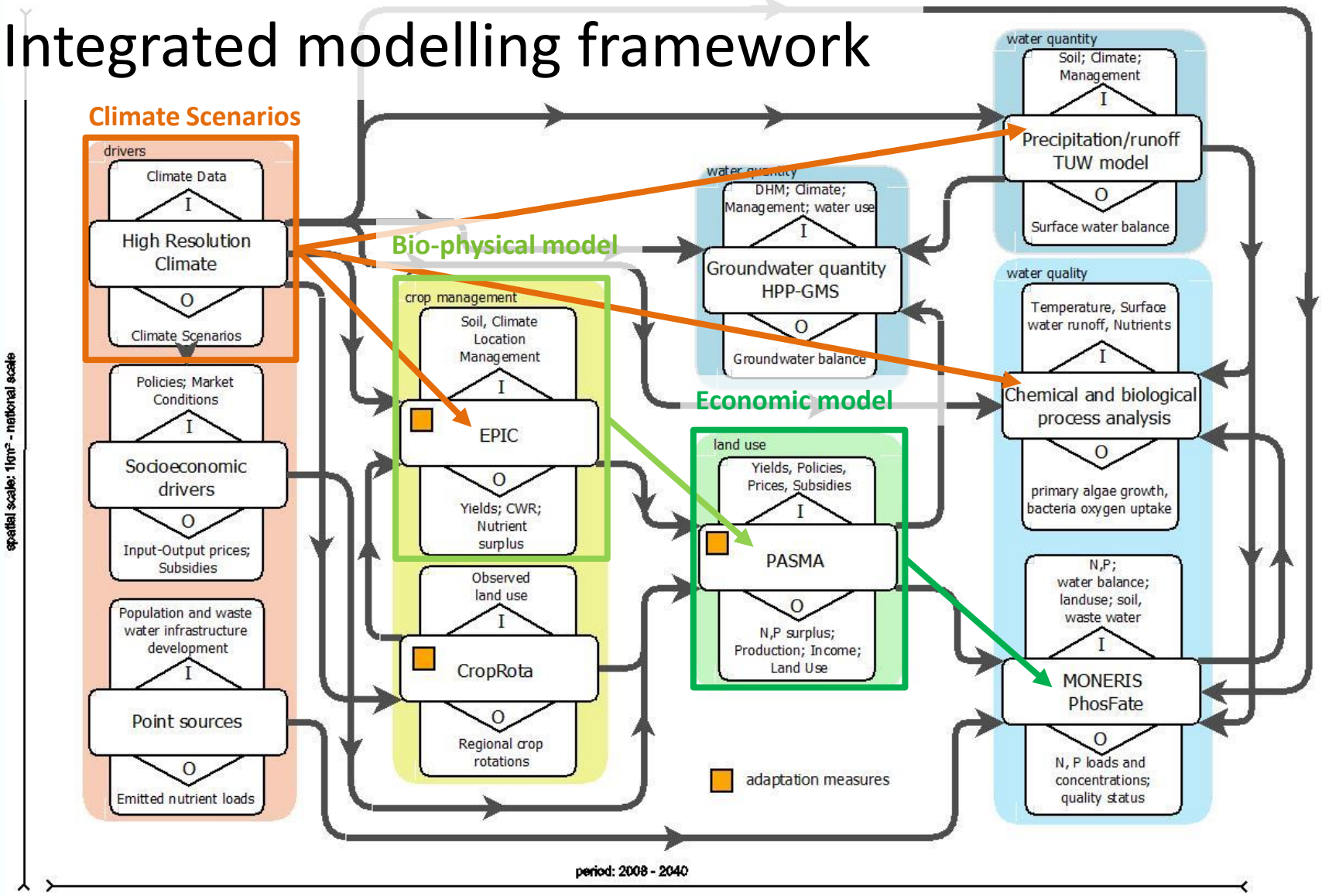
- How do climate and socio-economic changes affect Austrian **land use**, **nutrient losses** as well as the **low flow** and **quality** of water bodies?
- What are the impacts on **chemical and biological processes** in surface water?
- Which agricultural **adaptation** measures can cost-effectively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

