Can runoff event types explain scatter in nitrate C-Q relationships?

Saavedra F.[1*], Musolff A.[2], Merz R.[1], Von Freyberg J.[3,4], Basso S.[1], Tarasova L.[1]

[1]*Department of Catchment Hydrology, UFZ*
[2]*Department of Hydrogeology, UFZ*
[3]*School of Architecture, Civil and Environmental Engineering, EPFL*
[4]*Mountain Hydrology and Mass Movements, Swiss Federal Institute for Forest, Snow and Landscape Research, WSL*

✉ → *felipe.saavedra@ufz.de*

Can runoff event types explain scatter in nitrate C-Q relationships? → **YES**

Saavedra F.[1*], Musolff A.[2], Merz R.[1], Von Freyberg J.[3,4], Basso S.[1], Tarasova L.[1]

[1]*Department of Catchment Hydrology, UFZ*
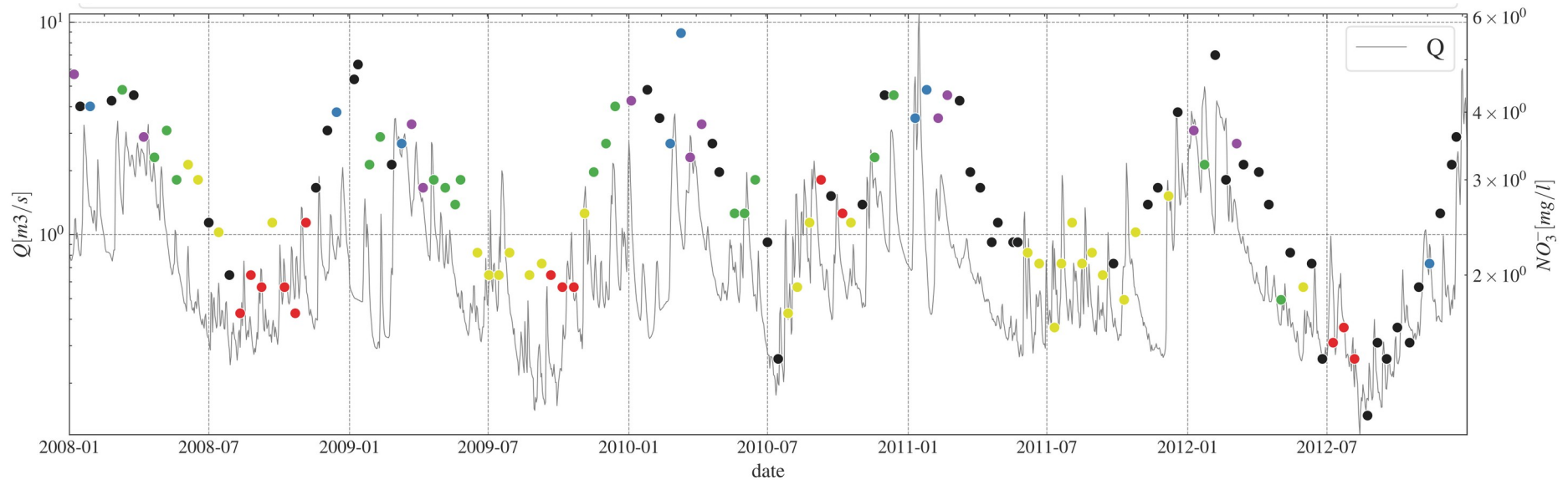[2]*Department of Hydrogeology, UFZ*
[3]*School of Architecture, Civil and Environmental Engineering, EPFL*
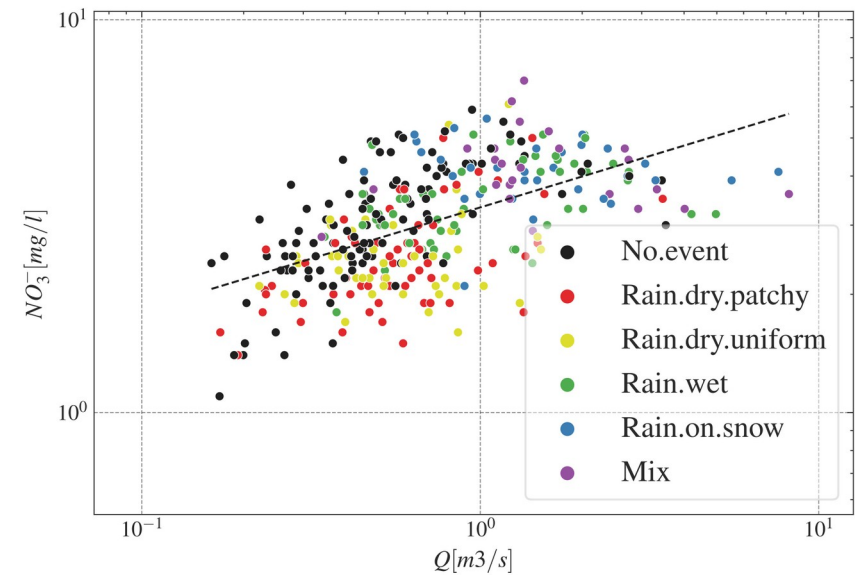[4]*Mountain Hydrology and Mass Movements, Swiss Federal Institute for Forest, Snow and Landscape Research, WSL*
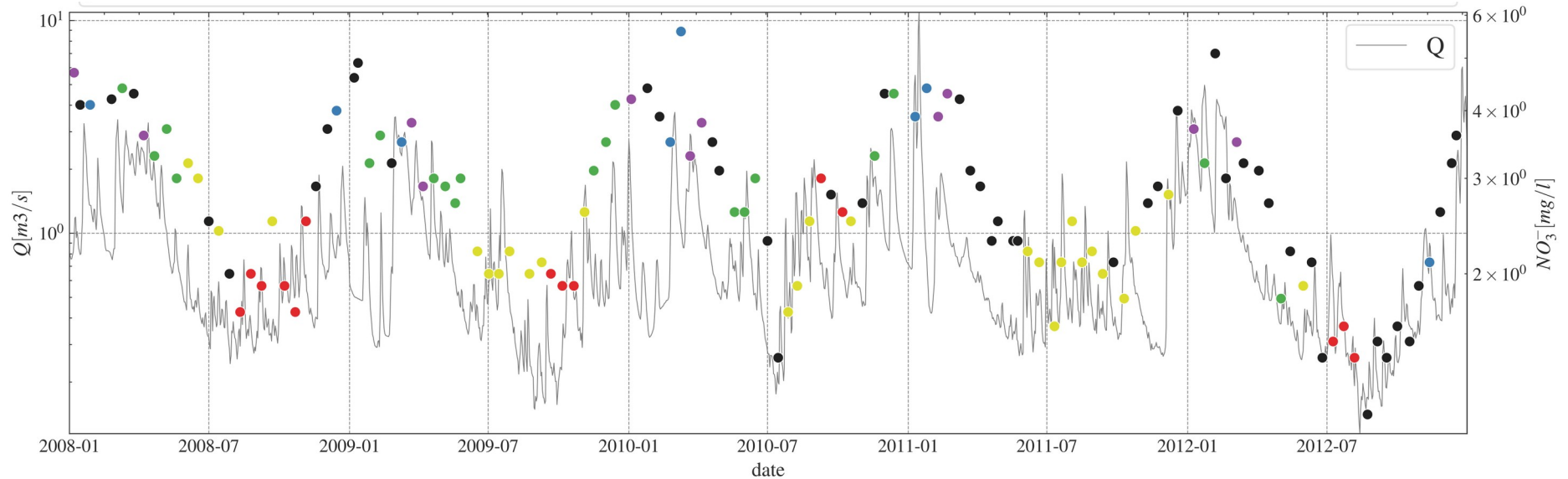
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Naab River - Germany

