Commission internationale de l'Hydrologie du bassin du Rhin
Internationale Kommission für die Hydrologie des Rheingebietes

CHR
KHR

RheinBlick2050

Development of joint climate and discharge projections for the international Rhine River catchments

Overview, current status of work and some preliminary results

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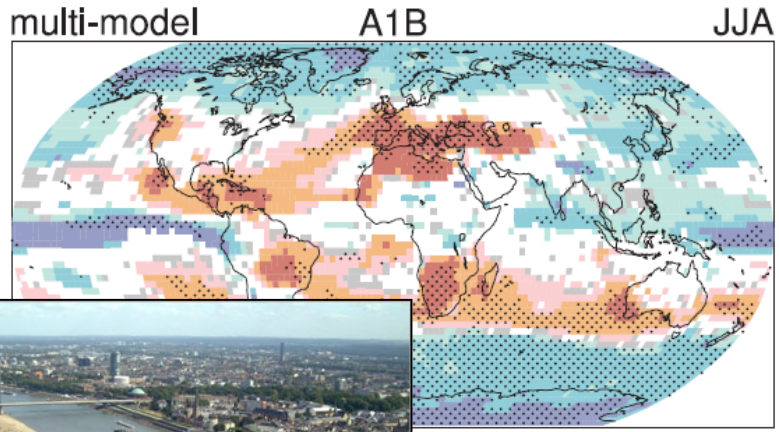
Kongress der Zentralkomission für die Rheinschifffahrt
"Rheinschifffahrt und Klimawandel – Herausforderung und Chance"
24./25. Juni 2009, Bonn

Motivation

- Climate change does and will modifiy hydrological processes and the water balance in the Rhine River catchments
- This has variable impacts, depending on respective sensitivities and vulnerabilities
- Decision makers need adequate adaptation and mitigation strategies based on good information
- Need for common climate change and discharge projections
- The CHR has a coordinating role in hydrological research in the Rhine River catchments (1st CHR report on climate change impacts: I-16 Grabs et al. 1997)
- Close linkage to and cooperation with the IKSR / AG-H / EG Klima



IPCC (2007), AR4 WG1 SPM

Photo: Ralf Scheer, Rhine at Düsseldorf

Photo: DDP, Rhine at Kehl

Photo: Welt Online
Maeslant Barrier at Rotterdam

Goals and anticipated results

- Development of joint, consistent climate and discharge projections
- Assessment of future changes of hydro-meteorological regimes, low- and high-flow in the Rhine River catchments; improved process understanding; no adaptation or mitigation studies
- "Meta" project, based on existing ongoing projects, results and data of the partners, like e.g. KLIWAS or CCHydro

Results

1. Hydrometeorological forcing data from ensembles of regional climate change projections
2. Hydrological model runs, detailed simulations for tributaries and Rhine River itself
3. Applicable information and quantifiable statements for policy and planning relevant time-spans until 2050 (overall until 2100)

