DROUGHT AS A NEW PRIORITY IN FLOOD-PRONE BASINS - THE MEUSE

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Global Network of basins working on climate change adaptation, the third meeting

Geneva, 6-7 April 2016

United Nations Economic Commission for Europe

Ministry of Infrastructure and the Environment

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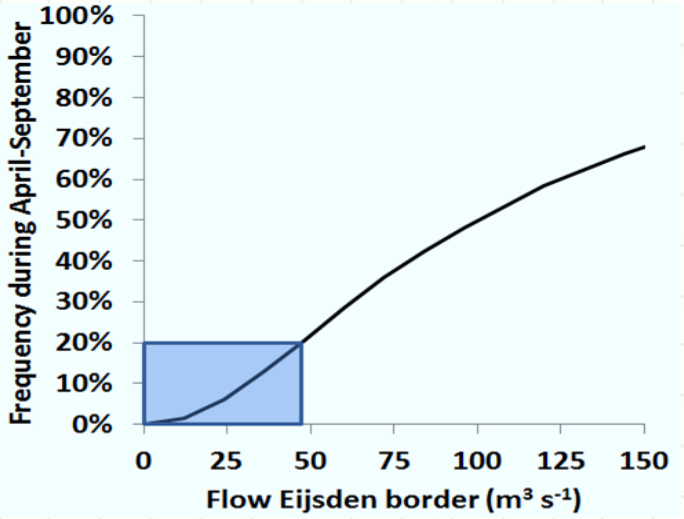
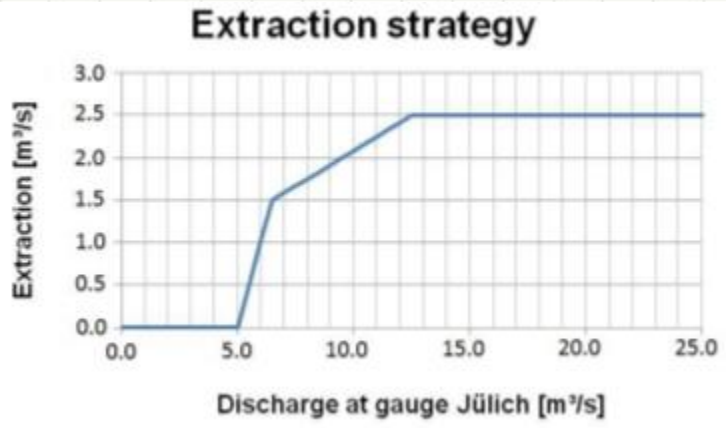
INTRODUCTION

- The Meuse is a rain fed river, prone to floods and droughts
- Little attention has been paid to droughts



- **Meuse** often encounters low flow conditions
  - Impact on water quality, including temperature
  - Ecological impacts
  - May be exacerbated by climate change



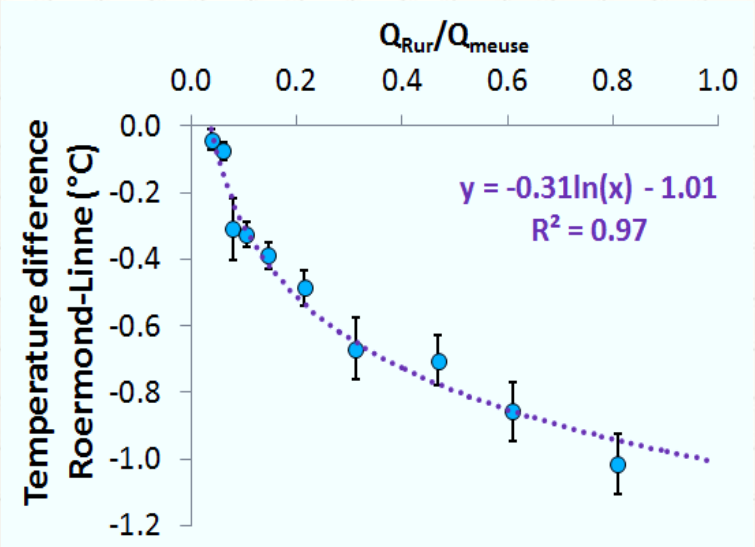
- **Rur** flow is relatively stable and contributes to Meuse flow
  - Highly regulated
  - Cooling effect on Meuse
  - Water diversion to former brown coal quarries

AIM OF THE MEUSE-RUR LINKAGE PROJECT

"To assess effects of climate change and Rur water diversion on the Meuse water quality in low flow situations"

Research questions:

- What is the contribution of the Rur to the discharge of the Meuse in periods of low flow?
- What is the effect of the relatively cool water from the Rur on the water temperature in the Meuse in low flow situations?
- What is the contribution of the Rur to the water quality of the Meuse in periods of low flow?



