QUADICA: A large-sample data set of water quality, discharge and catchment attributes for Germany

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QUADICA repository

Ebeling et al. 2022, under review for ESSD

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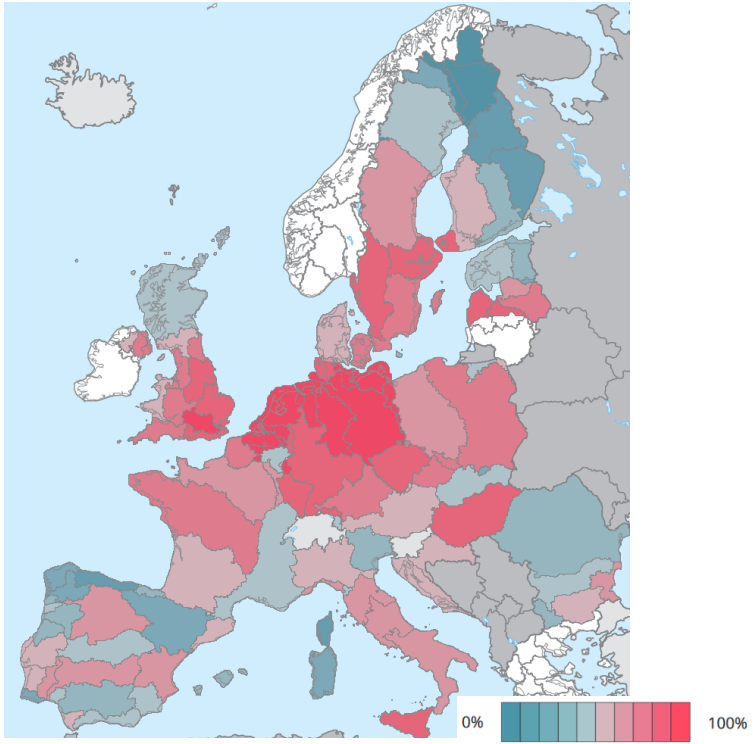
Motivation

- Degraded water quality is a main challenge
- Catchments = unit of interest

→ Understand functioning

- Large-sample hydrology to move beyond the single catchment
- Catchment similarities and differences
- Data are the key
- Several data sets exist

→ Consistent large-sample hydrological data set with a focus on water quality



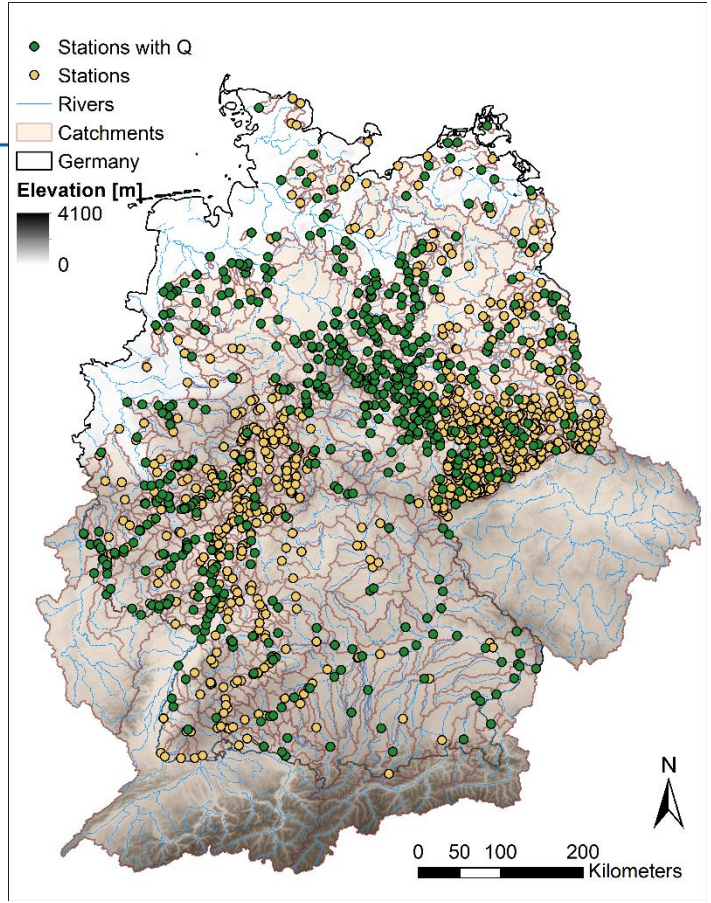
Surface waters not in a good ecological status (EEA, 2018)

What is QUADICA?

