

Wasser IQ Water: AI-supported modeling and forecasting of biodiversity and water quality in drinking water reservoirs



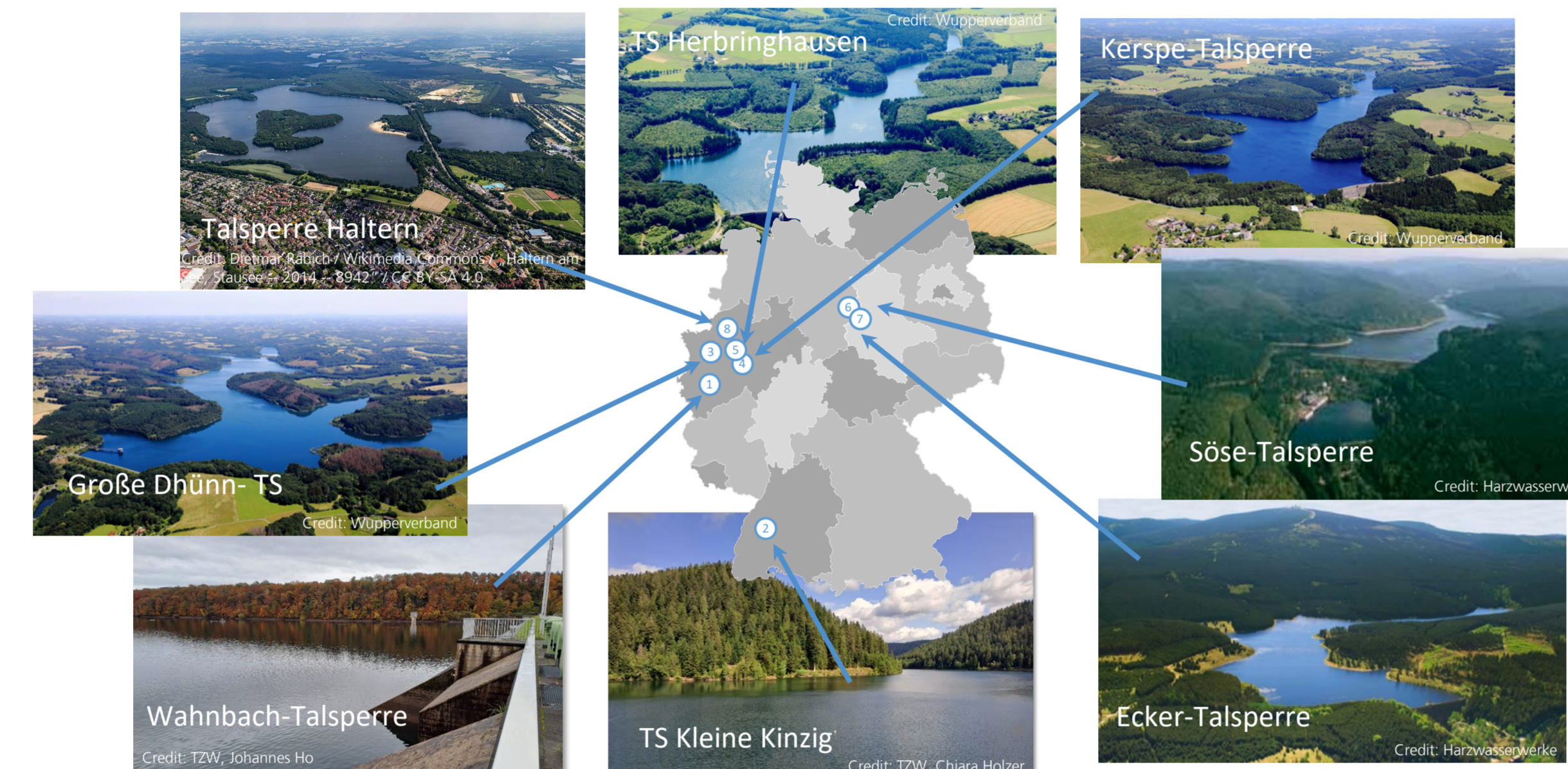
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Project Goals