Project consortium

- Steering and coordination

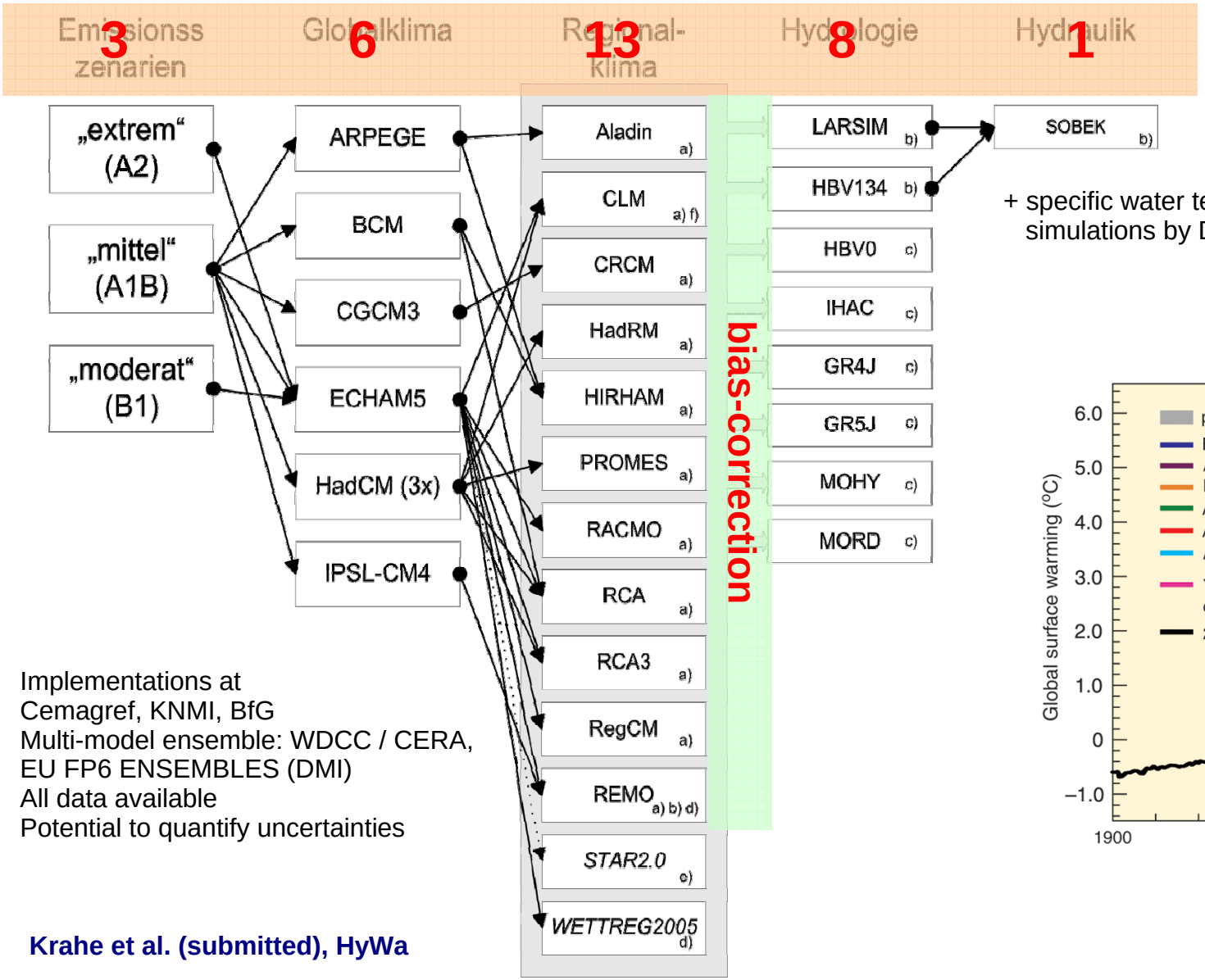
- Project group members (plus their respective project partners)

- Stakeholder involvement (definition of end-user requirements)

AG H
AG H / EG Klima

Experiment design, data, processing chains

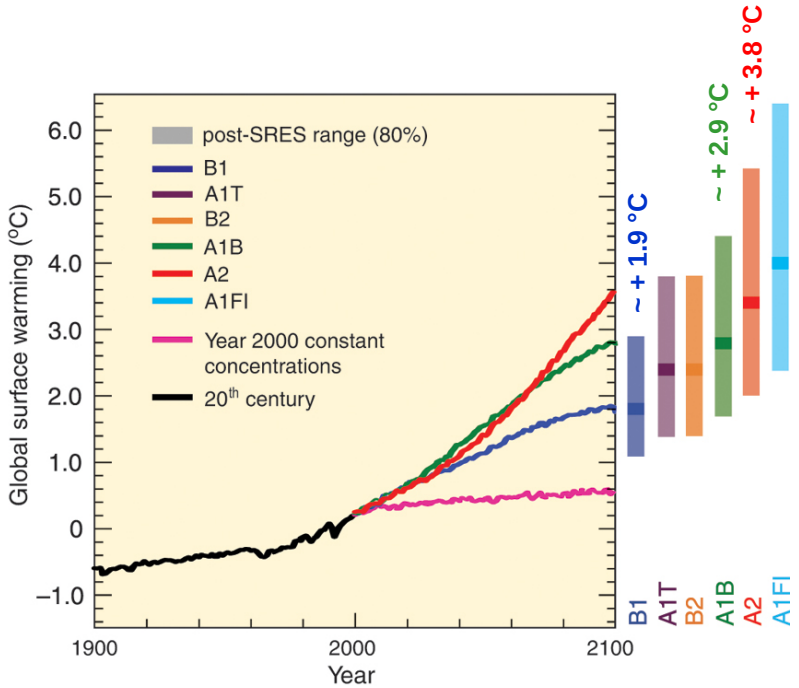
Multi-model results show an increasing bandwidth