long-term cQ relationship:
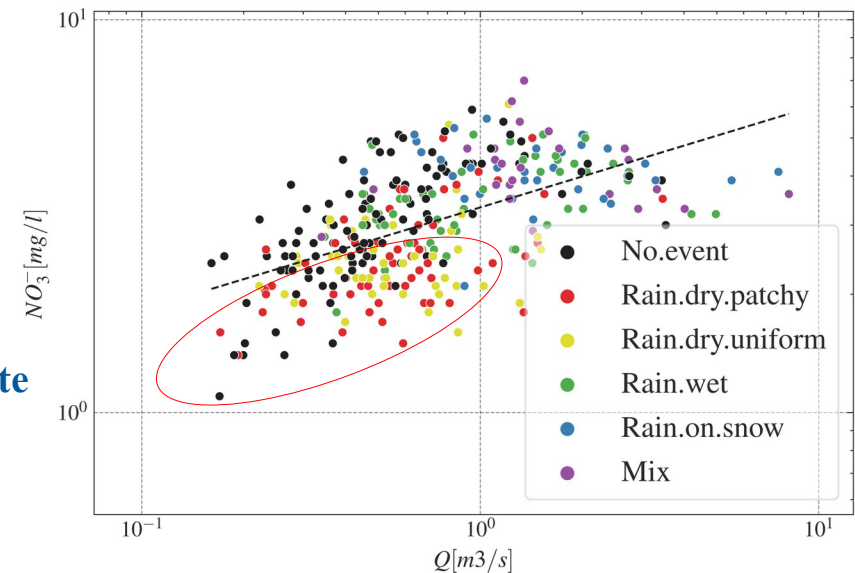
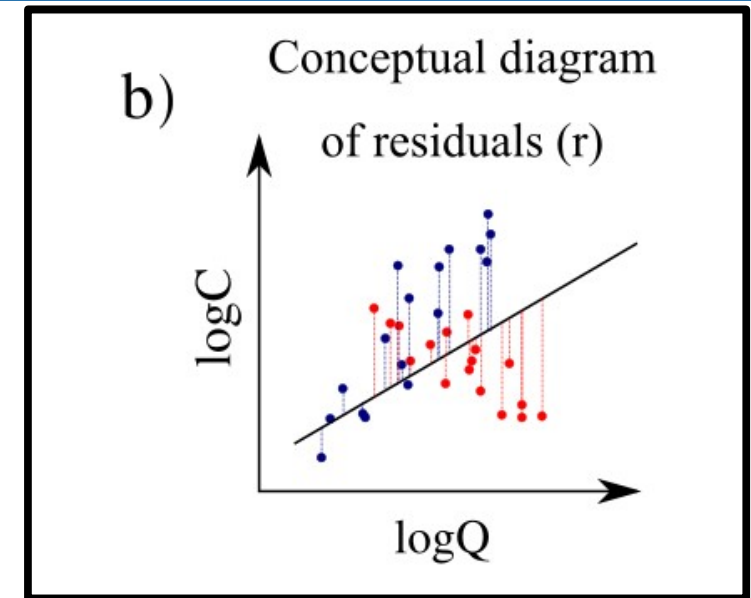$$\log(C_{sim}) = a + b \cdot \log(Q_{obs})$$

Naab River - Germany

long-term cQ relationship:

$$\log(C_{sim}) = a + b*\log(Q_{obs})$$

Research question::

Can runoff event types explain scatter in nitrate C-Q relationships?

