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TG1.2 Automatic QC/QA of impact model output – steps towards a QA tool

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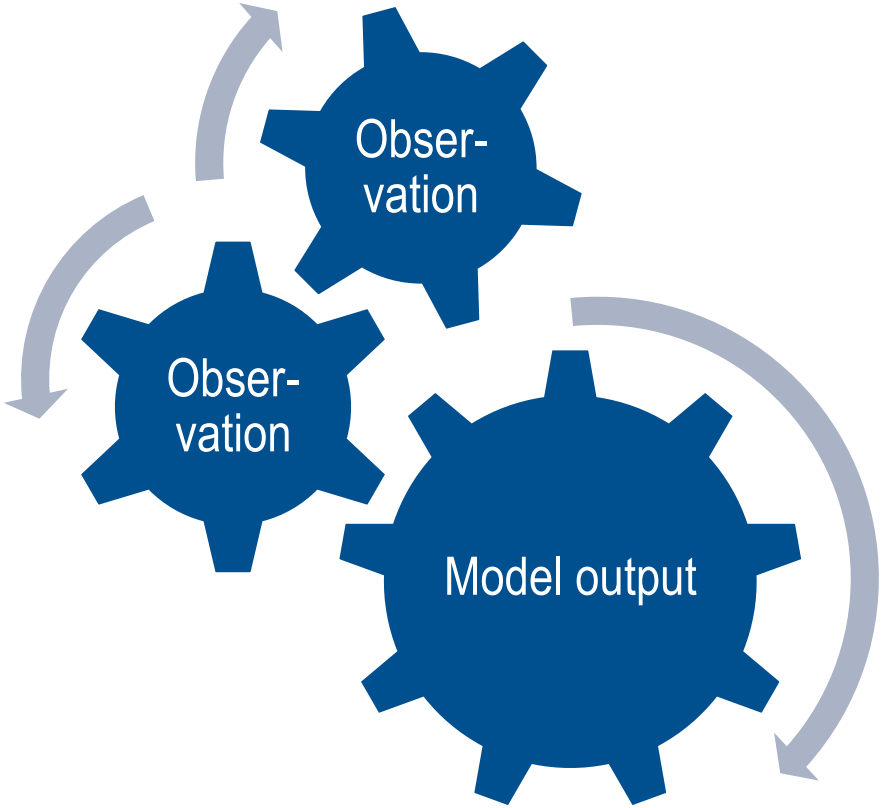
Motivation

- Simple and meaningful comparison of selected variables against observational data to:
  - support model development
  - support model intercomparison
  - support learning
  - get familiar with model ouputs
  - explore e.g. variables outside of own experience (space/time)



Status of the QA-tool

- There is not yet an existing QA-tool for the ISIMIP simulations
- Challenges:
  - Multiple ISIMIP sectors
  - Multiple key variables
  - Multiple observations
  - Multiple diagnostic comparison methods, e.g. efficiency criteria

  → Scientifically challenging, but/and:
  - Development capacities / funding

  - **We started!**

First steps towards a QA-tool

- Review of existing QA tools
- Virtual mobility grant to use ISIMIP model outputs with two existing QA tools
- Establishing a streamflow gauging database for consistent evaluation of global water models
- A „home“ for the tool: https://github.com/ISI-MIP/isimip-qa

Review of existing QA tools

- **Motivation:** evaluate if already existing tools can be used for ISIMIP purposes
- **Procedure:** internet / literature research and review of such tools in terms of: scope, availability, adaptability… Report Koutroulis & Müller Schmied (2021): https://proclias.eu

Tool	MIP	Code development possible?	Open source?	Topic	Reference data extendable?
ILAMB	C-LAMP	yes	yes	multiple	yes
EMSEvalTool	CMIP	yes	yes	multiple	yes
PALS		No		atmosphere	
PMP	CMIP	No	yes	atmosphere, climatology	
LVT	LIS	No (?)	yes	hydrology	

Overview with key characteristics of the tools evaluated

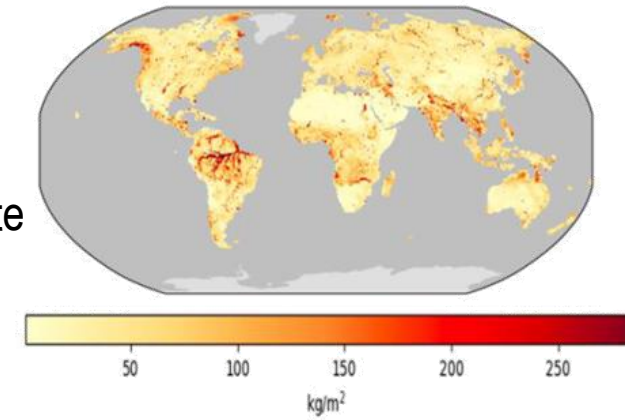
- **Outlook questions:**
  - Can those tools be considered as universal for all ISIMIP sectors? ?
  - Which tools are adaptable for the ISIMIP (data) needs? ILAMB, ESMValTool
  - How can we allocate resources to test those tools with real ISIMIP data? VM grant
  - Feasible to start with one or two sectors and transmit experiences to all sectors later? !

