Collaborative field trial for the harmonization of sediment sampling protocols in Switzerland

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Context and objectives

• In Switzerland, the 26 cantons are in charge of implementing the Swiss Federal Water Protection Ordinance [1].
• In collaboration with the Federal Office for the Environment (FOEN) the Ecotox Centre (EC) is developing a module for sediment chemical quality assessment.
• The EC conducted a survey and qualitative interviews to the 26 cantons in 2010 [2] and 2015:
  ➔ Until now 14/26 of the cantons have been performing sediment assessment by chemical analyses and comparison to soil or ICPR (Rhin) reference values. However, no harmonized protocols exist considering key steps which are:
    ➔ Fraction of sediment analyzed (2 mm vs 63 µm).
    ➔ Sieving procedure (in situ vs ex situ, dry vs wet).
    ➔ Replicates vs composite samples.
    ➔ Extraction method for metals analysis (HF vs HNO₃ vs Aqua Regia).
    ➔ Performed ancillary measurements

Study objective: Provide recommendations for a harmonized protocol for sediment sampling and pretreatment in Switzerland, taking into consideration current practices and “state of the art”, for chemical quality assessment of sediments by means of sediment quality criteria.

Methodology

Involved parties

Phases

Evaluation of national practices
Harmonized method proposal
Collaborative field trials
Chemical and statistical analyses
Method validation
Publication of the harmonized method

Approach

Surveys + interviews
Relevant literature

Centralized

Consensus

Sites

Site 1
Site 2
Site 3
Site 4

Fig. 3 Sites included in the field collaborative trial: fourteen sites with different regime, river bed, substrate and pollution sources (metal industry, WWTP, agriculture, etc.): 1) Calcareous river; 2) Alpine river; 3) Agricultural channel; 4) Lake delta.

Sampling and sieving methods

A Direct sampling in situ
B Composite sample
C Wet sieving
D Freeze-drying

Fig. 4 Illustration of cantons with different sampling methods that include different sampling devices, sieving procedure and pretreatment.

Preliminary results

Extraction methods

Fig. 5 Comparison of Cu concentrations at sites 1 to 4 (Fig. 3) after different sample pre-treatment (sieving 2 mm vs 63 µm and extraction). Yellow line: Flemish SQG for copper (20 mg/kg dw). Depending on the extraction used, sediment Cu concentration is above or below the threshold value.

Conclusions and perspectives

• The selection of the sediment fraction to analyze (63 µm vs 2 mm) and the extraction method is critical for any future comparison with effect-based SQGs for sediment quality assessment.
• All samples from the field trial are currently being analyzed.
• Depending on the results, recommendations for the sediment fraction and pre-treatment will be provided.
• A performance test will be carried out using the proposed harmonized protocol (eight operators at the same site).
• The recommendation of one single method that suits all objectives (e.g. site specific assessment of sediment quality, temporal trend analysis or identification of pollution sources) and types of water bodies appears, challenging.

www.oekotoxzentrum.ch

References