1. **We computed the residuals of the long-term C-Q**

2. **184 German catchments with low-frequency nitrate measurements**

3. **Different event types (Tarasova et al., 2020):**

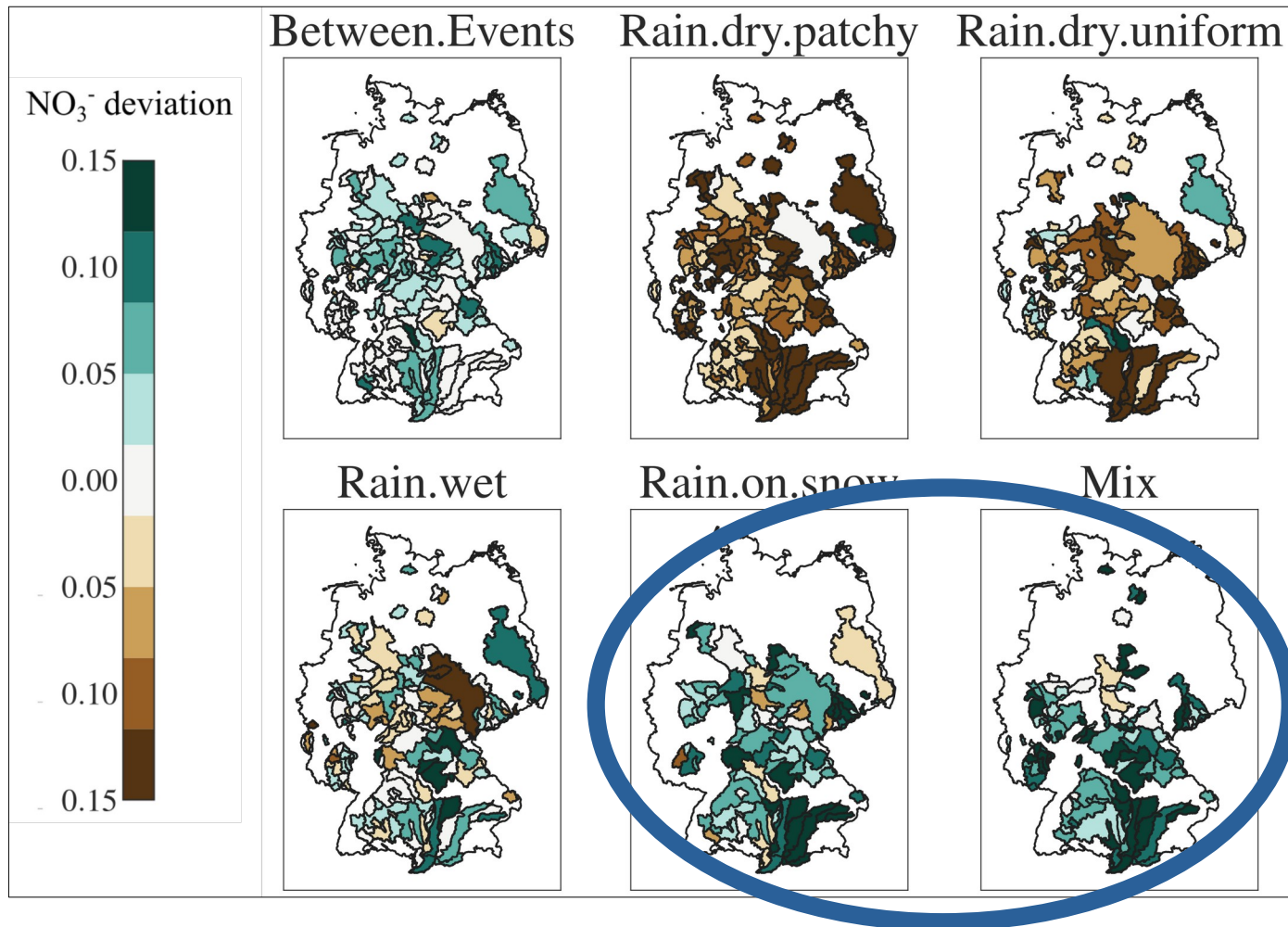b) Conceptual diagram of residuals (r)