Research process

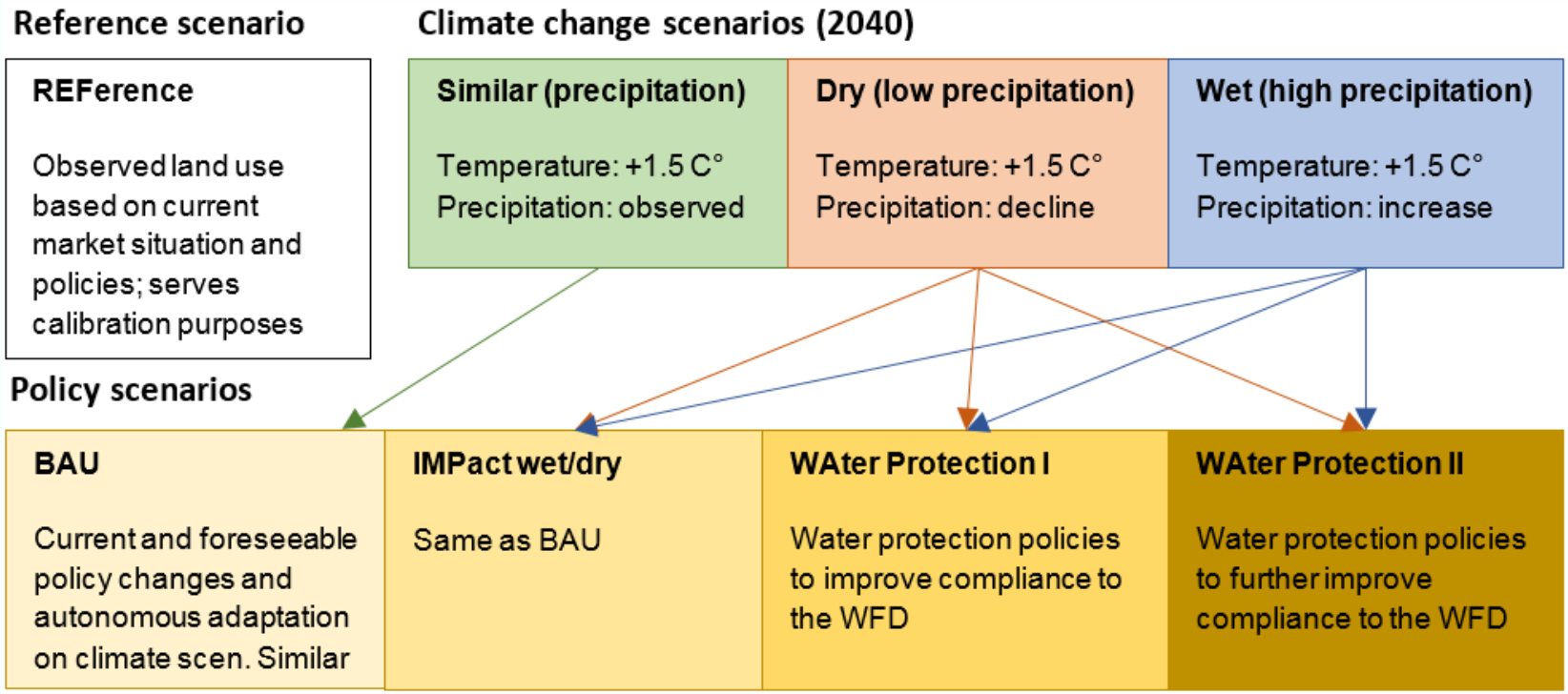
- Formation of stakeholder process
- Scenario development
  - land use and waste water management measures
  - climate and policy scenarios until 2040
- Model development
  - Austria at 1km² resolution/367 catchments
  - 2 Case study applications
- Scenario application

