Poster Number

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Topic	Risk assessment: Problem definition and conceptual model
Title	**Can we possibly derive sediment quality guidelines for chemical mixtures?**
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Summary: In reality, many chemical pollutants are indeed coexisting in the aquatic environment. For example, many antifouling biocide residues are often detected as a cocktail in water and sediment samples collected from coastal environments. Based on literature review of documented studies on the combined ecotoxicity of antifouling biocides, we found that both additive and synergistic effects together account for 80% of all cases in which about 35% cases are synergistic. To allow more accurate risk assessment of concurrently occurring chemicals, there is a need to develop sediment quality guidelines (SQGs) for these mixtures.

In this poster, several possibilities of deriving SQGs for chemical mixtures are introduced and discussed. First, if all components in a chemical mixture are known to share a similar toxic mode of action, we can assume that the combined toxicity of the mixture would follow a simple concentration addition model, and the concept of toxic equivalency quotient (TEQ) could be applied to derive the SQGs based on lethal and/or effect concentrations expressed in terms of TEQ and/or TEQ concentration.

This method has been applied to polychlorinated biphenyls, dioxins and dioxin-like compounds, and chlorinated polycyclic aromatic hydrocarbons. Second, if the mixtures contain chemicals with different toxic modes of action, it is possible to explore the use of the multidimensional species sensitivity distribution (m-SSD) approach.

Here I use binary mixtures of copper (Cu) and zinc pyrithione (ZnPT) as an example to illustrate the m-SSD method. We first conducted standard acute toxicity tests with an array of marine organisms for each chemical alone, and for their mixtures. The Cu-ZnPT mixtures showed a strong synergistic toxic effect to all test organisms. By utilizing all the toxicity data, we are able to construct a two-dimensional SSD in form of a response surface, from which we can derive any specific hazardous concentration for the two compounds. This

novel method can be potentially applicable to a more complex mixture in sediment by employing non-parametric response surface models.

Third, I will highlight the field-based SSD approach, which is integrated with the quantile regression method, can be used to derive sediment quality guidelines for any target chemical with consideration of the presence of chemical mixtures and biological interaction. Forth, I will introduce a novel nonparametric empirical Bayesian approach for deriving field-based SQGs from the relationship between species density and contaminant level in sediment. Finally, I will discuss the pros and cons of each described method, and their implications on sediment quality management.