A multi-year drought can alter the nitrate retention capacity of a catchment

Carolin Winter[1], Tam van Nguyen[1], Andreas Musolff[1], Stefanie R. Lutz[2], Michael Rode[3], Rohini Kumar[4], Jan H. Fleckenstein[1,5]

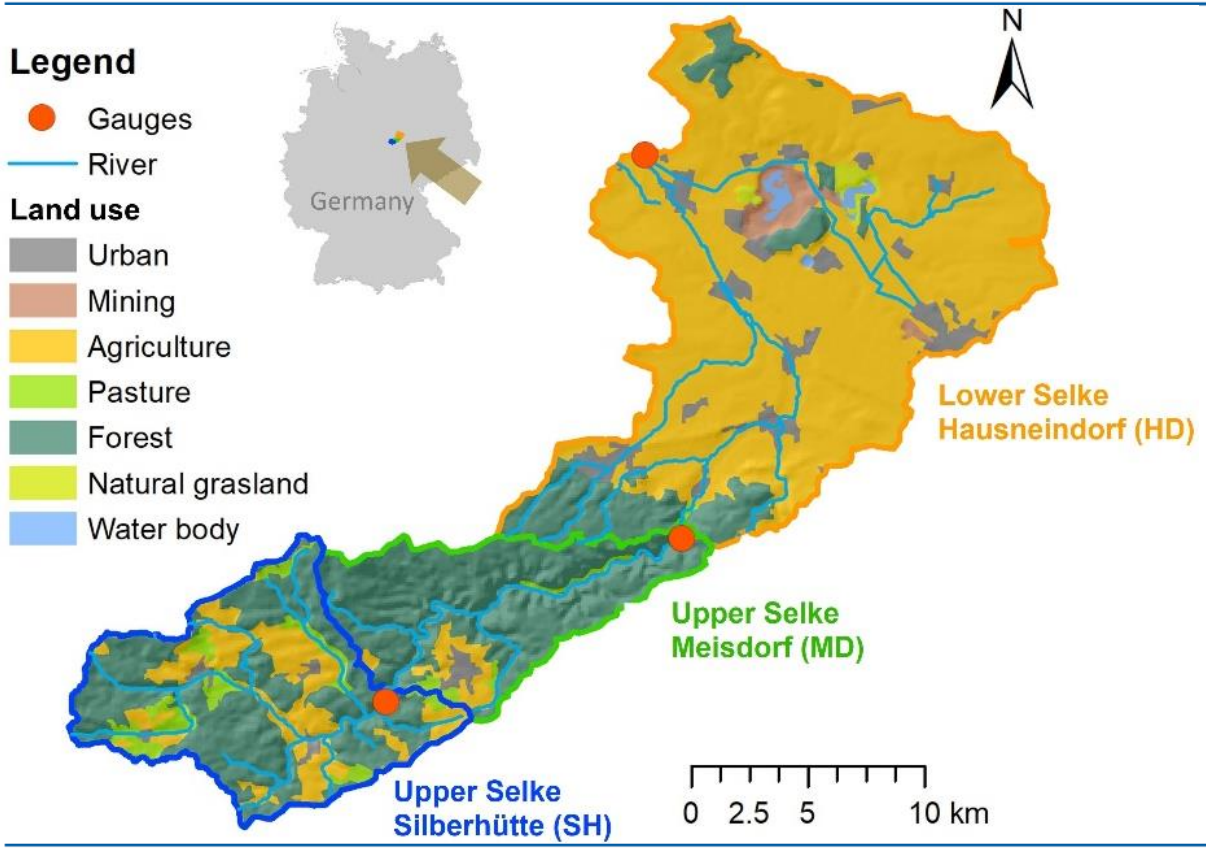
[1]Department of Hydrogeology – UFZ Leipzig, Germany
[2]Copernicus Institute of Sustainable Development – Utrecht University, Netherlands
[3]Department Aquatic Ecosystem Analysis and Management – UFZ Leipzig, Germany
[4]Department of Computational Hydrosystems – UFZ Leipzig, Germany
[5]Hydrologic Modelling Unit, Bayreuth Center of Ecology and Environmental Research – University of Bayreuth, Germany

The 2018-2019 drought across large parts of Europe had severe impacts on society and ecosystems

What are the impacts of such drought on water quality, in terms of nitrate pollution?