logC

logQ

1. We computed the residuals of the long-term C-Q

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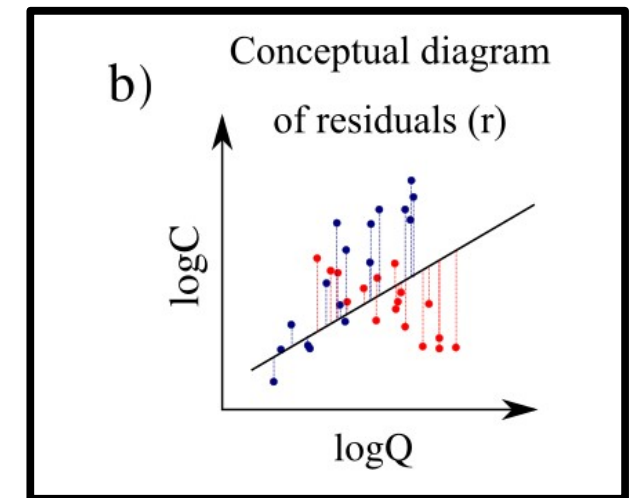
3. Different event types (Tarasova et al., 2020):
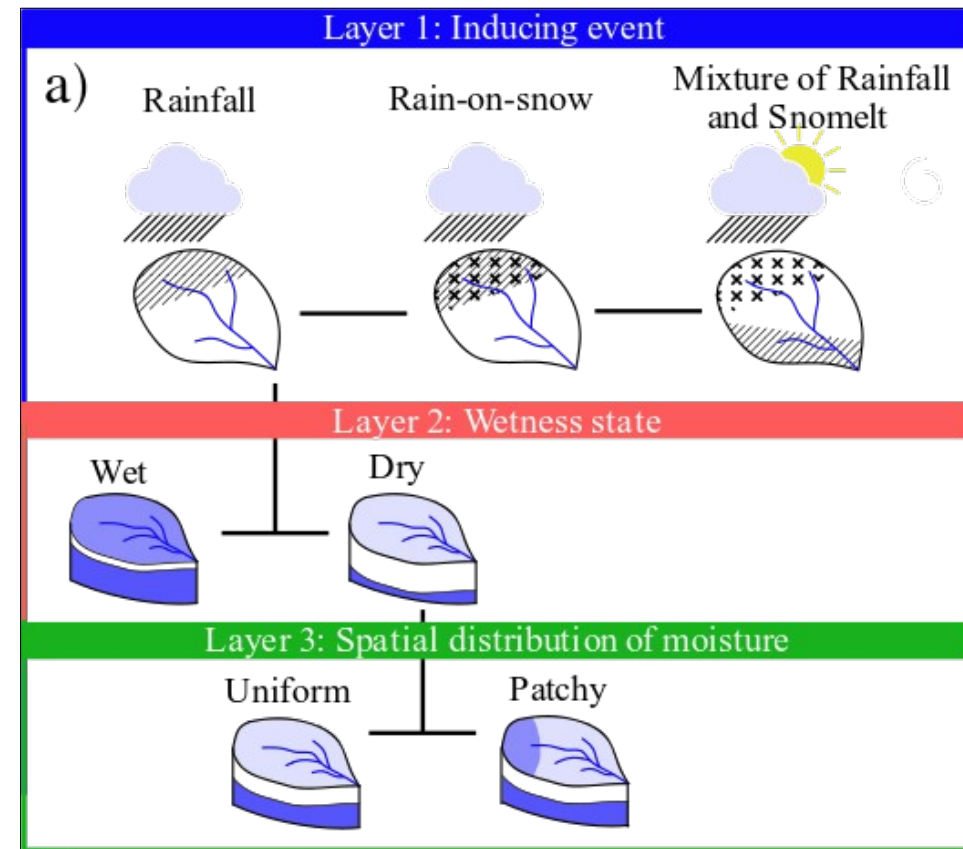
5. Results