- (1) Use of molecular methods for AI-supported microbial biodiversity monitoring
- (2) Development of eDNA-based methods for detecting invasive species
- (3) Advancement of sensor technologies for rapid detection of algae and cyanobacteria
- (4) Identification of sources of microorganisms relevant to hygiene and antibiotic resistance
- (5) AI-based tools for data analysis and forecasting
- (6) Integration of a Citizen Science - AI approach for biodiversity monitoring

Working Areas

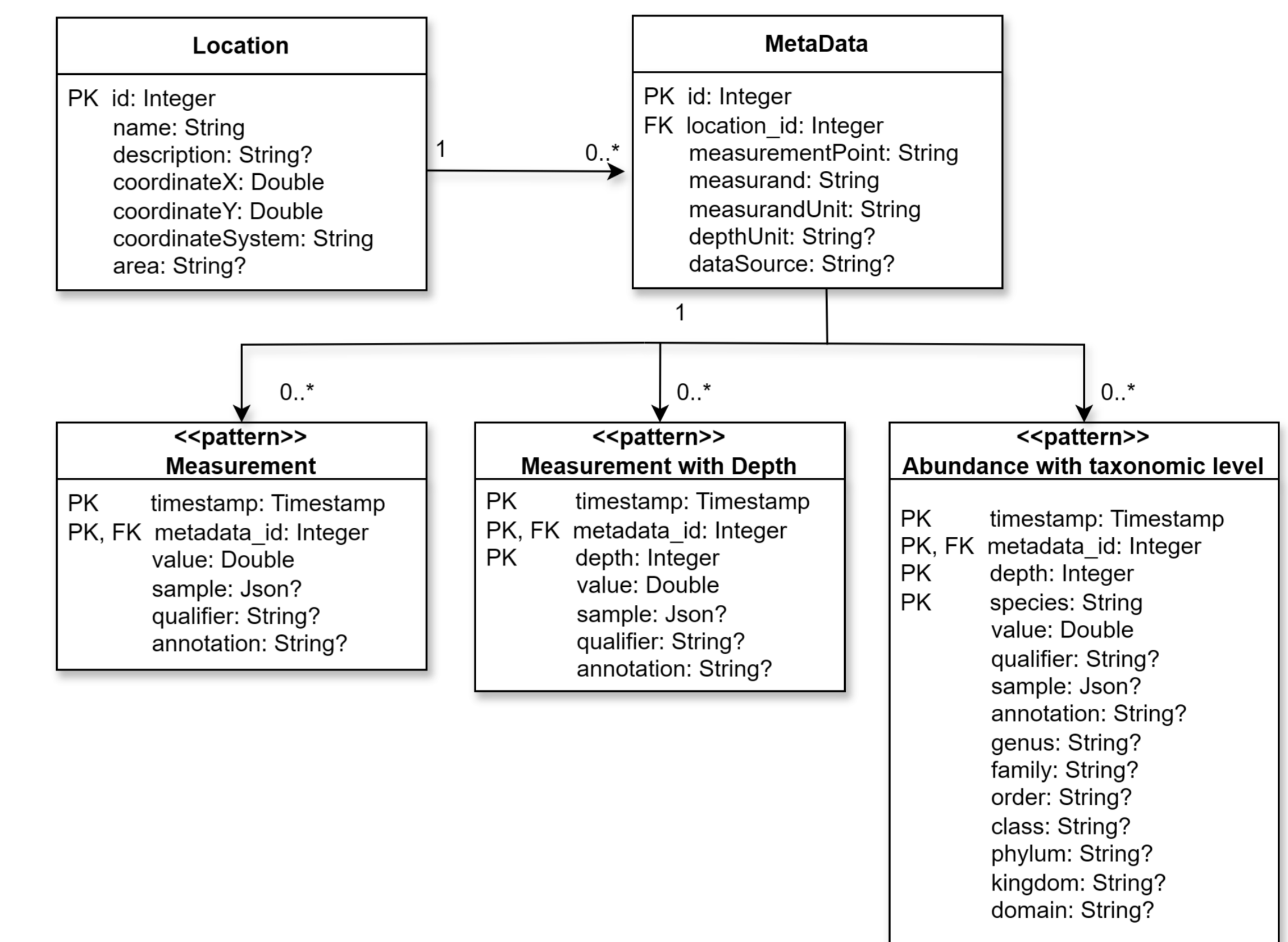


Data Perspective

- From a data analytics perspective, each reservoir can be seen as a data silo with sub-silos
- Each reservoir has its own relevant data patterns
- A variety of analyses produces heterogeneous data, each with different requirements to a data model