We used data-driven analysis and process-based modelling to investigate if and how it can alter catchment functioning in terms of retaining and releasing nitrogen

Study site



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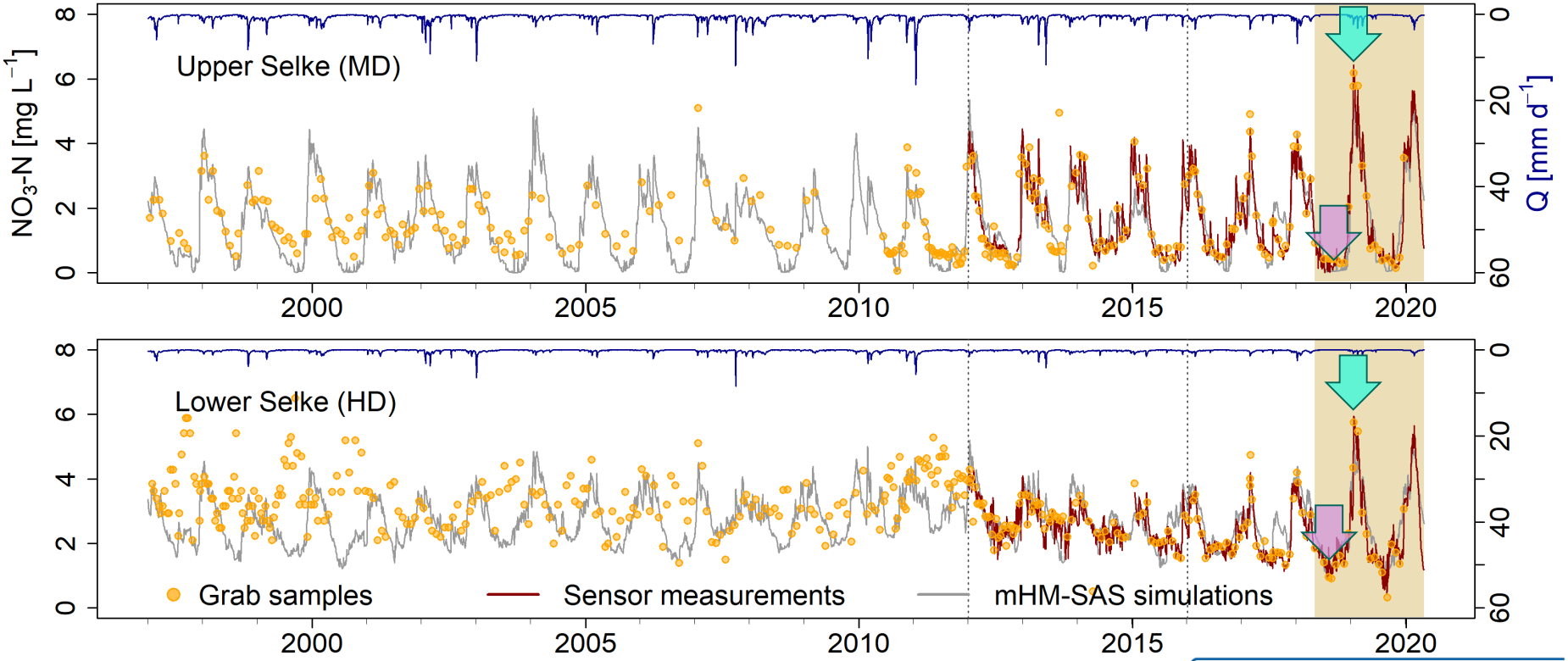
- Mesoscale heterogeneous catchment with 3 nested gauges
- Upstream (SH and MD): short transit times
- Downstream (HD): long transit times