“water **QUA**lity, **DI**scharge and **C**atchment **A**ttributes for large-sample studies in Germany”

Data set of 1386 catchments

- Water quality (riverine macronutrient concentrations)
- Water quantity (discharge)
- Meteorological forcing
- Diffuse nutrient input data
- Catchment boundaries and attributes



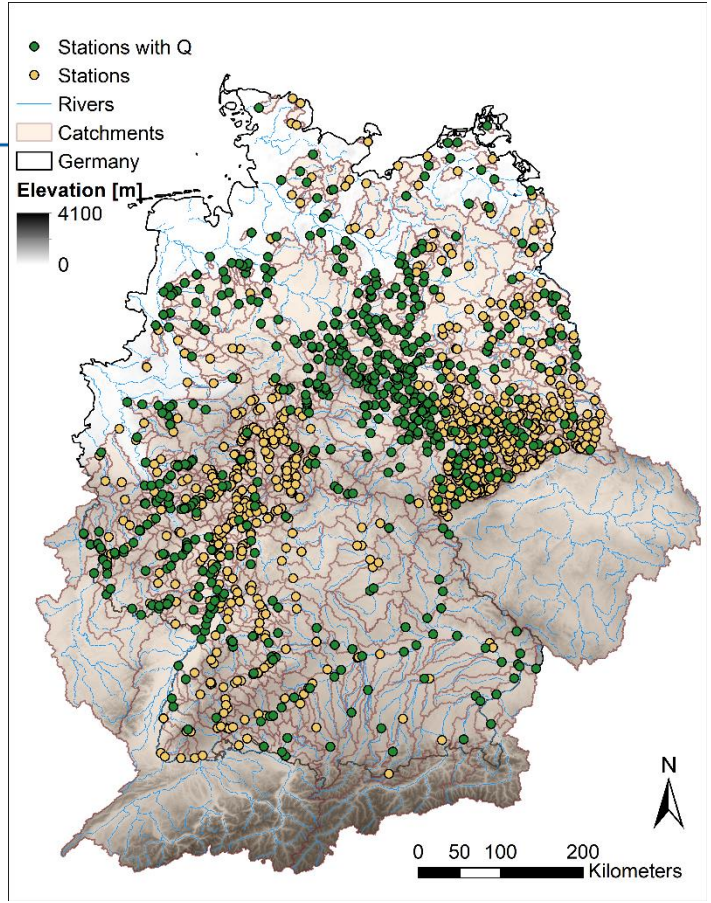
Stations and catchments of the QUADICA data set

Data basis and catchment selection

Data from environmental authorities

Criteria:

1. Data availability
   - At least 3 years, all seasons, ≥70 samples from 2000 (regarding NO_3^-, PO_4^{3-})
2. Catchment delineation
   - 100m DEM
   - Flow direction and accumulation
   - Catchment areas match river network (manual checks)



Stations and catchments of the QUADICA data set

Data in QUADICA

Annual median & long-term monthly median (observed)

- NO_3-N, N_{min}, TN, PO_4-P, TP, DOC, TOC
- Q → n=590

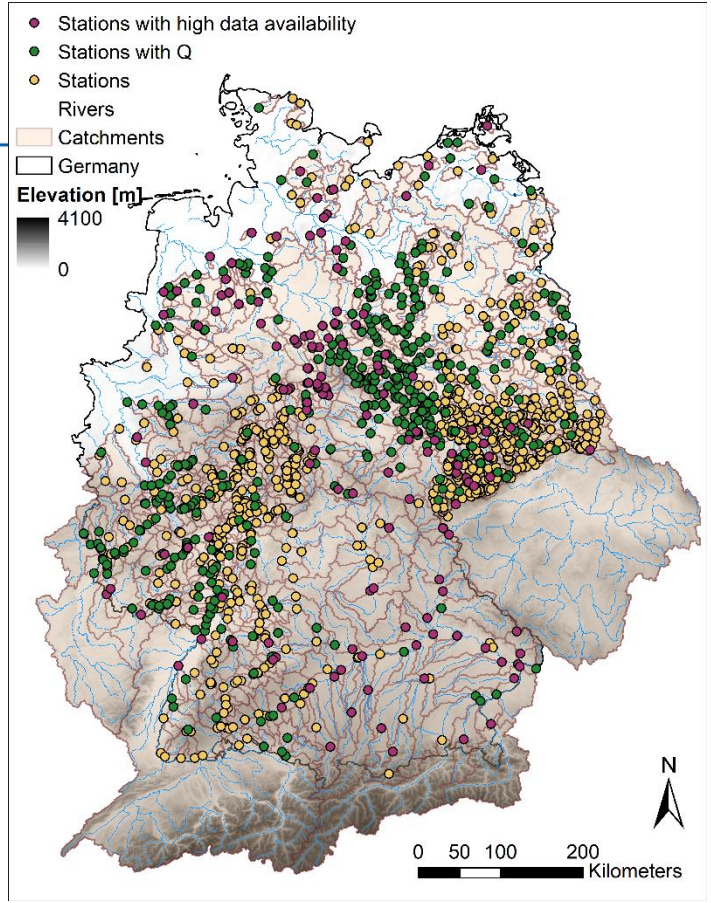
High data availability (≥20 years C, daily Q) → n=140