Challenge: Efficiently characterize and structure measurements from reservoirs

Data Model

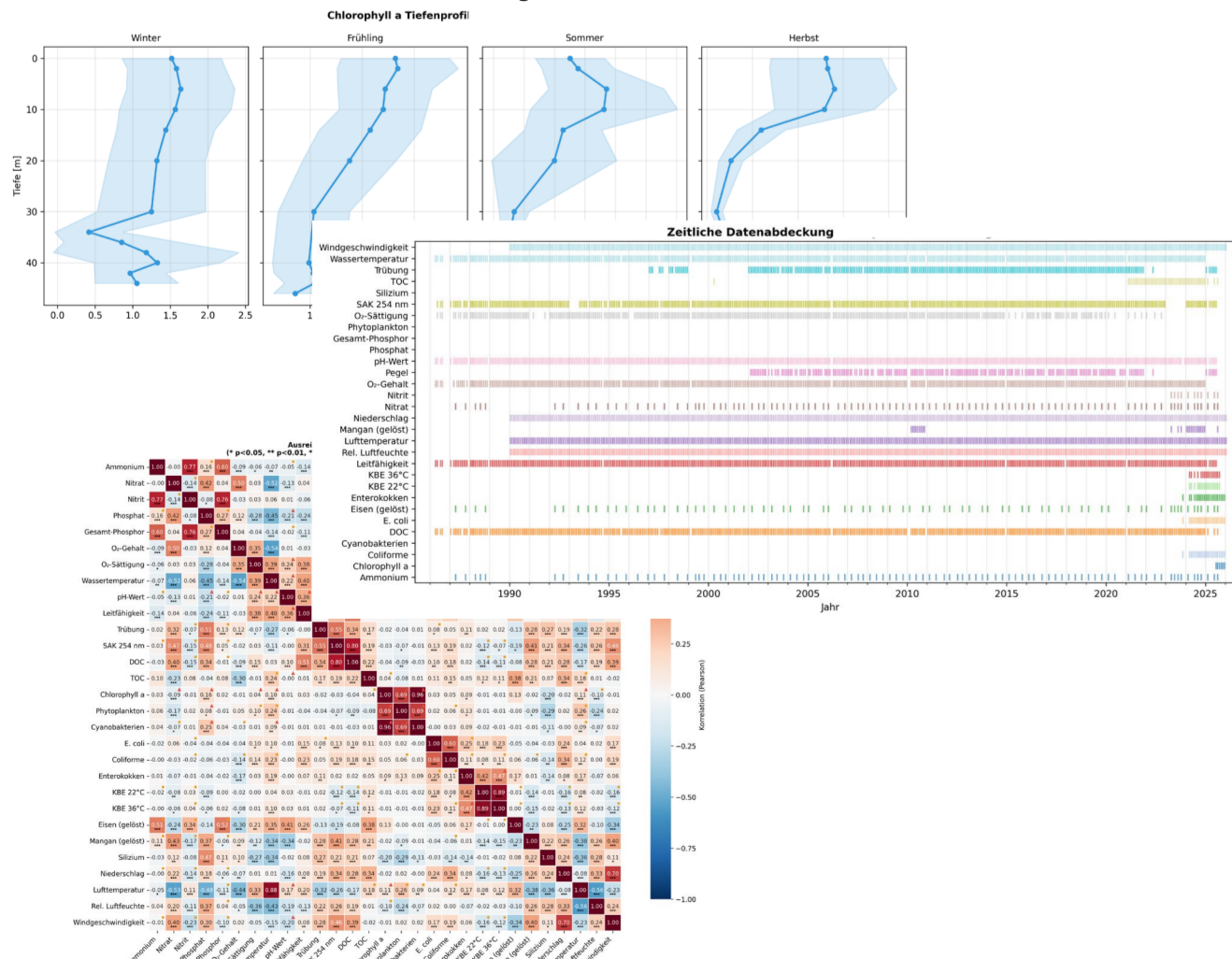


What did we do with the data so far?

