

***Interactive comment on* “The potential for material processing in hydrological systems – a novel classification approach” by C. E. Oldham et al.**

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I came across this discussion paper while looking for concepts for characterizing pelagic redoxclines in lakes (my background is environmental fluid dynamics; and I mainly work in surface waters). I found the concepts discussed in the manuscript very useful for our systems and was a little bit surprised to see the rather critical reviews. I agree that the manuscript would benefit from a clear definition of the system and corresponding boundary conditions in both - the conceptual discussion and the examples. However, the limitations of the proposed scaling also apply to the redoxclines in our studies, and also here the (turbulent) diffusion coefficient is scale-dependent, non-local, and varies in space and time... But still I can use the concept (e.g. the

non-dimensional number Ne) to identify scales at which this heterogeneity will affect turnover rates of redox-reaction and the conditions, e.g., enhanced transport along preferential transport paths, under which hot-spots are potentially important. The approach further allows to estimate the relative importance of transport limitation for different redox-sensitive elements, and I can apply it to sinking particles to evaluate to importance of transformations during sinking... The point I want to make is that, by taking all limitations into account, the concepts described in the manuscript provide a very useful framework for our current study, and potentially many others more.

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