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Abstract:

A first attempt to predict trace metal concentrations in the Scheldt Estuary with a two-dimensional depth-averaged sediment model

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We use the 2D depth-averaged component of the finite element SLIM to predict trace metal concentrations in the Scheldt Estuary. This model proved to be an efficient tool to describe accurately the hydrodynamics and the transport of dissolved and particulate matter in the Scheldt. As a finite element model, it takes advantage of unstructured grids to get a finer resolution of the coastlines and to increase the resolution where and when it is needed. As a 2D model, its computational cost is rather small, even with rather high temporal resolution, making it particularly efficient to undertake long term studies.

In the Scheldt, trace metals are mainly originating from industrial activities. Even though their release has drastically decreased now, the bottom sediments are still highly contaminated, with the risk of reinfesting water during strong resuspension events. The toxicity of trace metals is generally thought to be low as long as they remain attached to suspended particles. But it is not the case anymore once they are dissolved in the water.

It has been observed that the total metal concentration can be relatively well predicted in the Scheldt by empirical functions of environmental variables such as salinity and turbidity. The total metal concentration can therefore be predicted without having to explicitly represent it as a variable of the model. Moreover, similar empirical regressions are also available to predict the metal partition coefficient  $K_D$ , which is the ratio between particulate and dissolved metal concentrations. The dissolved-particulate speciation can therefore also be reconstructed a posteriori with this method. Although it does not allow to understand the observations, this empirical approach is relatively fast and easy to implement.

A second approach consists in computing explicitly the total metal concentration and deducing the concentration of each phase from the partition coefficient  $K_D$ . This method allows for a better understanding of the metal transport. However, unlike the empirical approach, this method requires accurate informations about the sources of pollution. Moreover, it has the drawback to consider an instantaneous equilibrium between the two phases.

Both approaches are considered in this talk.