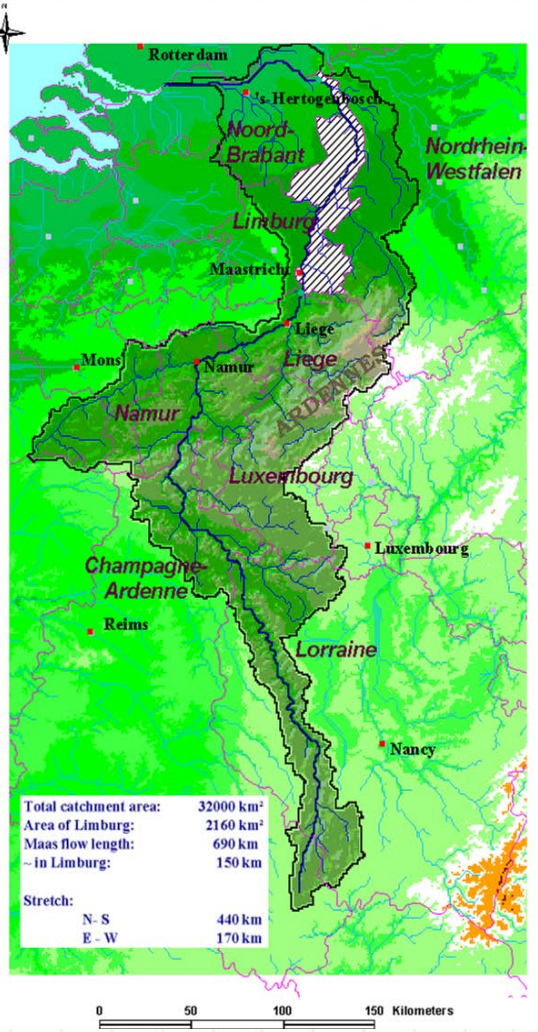
TRANSBOUNDARY COOPERATION

Main challenges

- One consistent climate scenario needed
- Data exchange across boundaries proves to be difficult in practice; restrictions apply
- Consistent modelling approach needed for assessment of water quality from climate data

Solutions

- Use existing, transnational climate scenario (AMICE)
- Statistical approach developed at Wageningen UR (Van Vliet et al., 2011)
- Model calibrated and applied for Rur (RWTH, Aachen) and Meuse (Alterra, Wageningen) separately, allowing input of regional knowledge, including access to required data sets



APPROACH

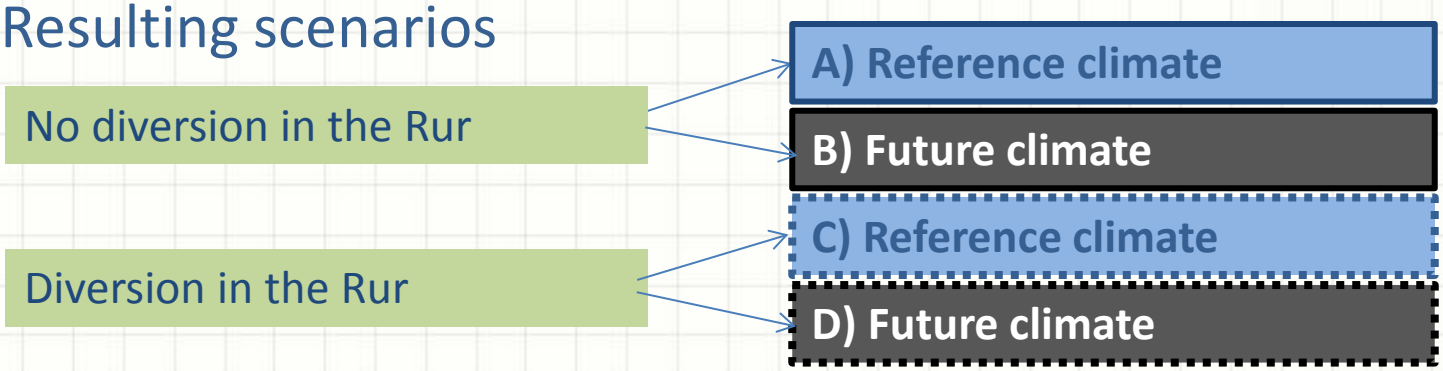
- Combine

  1) Climate scenarios (focus on dry; **reference** or **2021-2050**)

  - **River flow** from precipitation, evaporation, ... (HBV, Deltares)
  - **Water temperature** from air temperature (Van Vliet et al., 2011).