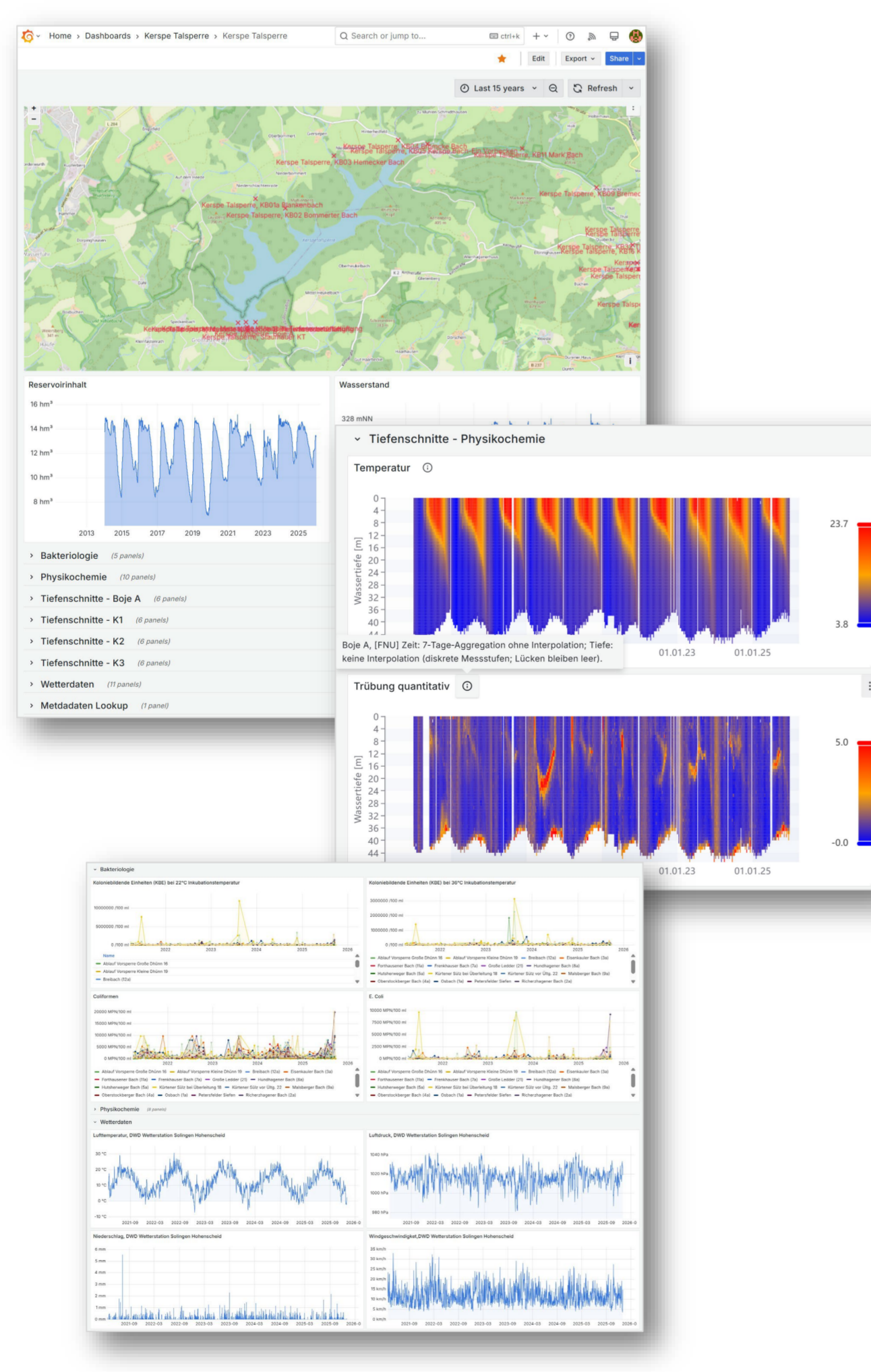
Semi-Automated Explorative Data Analysis Reports

Reports covering the topics:

