

Low water, high water: what to expect

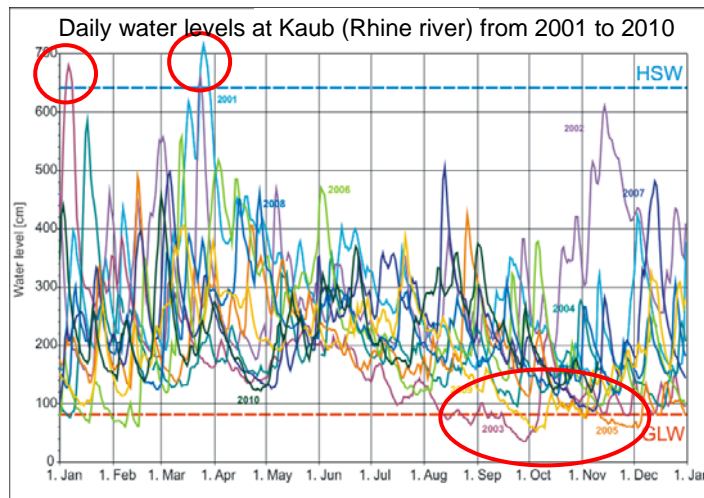
Inland Navigation in a changing climate

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Barge to Business, 30.11.-01.12.2010, Bruxelles

Climate Change and Impact What is known?

→ IWT is vulnerable to climate change.



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Climate Change and Impact

What is known?



→ People (including some scientists) already have a picture about IWT under climate change.

"Climate change threatens navigation [...] on the Elbe river."

"The new data are very reliable. They can serve as a basis for decision making."

Source: Sächsische Zeitung, Dresden, 22.10.2009

Research Programme

- Analyses of climate change and impacts
- Development of adaptation options
- Coastal and inland waterways Central Europe
- 30 projects, up to year 2013

1. Global emission scenarios / future development
2. Projections by global climate models
3. Projections by regional climate models
4. Hydrological models
- 4'. Oceanographic models
5. Sediment and morpho-hydrodynamic models
6. Water quality models
- 6'. Navigation models
7. Ecosystem models
- 7'. Economic models

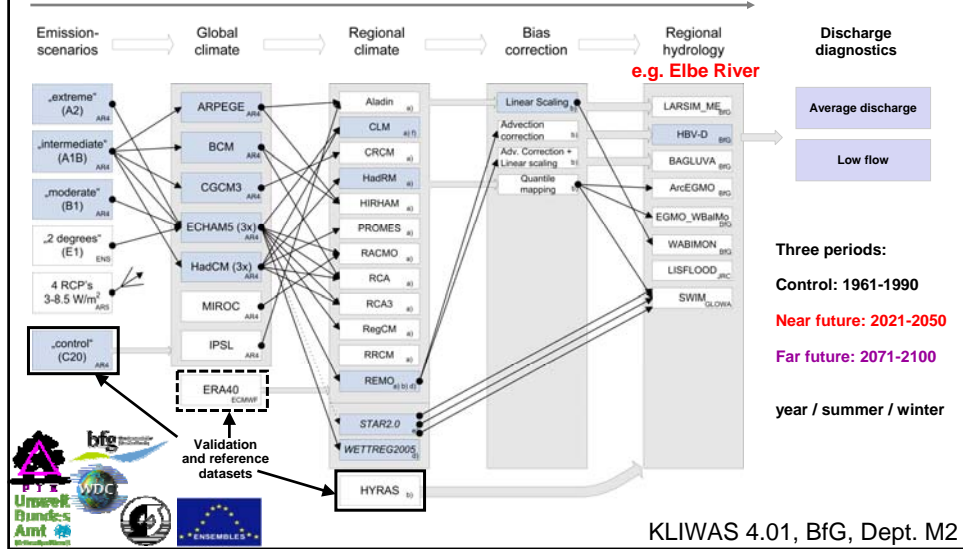
+ National and international partners

+ Associated projects:

KLIWAS – Model chain



→ "Multi-Model approach" is a key concept for uncertainty assessment and currently the only basis for robust statements.