Foto: André Künzelmann/UFZ

Integrated modelling framework

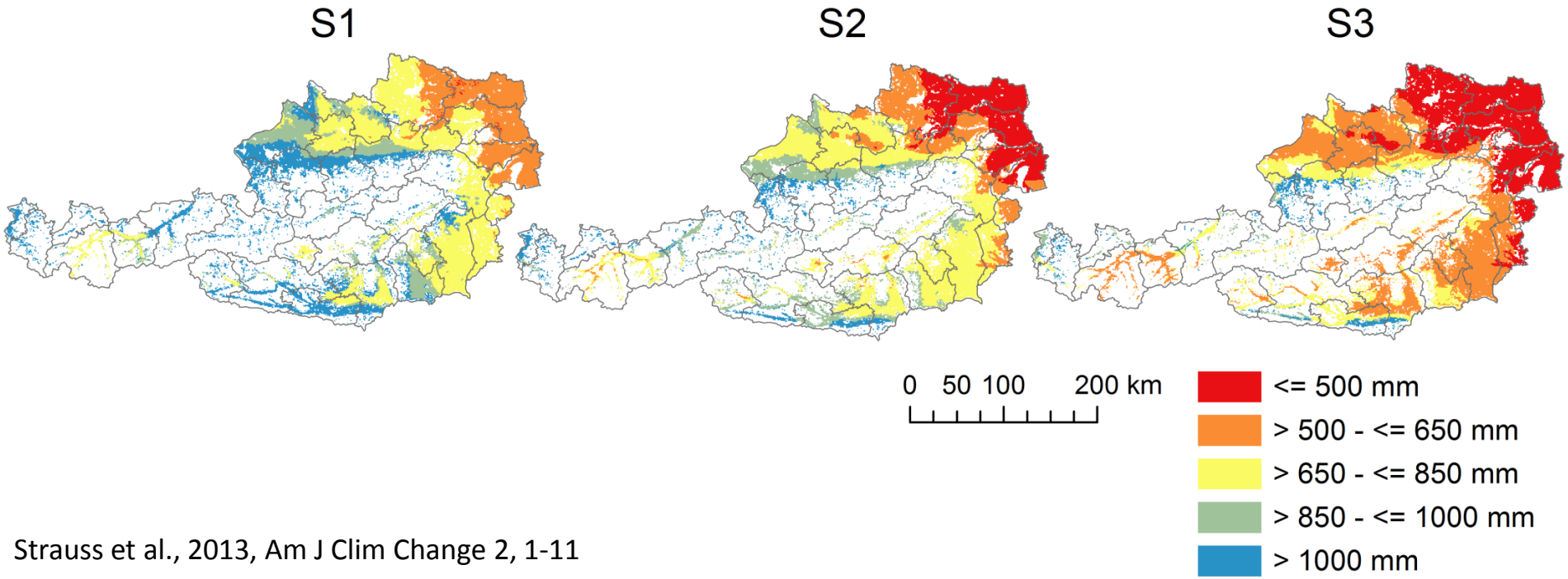


Climate & policy scenarios



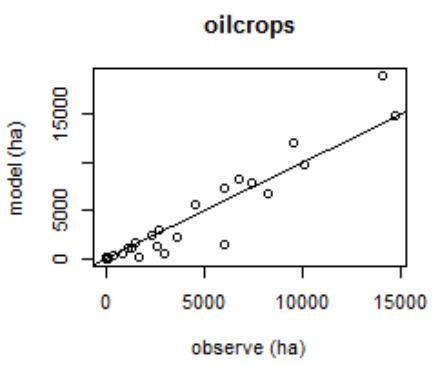
Results – Climate change scenarios

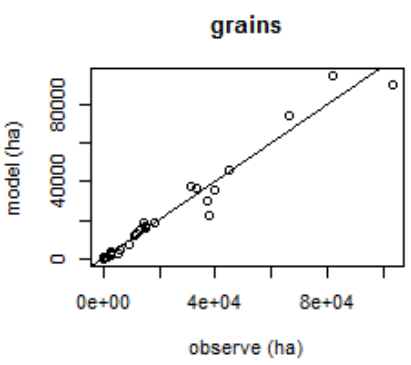
Average annual precipitation sums of three drought scenarios S1 (baseline), S2, and S3 for cropland in Austria

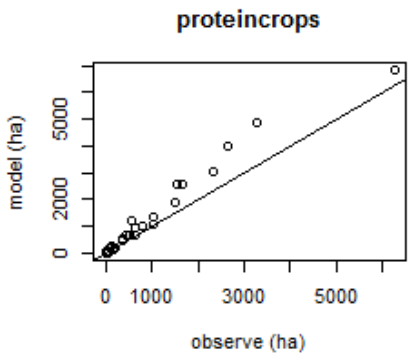


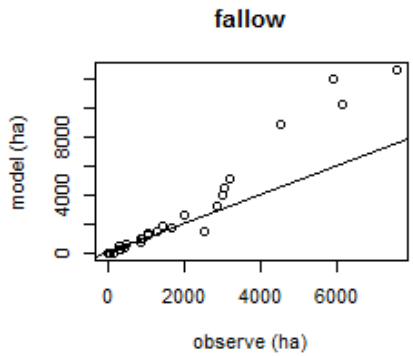
Strauss et al., 2013, Am J Clim Change 2, 1-11