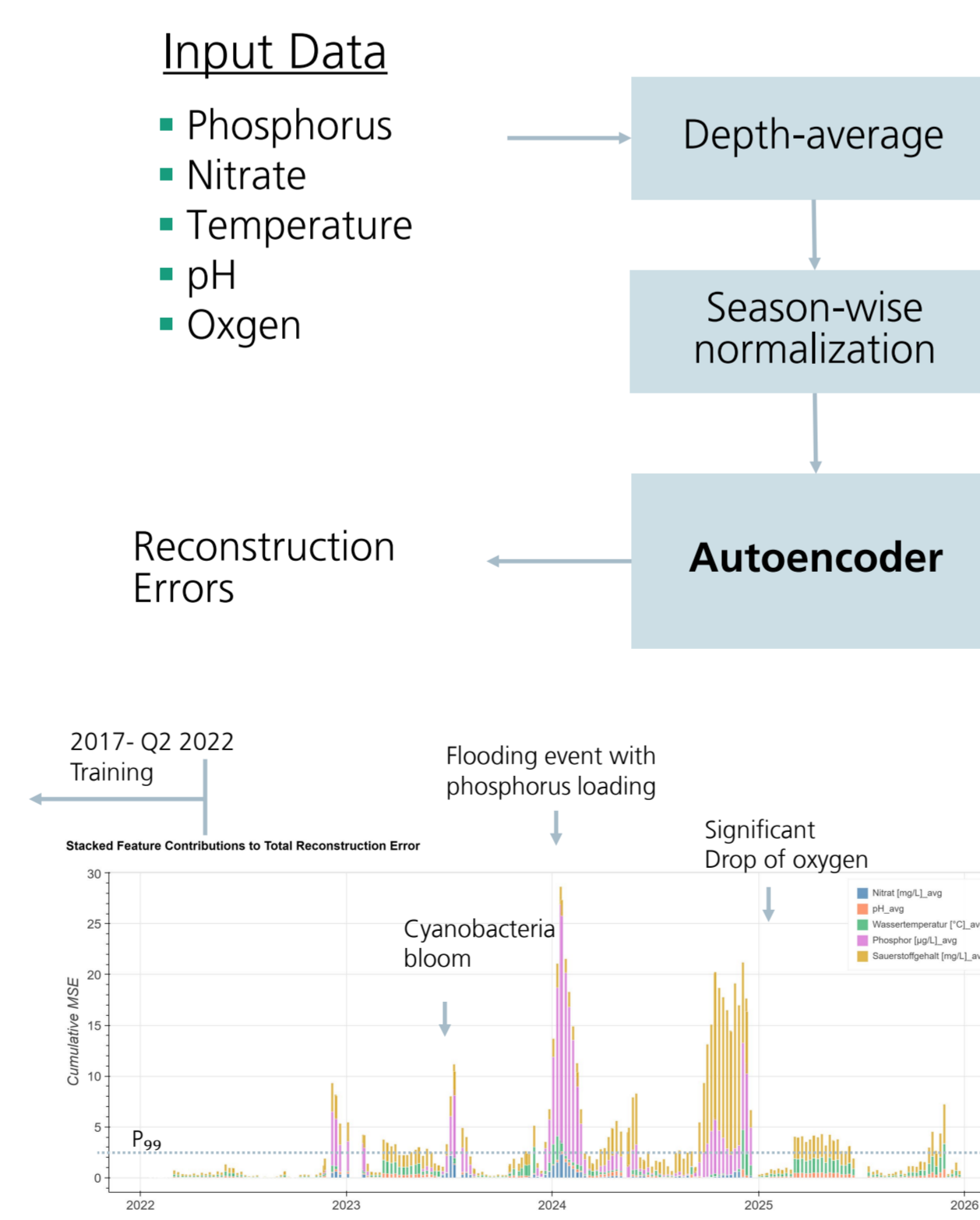
- (1) Data Availability
- (2) Correlation analyses (surface data)
- (3) Depth dependent analyses
- (4) Correlations over time (including depth and surface data)
- (5) Trend Analyses
- (6) Anomaly Detection
- (7) Cluster Analyses