+ specific water temperature simulations by Deltares

Implementations at
Cemagref, KNMI, BfG
Multi-model ensemble: WDCC / CERA, EU FP6 ENSEMBLES (DMI)
All data available
Potential to quantify uncertainties

Krahe et al. (submitted), HyWa

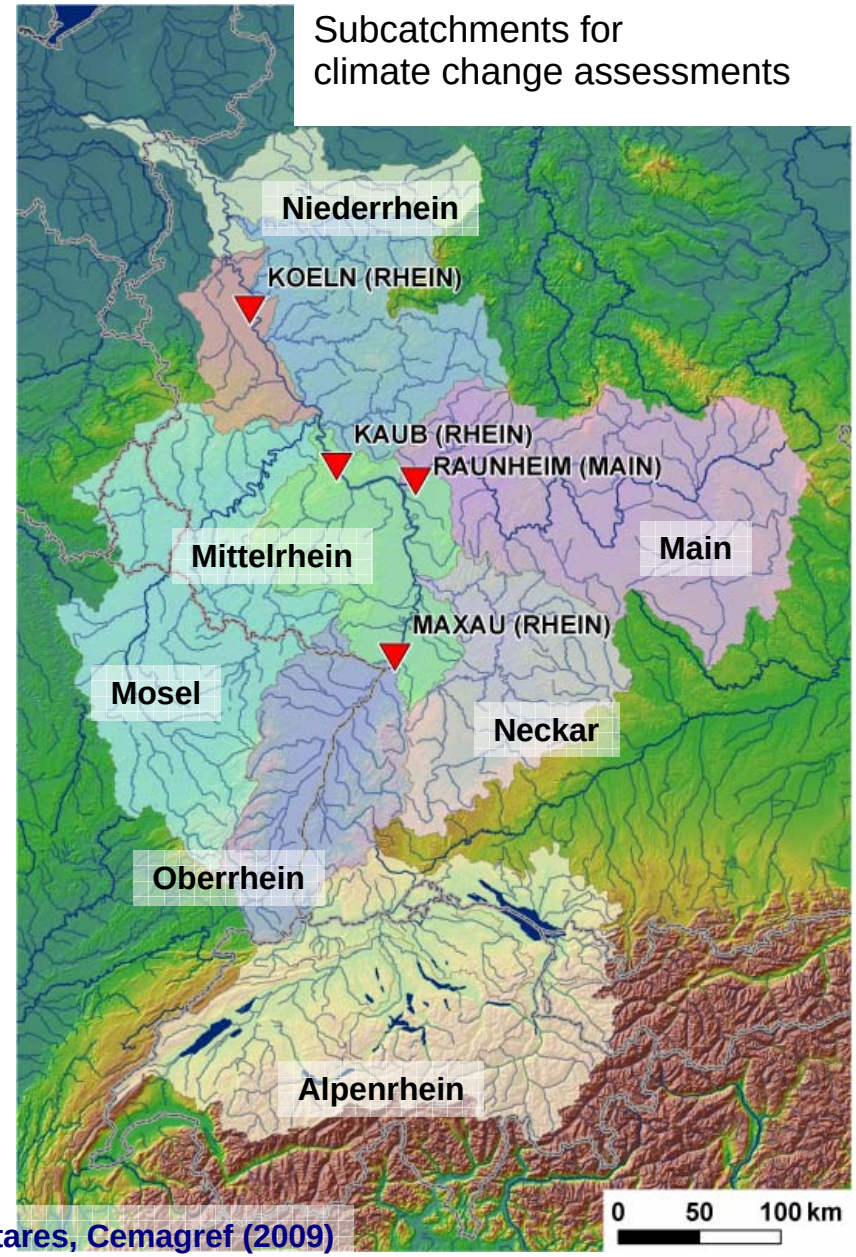


IPCC (2007), AR4 SYR SPM

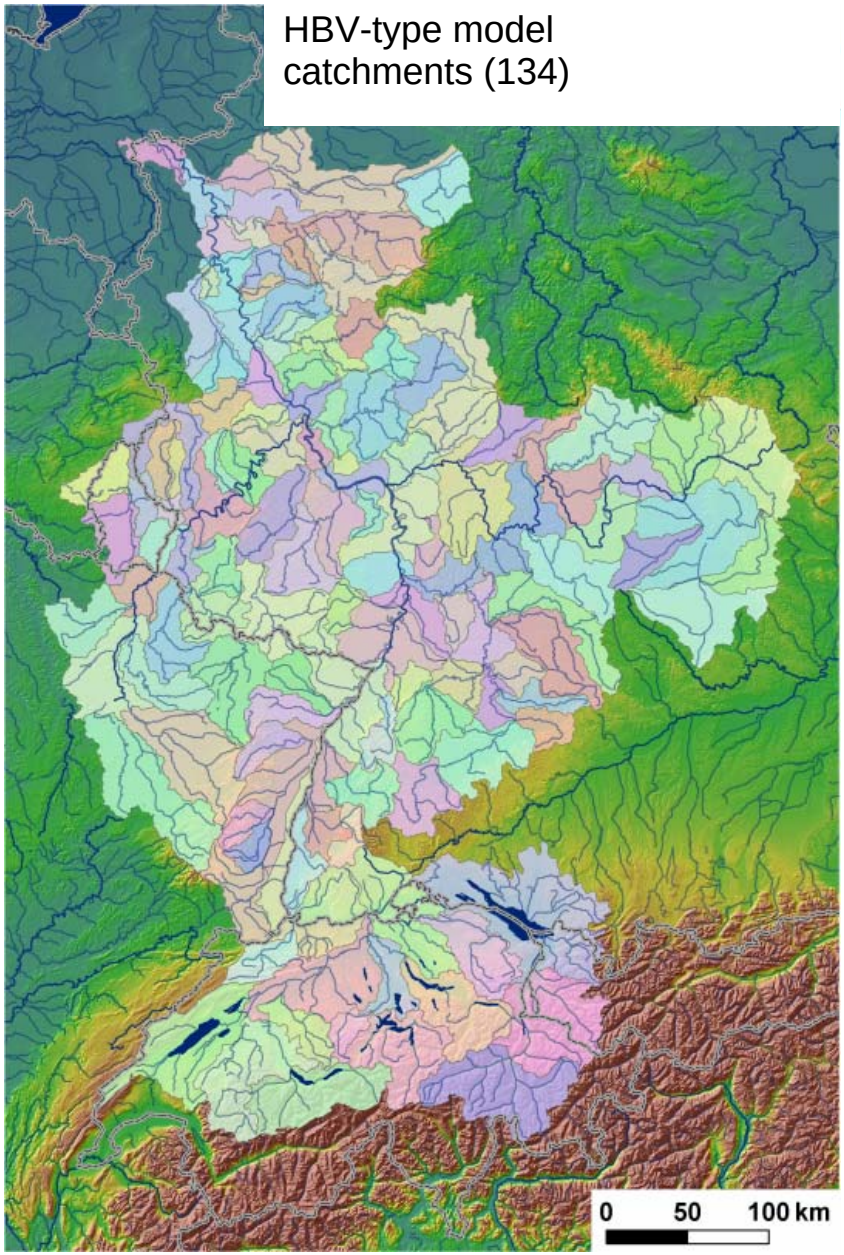
observed (C20)	re-analyses	hydromet. obs.	discharge obs.