- We identified **pronounced and persistent deviations** of the long-term C-Q relationship.
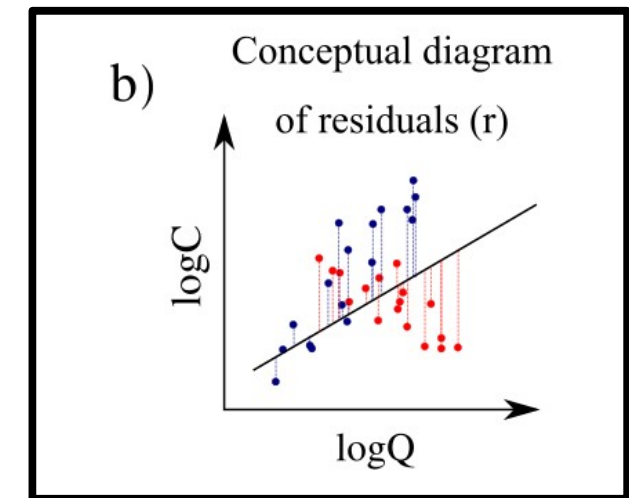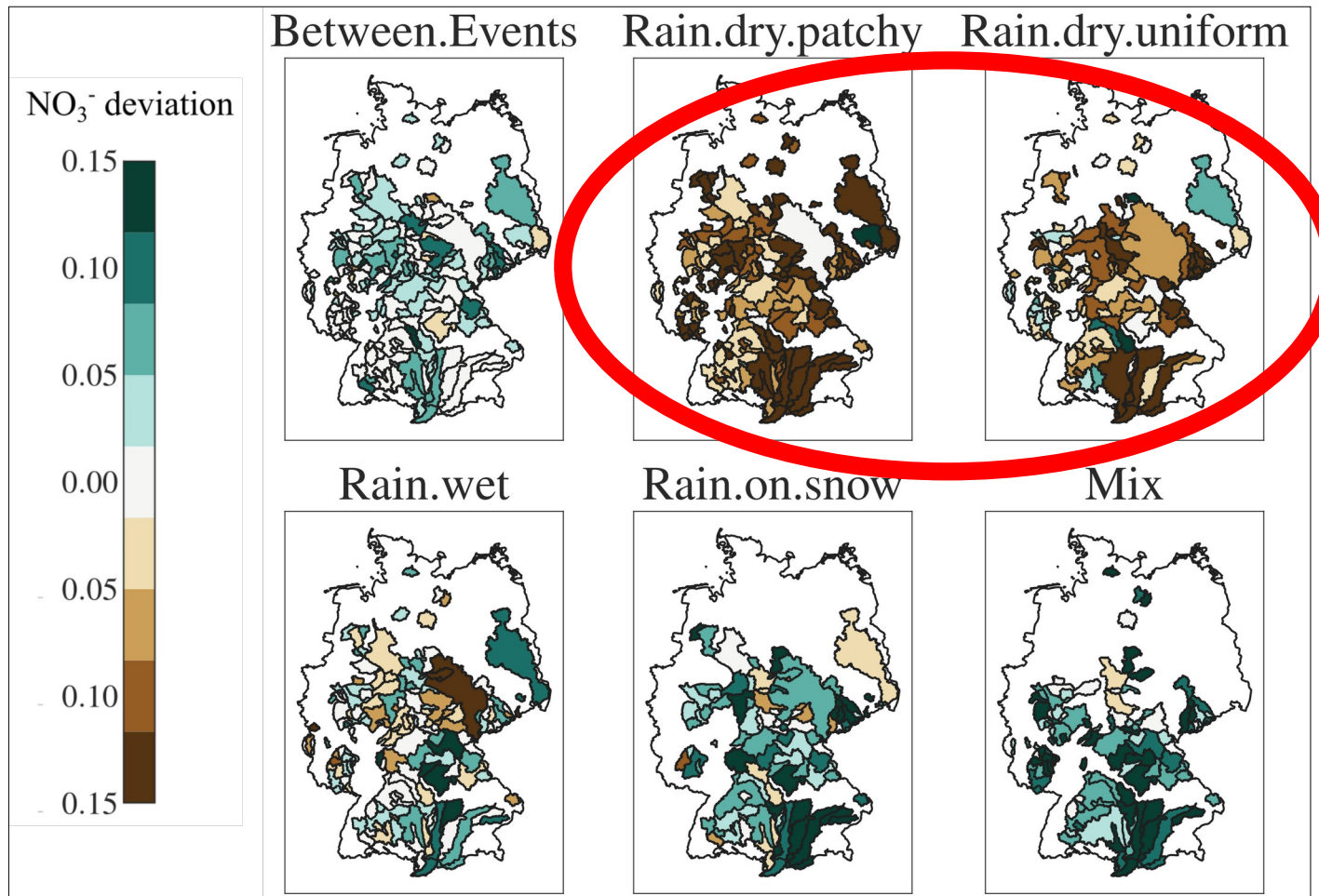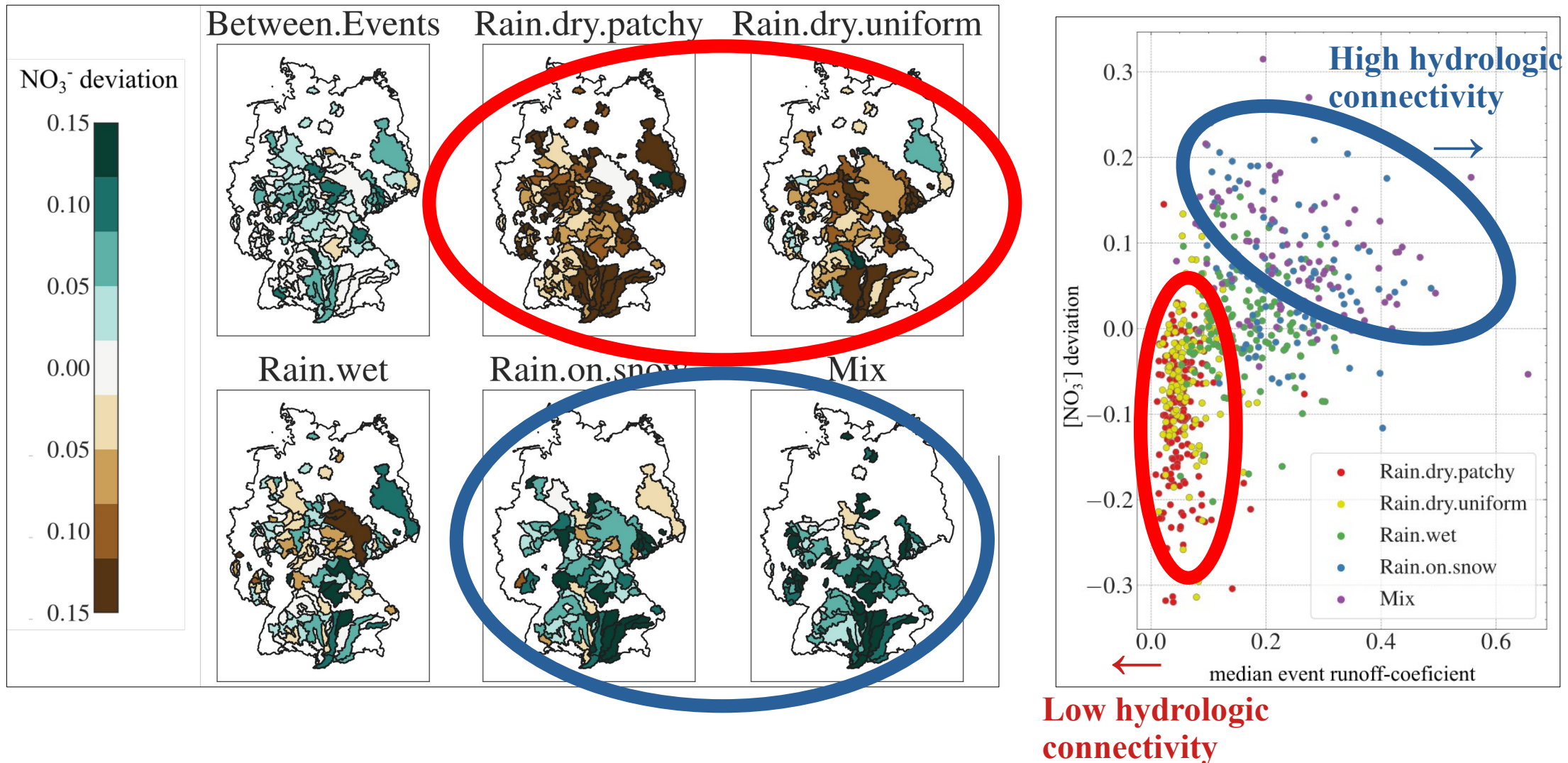