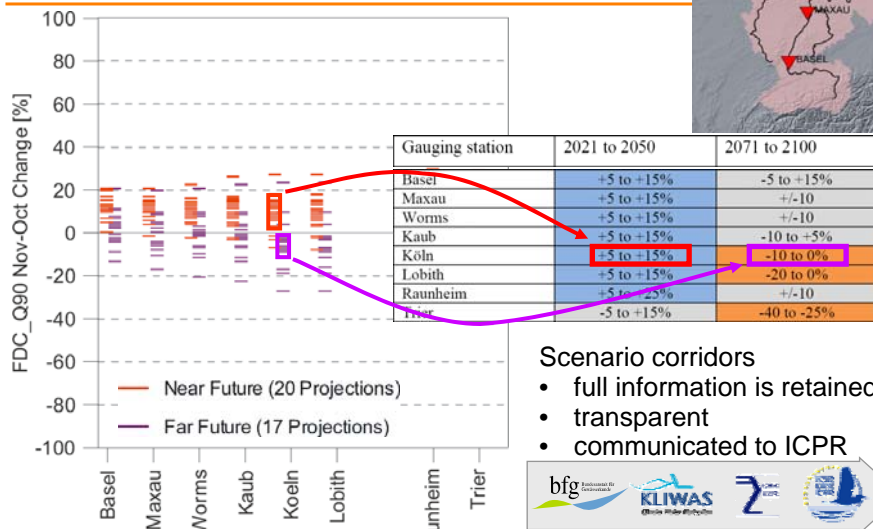


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Rhine River (robust results)

Low flow (here: discharge undershot on 36.5 days per year)

- Near future: Less extreme
- Far future: More extreme



- Scenario corridors
- full information is retained
 - transparent
 - communicated to ICPR



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Elbe (preliminary results)

Seasonal precipitation (Ensemble of 18 RCM simulations)



- Near future: Summer +/- ; Winter +
- Far future: Summer - ; Winter +

- The results are still incomplete!
- A clear decrease of summer precipitation for the mid of the 21st century, as indicated by earlier studies, is not obvious from the current multi model ensemble.
- An increase of Winter precipitation is confirmed by most projections.

This figure has deliberately been deleted, as the results presented are still preliminary and incomplete. Please do not hesitate to contact us for any questions:
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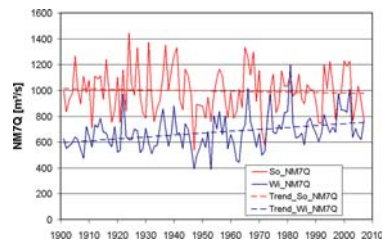
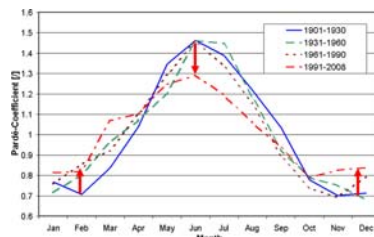
Danube (preliminary results)

Discharge regime change during the 20th century



- Equalisation of annual cycle of mean discharge

- Nival (snow driven) regime has become more pluvial (precipitation driven).
- Construction of dams and reservoirs
- Low flow discharges have been rising.



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Take home messages



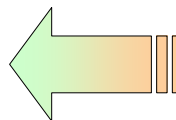
- Research Programme KLIWAS
 - 30 projects, up to year 2013
 - inland & coastal zone, all large basins (Rhine, Elbe, Danube,...)
 - water quantity, quality, ecology, and economy
- Rhine River
 - Current results for mid-century point to limited impact of climate change on low flow compared to present (+/-10%).
 - In case of continued increase of GHG concentrations until 2100 changes may become more severe.
 - Scenarios are internationally concerted (cf. CHR-Report I-23; Görden et al., 2010; Download at www.khr-chr.org) and serve as a basis in political processes (e.g. ICPR).
- Elbe and Danube Rivers
 - Existing scenarios may have to be re-evaluated in consideration of the multi-model ensemble.

Neither **panic** nor be **ignorant**,
just **research** and **evaluate!**



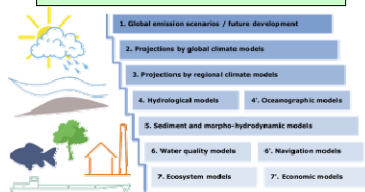
Science

- Acquire and evaluate knowledge, unemotional
- “Uncertainty”
- “Projections”
- Appropriate messages
- Individual results are treated critical



Media

- Raise public awareness addressing emotions
- „Climate Catastrophe“
- „Climate Crisis“
- Easy to understand messages
- Individual results are treated as „truth“



Thank you!

www.kliwas.de

Ressortforschungsprogramm

- Deutscher Wetterdienst (DWD)
- Bundesamt für Seeschifffahrt und Hydrographie (BSH)
- Bundesanstalt für Gewässerkunde (BIG)
- Bundesanstalt für Wasserbau (BAW)



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