Study area, full Rhine River basin

Subcatchments for climate change assessments

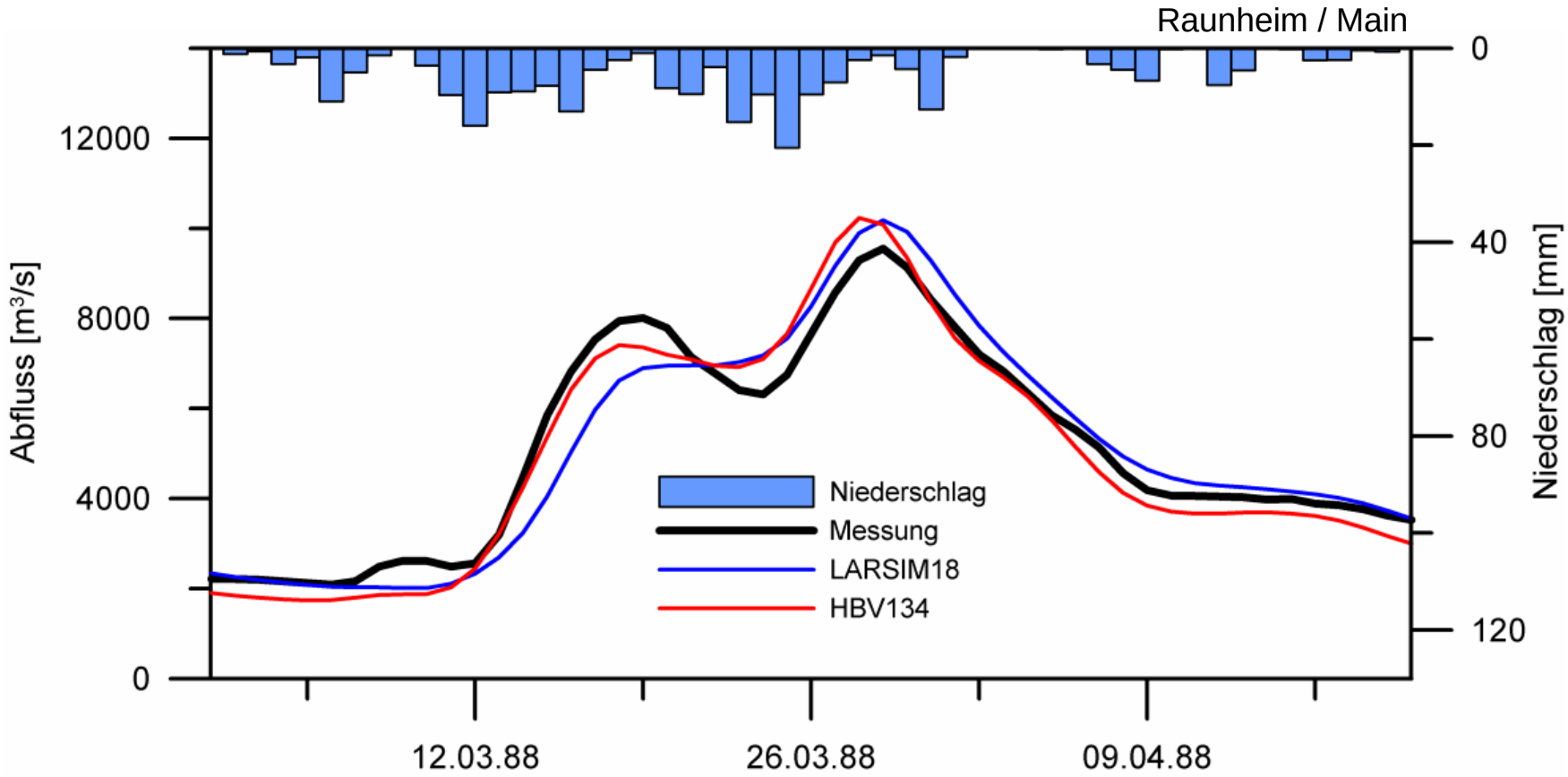


HBV-type model catchments (134)



BfG, Deltares, Cemagref (2009)