Snow-impacted events

- We identified **pronounced and persistent deviations** of the long-term C-Q relationship.

Rain events on dry-soil

- **Deviations vs hydrologic connectivity (quantified as event-runoff coefficient)**

6. Key Messages

- **Snow-impacted events produce increased nitrate mobilization across German catchments**

- **Instead, rainfall on dry soil produce lower nitrate concentrations.**

- **Contrasting levels of hydrologic connectivity might play a key role controlling nitrate transport due to the activation of faster flow paths between sources and streams.**

Preprint $\rightarrow$ Saavedra, F., Musolff, A., von Freyberg, J., Merz, R., Basso, S., & Tarasova, L. (2022). Disentangling Scatter in Long-Term Concentration-Discharge Relationships: The Role of Event Types. EGUsphere, 1–27. https://doi.org/10.5194/egusphere-2022-205
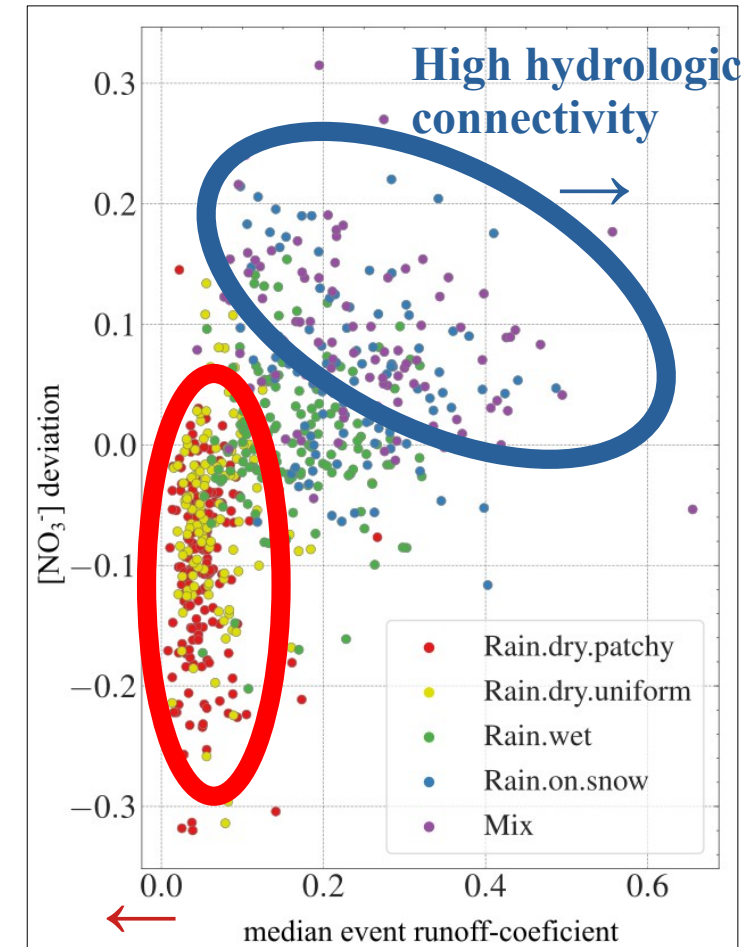
Thanks!

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- Saavedra, F., Musolff, A., von Freyberg, J., Merz, R., Basso, S., & Tarasova, L. (2022). Disentangling Scatter in Long-Term Concentration-Discharge Relationships: The Role of Event Types. EGUsphere, 1–27. https://doi.org/10.5194/egusphere-2022-205

- Tarasova, L., Basso, S., Wendi, D., Viglione, A., Kumar, R., & Merz, R. (2020). A Process-Based Framework to Characterize and Classify Runoff Events: The Event Typology of Germany. Water Resources Research, 56(5), e2019WR026951. https://doi.org/10.1029/2019WR026951