Testing ISIMIP model outputs with ILAMB and ESMValTool

- ILAMB and ESMValTool have been selected to be suitable for testing global water model outputs as pilot sector
- virtual mobility grant for Emmanuel Nyenah (VU Brussels, Belgium)
- Report Nyenah, Müller Schmied & Koutroulis (2021), available at https://proclias.eu

ILAMB (The International Land Model Benchmarking Project)

- Works fine with ISIMIP model output
- Comparison to streamflow data and observations of total water storage anomalies
- Implementing an additional efficiency metrics
- Implementing additional reference data (streamflow)
- Testing region-specific assessments
- Outlook: inclusion of basin outlines, new metrics at website



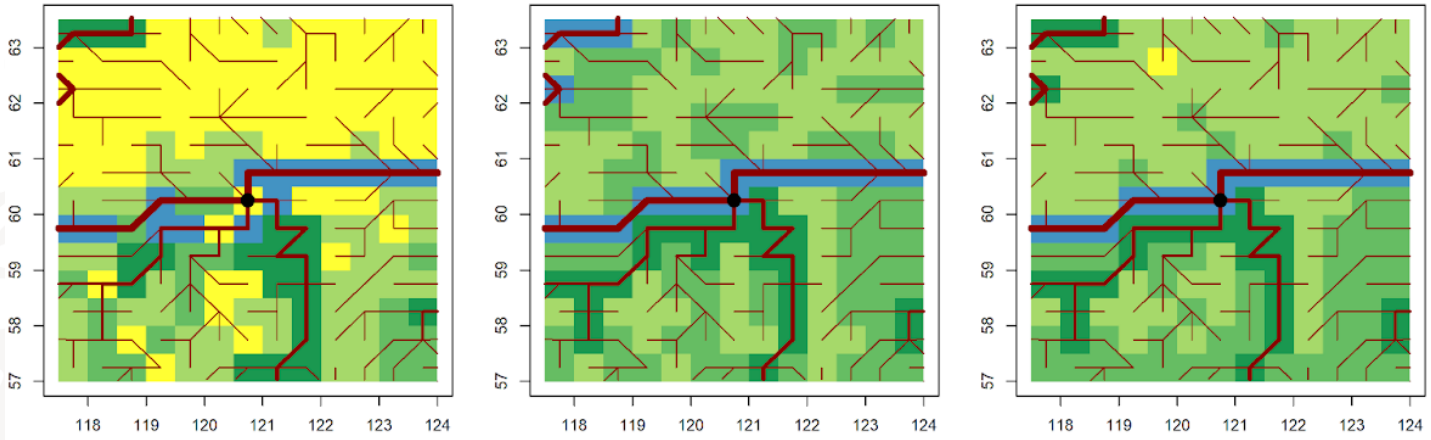
RMSE of total water storage anomalies of one model

ESMValTool (Earth System Model Evaluation Tool)

- Can currently not digest ISIMIP data structure
- Outlook: modify ISIMIP data to test the tool

Establishing a streamflow gauging network

- Some models of the global water sector deviate in the drainage direction of their river routing procedure → hinders consistent evaluation with station observations
- Leonie Schiebener (GU Frankfurt) assessed a dataset of 1509 stations (merge of 3 data sets with certian quality criteria) to:
  - Select stations where original coordinates fit to the DDM30 (the „standard“) (711 stations)
  - Select those with > 50.000 km2 catchment size (313 stations)
  - Visual inspection for each model if the station is located in the drainage network
  - 135 stations can be used for consistent intercomparison for all 11 models
  - Report in progress



Example where station is not in stream network for all (3 out of 11) models

A home for developing the QA-tool

https://github.com/ISI-MIP/isimip-qa

- We have the environment ready for
  - Discussions inside issues
  - Storing scripts (and reference data?)
  - Writing guidelines
  - Developing / modifying existent tools for ISIMIP needs
  - …

Outlook

- We need to increase personnel capacity for tool development
- We are seeking for collaboration to other communities / exchange of experience
- We need sectoral information about key variables and benchmark data
- …