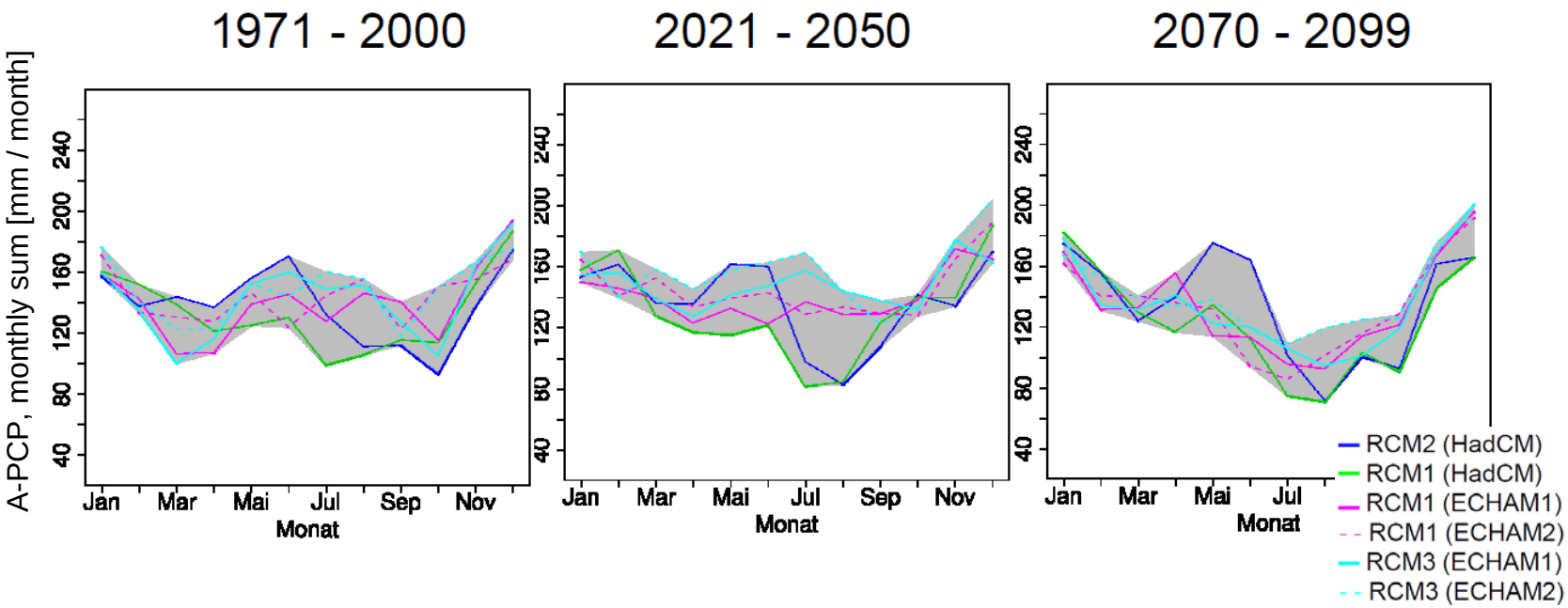
Atmospheric forcing and discharge simulation



- HBV: 134 model-catchments
- HBV: Daily atmospheric forcing of precipitation, temperature, evapotranspiration

Bandwidth of atmospheric forcing data, ensembles
Bias corrections necessary

Long-term monthly means of daily RCM total precipitation, outputs from EU FP6 ENSEMBLES project models, for basins upstream Maxau (SRES: A1B)



- Four different bias correction methodologies are implemented to correct RCM data
- Tests of model and processing chain suitability, hydrological model robustness
- Evaluation criteria catalogues designed with hydrological impact assessment in mind

Bülow and Tomassini (2009), MPI-M, 1st KLIWAS status conference, 2009-03-18/19, Bonn