  2) Water diversion scenario for the Rur: proposed extraction strategy (**yes** or **no**)

- Resulting scenarios

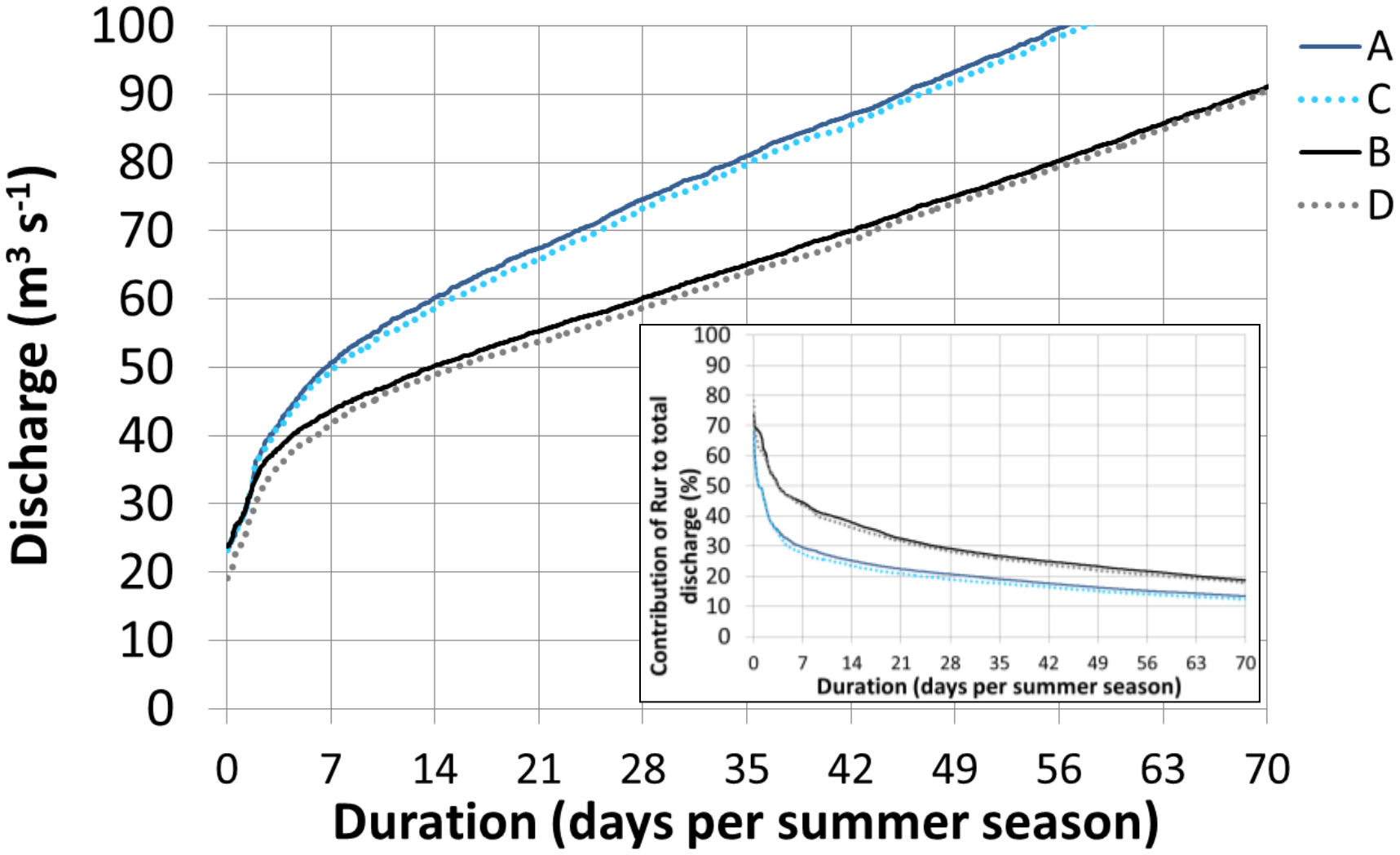


- "Mixing of water" downstream of Rur mouth, NL
- Link results to water quality indicators