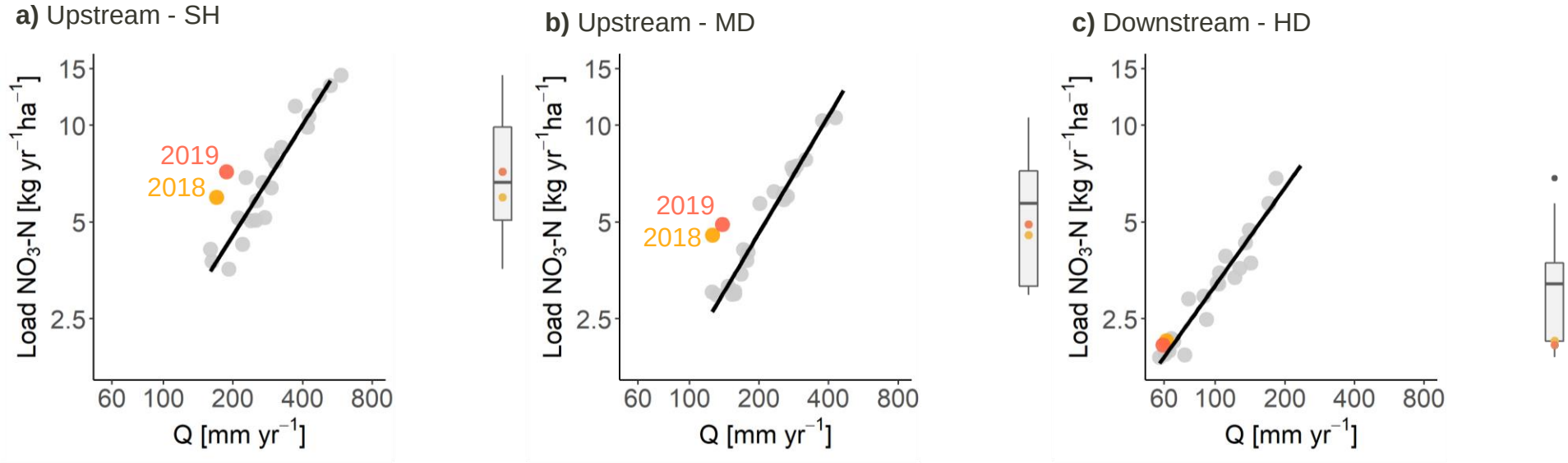
Data

→ Very low nitrate concentrations during dry summers

→ Exceptionally high concentrations during rewetting



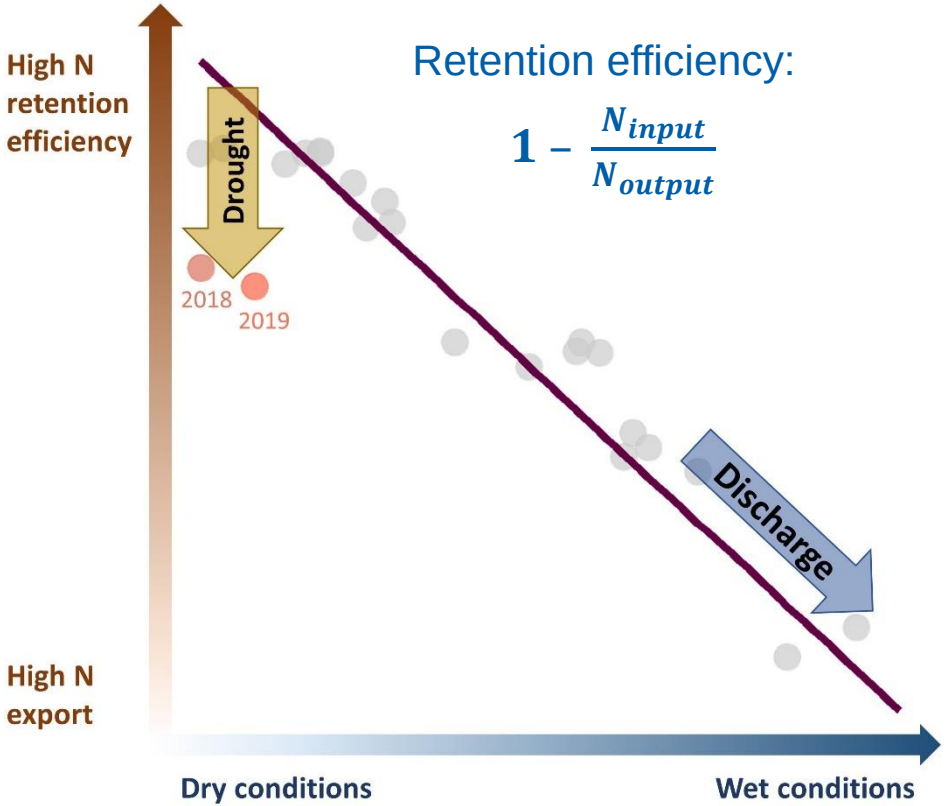
Drought impact on stream nitrate export



Upstream: Loads are close to the long-term median, but relative to discharge they are exceptionally high

Downstream: Loads are small compared to previous years, but in line with the Load-Discharge relationship

A multi-year drought can decrease N retention capacity of a catchment



Retention efficiency:

$$1 - \frac{N_{input}}{N_{output}}$$

- Lower N denitrification and plant uptake in dry soils cause a higher provision of N for leaching with rewetting
- Catchment specific transit times control the timing of drought impacts on stream nitrate concentrations

➢ **Increasingly long and hot droughts pose a risk to water quality at catchment scale**

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References

Nguyen, T. V., Kumar, R., Musolff, A., Lutz, S. R., Sarrazin, F., Attinger, S., & Fleckenstein, J. H. (2022). Disparate Seasonal Nitrate Export From Nested Heterogeneous Subcatchments Revealed With StorAge Selection Functions. *Water Resources Research*, *58*(3), e2021WR030797.

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