Preliminary projections: mean discharge

Diese Abbildung ist bewusst anonymisiert, da die Ergebnisse noch vorläufig und unvollständig sind. Für Rückfragen stehen wir Ihnen gerne zur Verfügung:
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This figure has deliberately been made anonymous, as the results presented are still preliminary and incomplete. Please do not hesitate to contact us for any questions::
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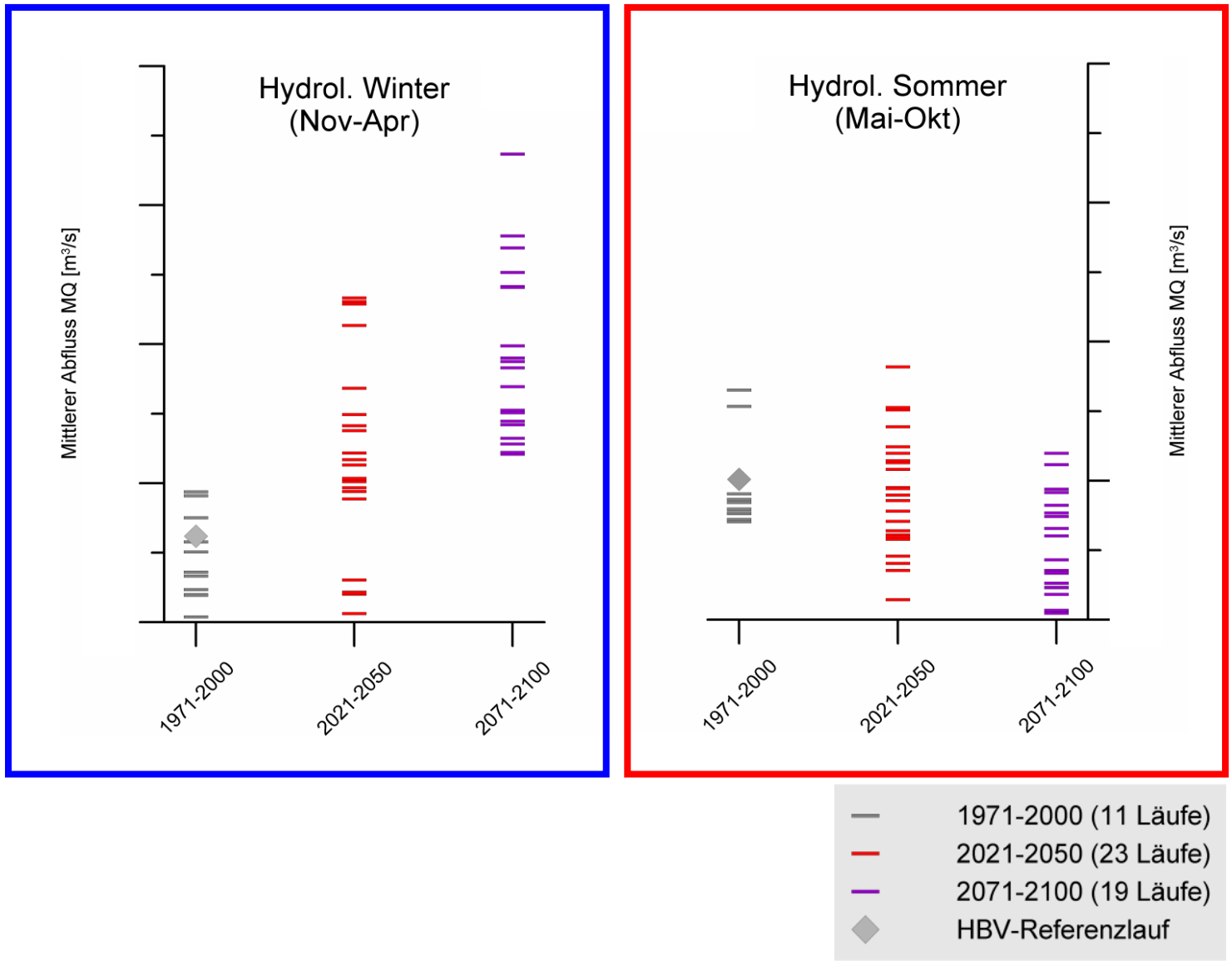