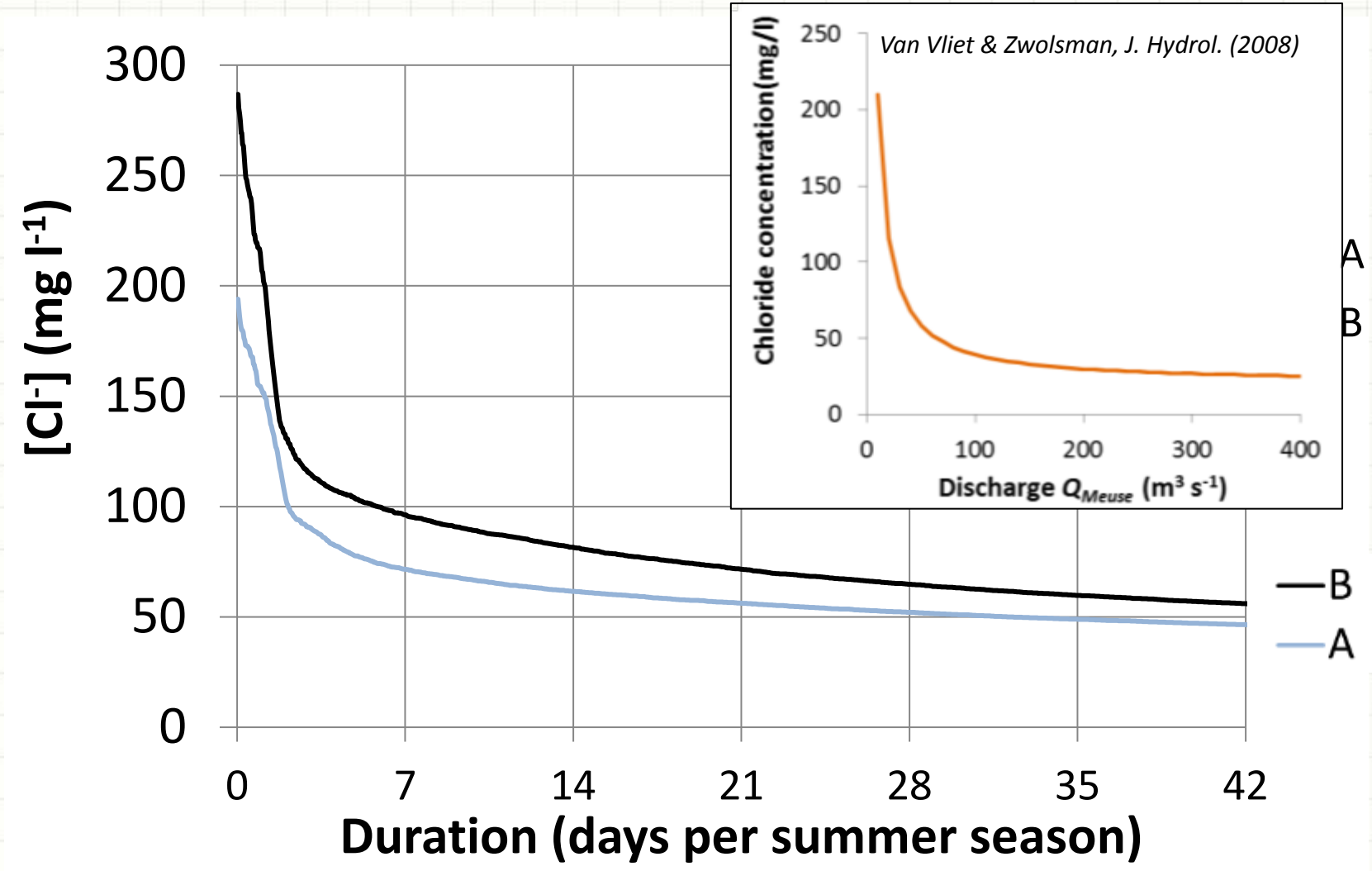
  1) Oxygen concentration to *water temperature*

