

Sediment quality evaluation: normalisation, baselines and reference sites

- What can and should be compared?

Rodney Stevens¹, Mário Mil-Homens²

¹Department of Earth Sciences, Göteborg University, Box 460, 40530 Göteborg, Sweden Phone: +46-(0)-31-7732807

²Departamento de Geologia Marinha, Instituto Nacional de Engenharia, Tecnologia e Inovação, I.P., Estrada da Portela, Apartado 7586, 2721-866 Alfragide, Portugal E-mail: stevens@geo.gu.se

Introduction: Site-specific assessment of sediments in waterways, estuaries and the coastal zone is motivated by both environmental and economic benefits. At the same time, compatibility and standardisation of the numerous evaluation schemes and prescribed parameters is essential for sustainable and viable management over a longer time in. For instance, the Sediment Quality Triad [1] combining geochemistry, bioassays and benthos evaluations has gained widespread acceptance in Europe. However, this classification does not really integrate and utilise the strengths of the three measures involved. Inconsistent assessments can result from the conflicts between the different sediment quality measures, but this presentation will focus mainly upon the proactive possibilities through using a process-oriented basis for integration of methodologies.

Methods: Some common evaluation methods are compared in Fig. 1. A recent EU project dealing with siltation and environmental sedimentology (H-SENSE) (<http://hjs.geol.uib.no/hsense/>)[2], will be summarised.

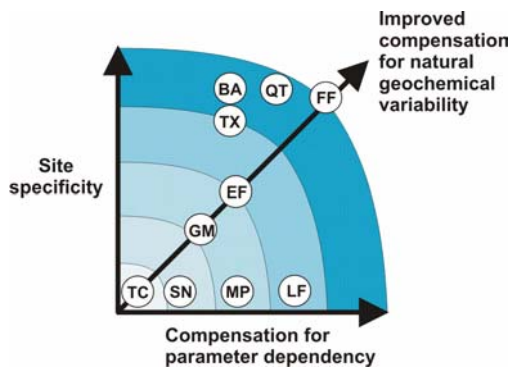


Fig. 1: Different measures of contamination and their relative ability to compensate for sediment parameter dependency and to provide site specificity. Functional Facies (FF) can improve the interpretative basis of geochemical measures (TC= total content; SN=single-parameter normalisation; MP=multi-parameter normalisation; LF=leached, mobile fractions; GM=gradient method; EF=enrichment factors) and provide more efficient use of expensive biological measures (TX=toxicity tests; BA=bioassay; QT=sediment quality triad).

Results: In order to compensation for natural variability in sediment geochemistry, it is desirable to identify correlation to different sediment parameters, often using population statistics. Upward in Fig. 1, the methods have an increased site-specific character. The use of Functional Facies aims to integrate bio-geo relationships, including both parameter relationships and site specificity (Fig. 2).

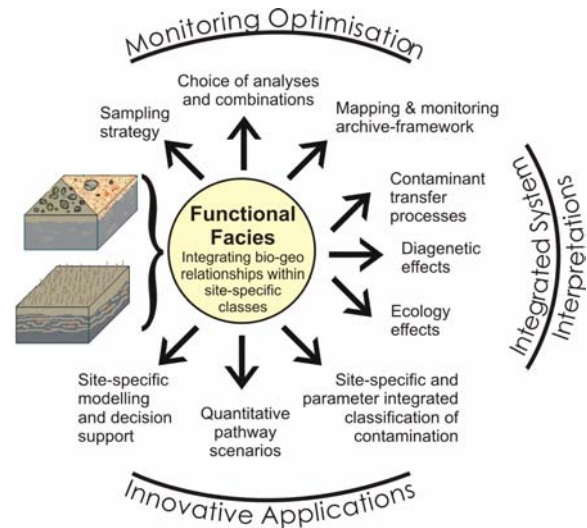


Fig. 2: The documentary and interpretative framework of Functional Facies.

Discussion: An in-depth evaluation of sediment quality implies process understanding. This is complicated in environments impacted by humans, but baseline values and natural processes can also be established from reference sites and models. The Nordre älv estuary is the largest estuary in Europe that has not been exploited as a harbour or shipping route, and offers a unique opportunity for cooperative research regarding catchment and basin-wide responses to changes in the natural (e.g. climatic) and societal influences over a longer time. This, and the continued development and integration of methods for sediment quality evaluation, is considered appropriate for a broader, cooperative project.

References: [1] Chapman et al. (1987) *Marine Ecology Progress Series* 37: 75-96. [2] Stevens (2003) *Environmental Geology* 43: 432-433.