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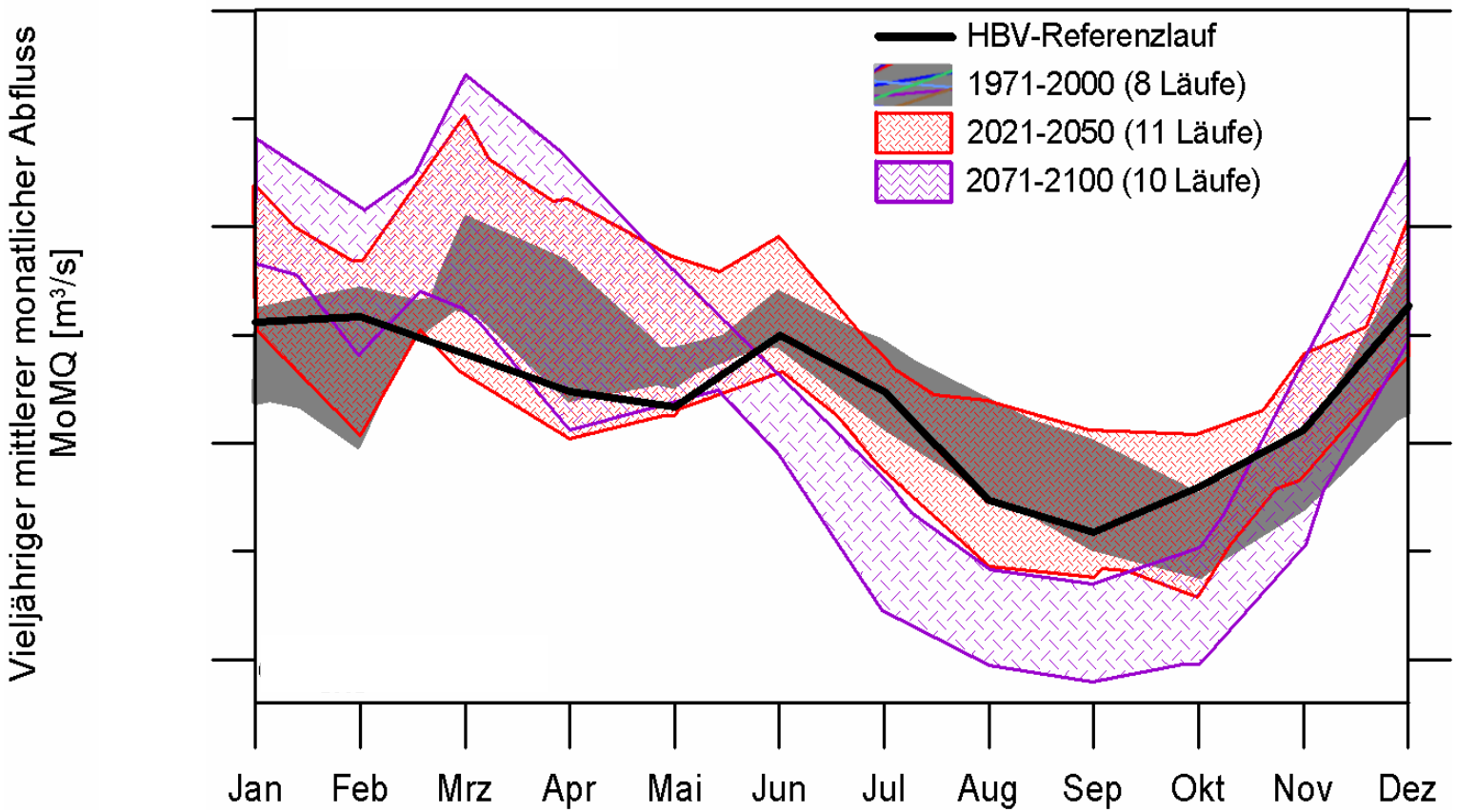
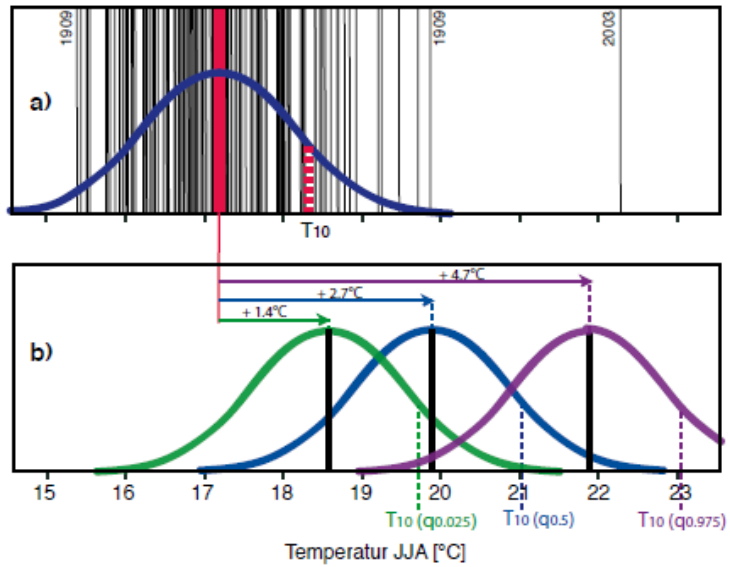
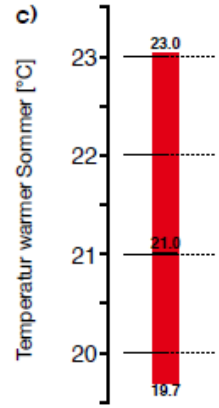


Summary and outlook – work in progress

- Focus on hydrology
- Up to 2050 moderate changes in average discharge
- Up to 2100 discharge projections in accordance with each other: decrease of average discharge in summer, increase in winter
- Large spread in the discharge projections
- Uncertainties can be quantified





OcCC / ProClim (Eds.) (2007)

Upcoming

- Further climate change projections
- Further statistical analyses and diagnostics
- Water level projections
- CHR report on RheinBlick2050: "Assessment of Climate Change Impacts on Discharge in the International Rhine River Basin", planned for spring 2010

CHR reports
I-16 Grabs et al. (1996)
and I-22 Belz et al. (2007)

RheinBlick2050

http://www.chr-khr.org > Projects > RheinBlick2050

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