- Reconstructed daily C time series → monthly C, Q and load

Forcing data

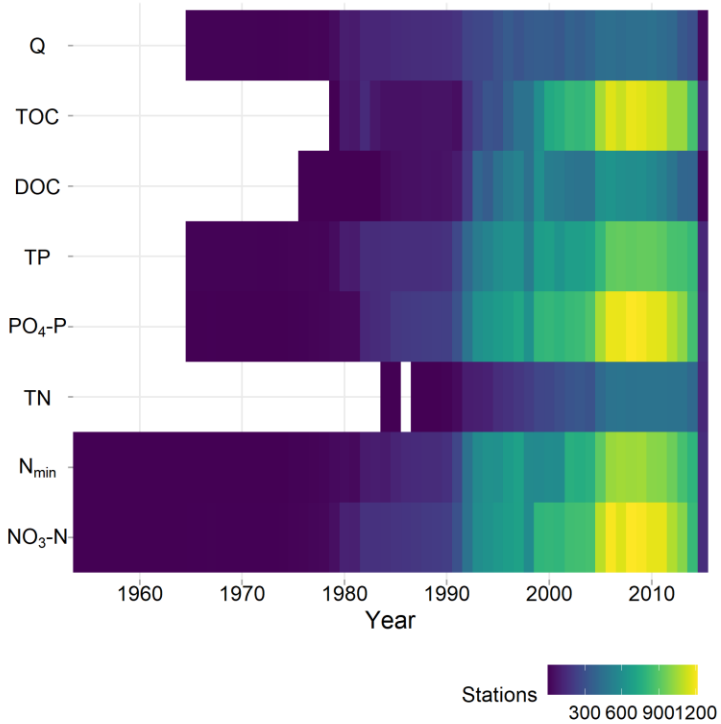
- Monthly P, PET, T
- Annual diffuse N input

Catchment attributes (>100)



Stations and catchments of the QUADICA data set

Data in QUADICA



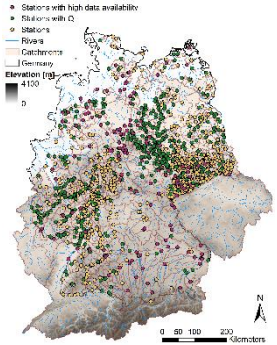
Data density of annual median concentration and discharge data in QUADICA

Conclusions and Outlook QUADICA

QUADICA repository

Ebeling et al. 2022, under review for ESSD

- High spatio-temporal coverage
- Harmonized, comprehensive data set
- Various nutrients
- Ready-to-use metrics



Opportunities

- Spatial and temporal patterns in water quality and quantity
  - Archetypes and controls of mean concentrations and concentration-discharge relationships (Ebeling et al. 2021 WRR)
  - N trajectories: legacies (Ehrhardt et al. 2021 WRR), seasonality (Ebeling et al. 2021 GBC)
- Average concentrations, trends, seasonality, trajectories, and dominant drivers
- Calibrate and validate water and solute transport models
- Single to multiple catchment analyses at national scale

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Earth System Science Data Discussions

Water quality, discharge and catchment attributes for large-sample studies in Germany - QUADICA

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Abstract. Environmental data are the key to define and address water quality and quantity challenges at catchment scale. Here, we present the first large-sample water quality data set for 1386 German