Interactive Grafana Dashboards

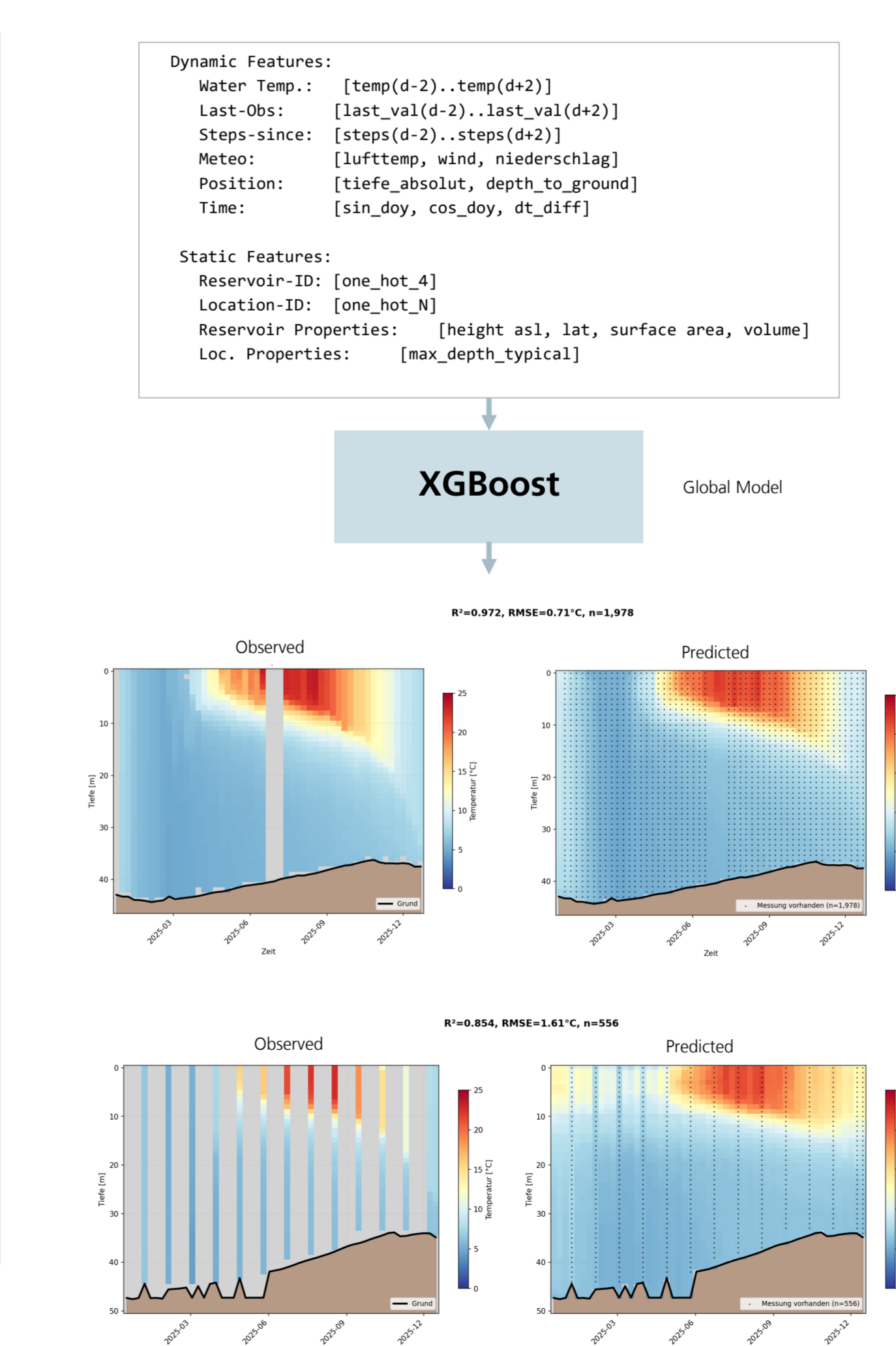


Reservoir Fingerprints



Challenge: The "norm" has changed significantly in recent years: what exactly constitutes an anomaly?

Water Temperature Forecasting



Preliminary Results

- Seasonal, dam- and depth-dependent variation in microbial biodiversity
- Distinct biodiversity patterns among different reservoirs
- Data are extremely sparse and heterogeneous which poses a significant challenge for ML-based approaches
- Usefulness of a common data model for ML-based analyses was demonstrated

Next steps

- Integrate new data types into the data model and the database (e.g., from Raman Spectroscopy)
- Develop algae bloom forecasting models that integrate eDNA data
- Knowledge generation approaches based on newly available eDNA data



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