  2) Chloride concentration to *flow*

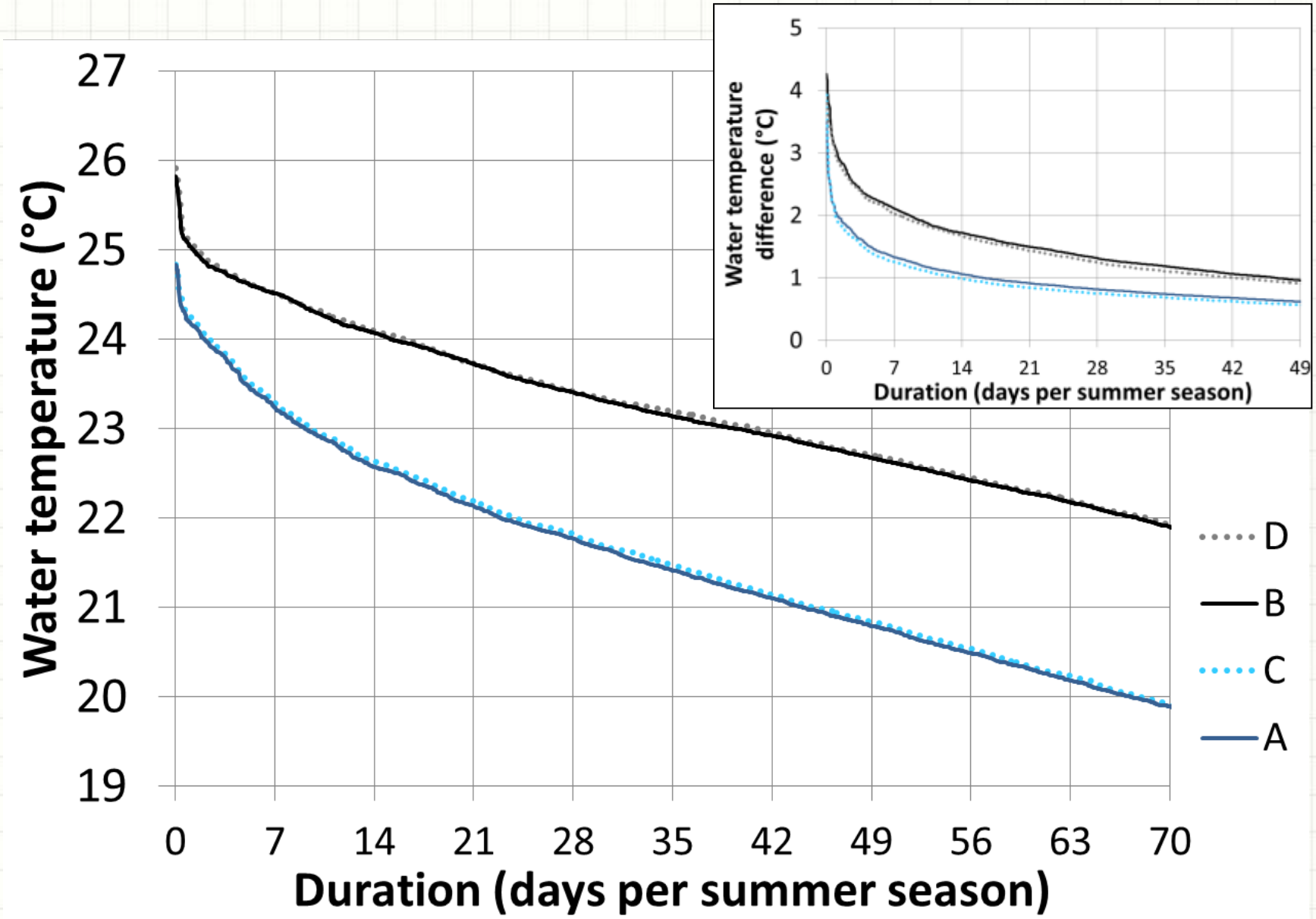
DISCHARGE (LOW FLOWS)



