Origin and historical inputs of suspended particulate matter (SPM) from the Rhône tributaries: use of the non-reactive geochemical signature of particles.

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Objectives:
- Determine the origin of SPM from the Rhône River tributaries:
  - Estimate relative contributions of SPM fluxes using conservative tracers (major and trace elements in the residual fraction, particle size correction)
  - Estimate uncertainties associated with these contributions
- Determine the historical SPM inputs of the tributaries by applying the fingerprinting approach on a sediment core.

Context:
- The determination of sediment origin is essential to manage suspended particulate matter inputs in river systems.
- SPM contribute to the transport of a large amount of essential contaminants in rivers.
- The Rhône River is the main sediment input to the Mediterranean Sea. The Rhône sediment observatory (OSR) program aims to develop a fingerprinting approach in Rhône River watershed with a large number of SPM samples over 7 years (n = 300).

Material and methods:
- The SPM sampling strategy includes centrifugation (C) Approximately 4h, Particle trap (PT) (2 weeks to 1 month), and the Rhône River basin enlarged map.
- The sample treatment and analysis involves total mineralization, soft extraction, heating block, and data treatment and geochemical mixing model.

Residual metal concentrations in SPM samples:
- Residual Al, Ba, and Zn concentrations in SPM in Rhône River tributaries.

Source fingerprinting in the Upper Rhône:
- Geochemical mixing model results from SPM data: relative source contributions in %.
- The data treatment and geochemical mixing model involves Kruskal-Wallis test + Discriminant Function Analysis → tracer selection, Mixing model + Monte Carlo analysis (1000 repetitions) + relative source contribution estimates + uncertainties, and Data treatment: standardisation, particle size correction (Gelli and Now, 2011).

Conclusions:
- Original approach to trace with the residual fraction of SPM in Upper Rhône
- Discriminant elements were found
- Robust relative contribution results at the sample and Upper Rhône scales
- Try to reduce uncertainties of relative contributions by applying a particle size correction factor [1]
- Complete the OSR SPM database as a number of samples are missing, on some tributaries, to trace SPM sources at Arles stations and in sediment core
- Historical SPM inputs in the Upper Rhône
- Compare SPM and sediment core results

Perspectives:
- Application of the non-reactive geochemical signature of particles to SPM in Rhône River tributaries
- Improve the approach with more samples and different sites

References:
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