Changing conditions for example elevated inputs, land use & climate change have to be considered. The development of a statistically refined monitoring-network integrating a multi-isotopic approach is one primary objective of the conducted study.

**Introduction**

Isotope studies conducted over large spatial and/or temporal scales can provide powerful insights into natural hydrological and hydrochemical processes and the effects of anthropogenic influences. The challenge of this project is to characterize and quantify large (regional) scale dynamics and trends in water and solute fluxes of the TERENO Bode catchment (Fig.2).

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**Field Monitoring**

Surface water sampling of main tributary rivers and detection of on-site parameters (EC, O2, Redox potential, temperature)

Precipitation water sampling

133 sampling sites and 25 intensive sampling sites (Fig.1)

**Laboratory Analysis**

Basic hydrochemical composition (main anions & cations)

Stable isotopes:

- δ2H/δ18O of H2O
- δ15N and δ18O of nitrate
- δ34S, δ18O of sulfate
- δ13C-DIC, δ13C-DOC

**Results**

The δ2H/δ18O-isotopic signature of water provides an ideal conservative tracer of water sources and mixing processes which is useful for quantifying flow contributions from different tributaries and groundwater as well as active evaporation processes (Fig.3 & 4). The detection of δ13C-DIC may help depict the influence of certain soil processes like degradation of organic matter (Fig.5, right).

Isotopic signatures of NO3 (Fig.6, left) yield information on nitrogen transformation processes. Isotopes of SO4 (Fig.6, middle) can be used to quantify different input factors and the influence of sulfate reduction & mixing processes.

**Statistical Analysis**

Statistical analyses of temporal and spatial isotope distribution pattern

Combination of isotope pattern (Fig.6) with available area data (e.g. soil, vegetation, land use, geology …)

**Outlook**

**Paired Catchment Study**

Erlauf River in the Alpine foothills, Austria

45 surface water sampling sites (Fig. 7)

Main differences:

- Altitude, precipitation, geology, size etc.

Fig.7: Left: River Erlauf, a tributary of the river Donube, Austria; Right: Catchment with corresponding sampling sites

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