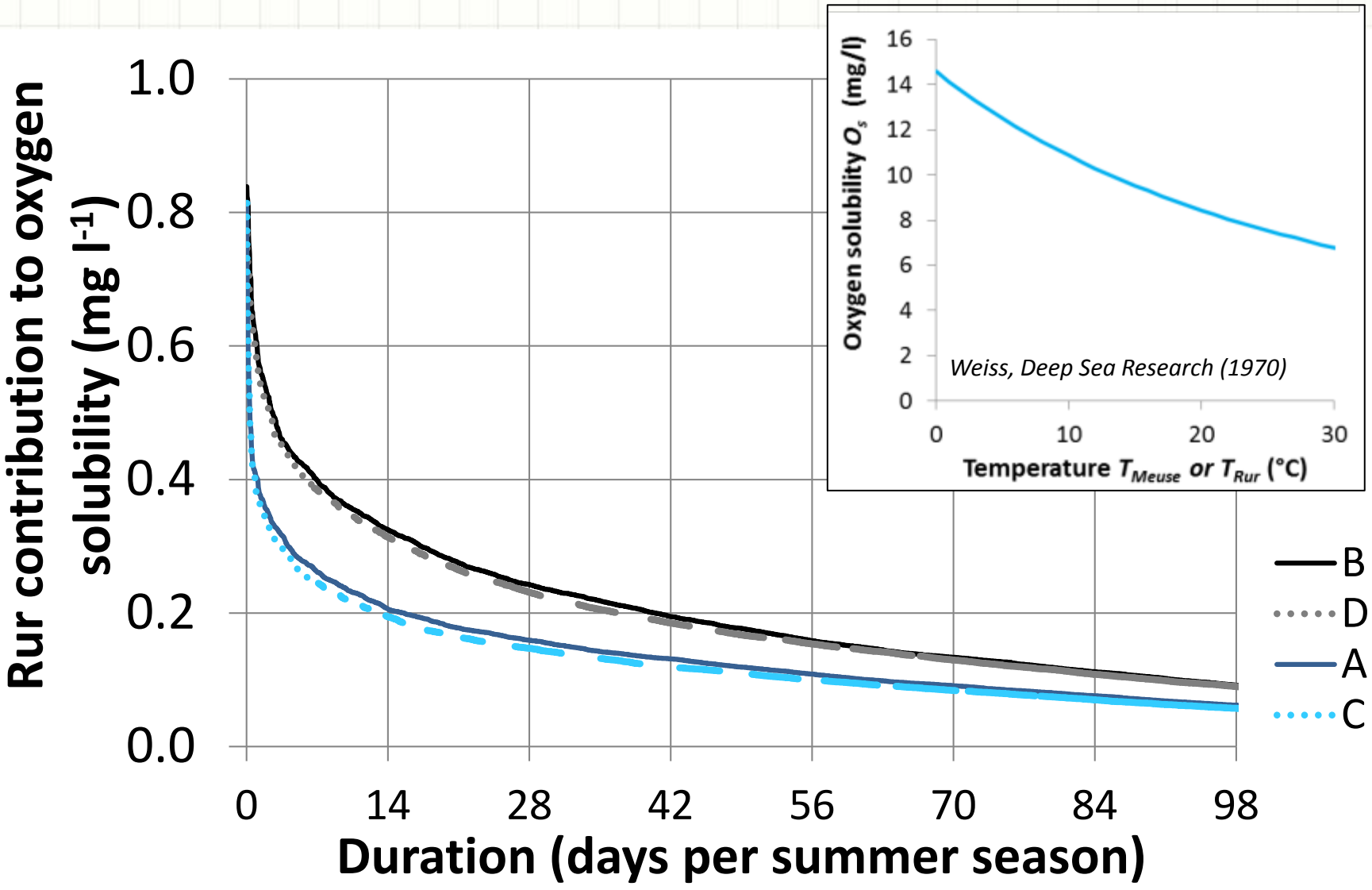
CHLORIDE (DISCHARGE-DRIVEN; LOW FLOWS)



Temperature (Low flows)



OXYGEN (SOLUBILITY, T-DRIVEN; LOW FLOWS)



CONCLUSIONS

- ***Climate change may affect*** discharge (Q) and water temperature (T_w) considerably, even in the near future
- ***Critical, drought-related events*** may occur more often and have a longer duration, with sometimes strong impact on water temperature and quality
- ***The Rur has a significant effect on Q and T_w*** downstream of the Rur mouth, with related impact on water quality
- ***Effect of water diversion*** in the Rur seems to have a relatively small effect; however, this may still be important in (very)low flow summer conditions

POSSIBLE FUTURE RESEARCH

- What will happen in the ***distant future*** (2071-2100)?
- Use physical model to assess role of ***possible physical feedbacks*** (positive or negative)
- Depending on the climate change, ***diversion*** may need to be extended and its effects reconsidered
- Consider ***trends in pollution*** (medicines, microplastics, …)