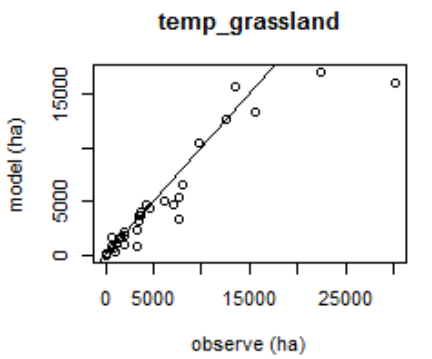
Results – PASMA

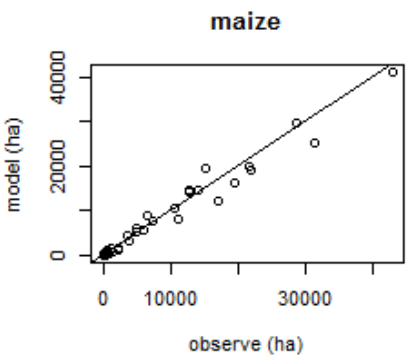


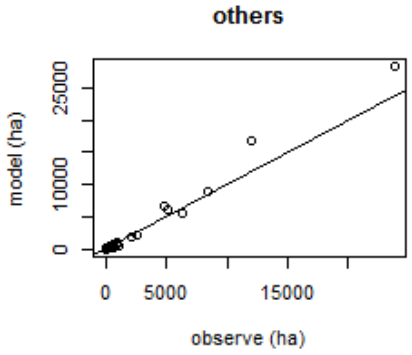




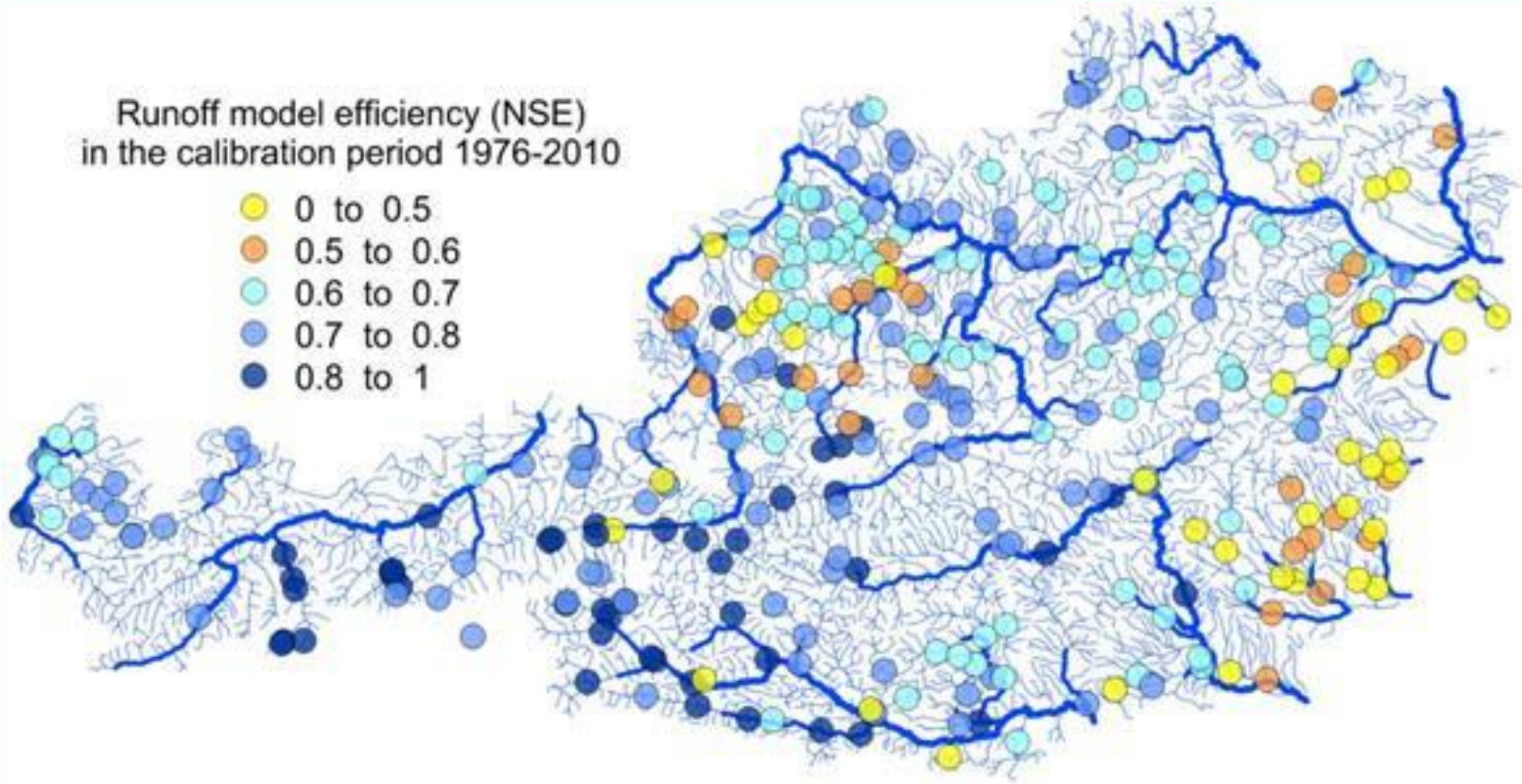








Results – TUW Model



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, precipitaion 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

AQUASTRESS

Foto: André Künzelmann/UFZ

Contact details

Mathias Zessner (Project coordinator)

Water Quality Management of the Institute for Water Quality, Resources and Wastemanagement

Vienna University of Technology

mzessner@iwag.tuwien.ac.at

Martin Schönhart (Presenter)

Institute for Sustainable Economic Development

BOKU University, Vienna

martin.schoenhart@boku.ac.at