Capturing salinity profile across the Schelde Estuary: A hybrid modelling approach

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Three-dimensional (3-D) numerical models constitute indispensable instruments for simulating and forecasting estuarine salinity profiles, essential for developing management strategies to improve and maintain the healthy state of estuarine ecosystems. However, the effort required to run these models is significant due to prolonged computation time. In contrast, developing management strategies for estuaries often require a quick turnaround time for long-term simulations or short-term forecasts of estuarine salinity conditions that 3D models cannot meet. To bridge this gap, we established a coupled modelling framework that links the one-dimensional (1-D) OMES ecosystem model with the 3-D Scaldis hydrodynamic model, yielding rapid simulations of salinity profiles throughout the Schelde estuary. Synthetic salinity fields generated by Scaldis were used to calibrate the 1-D OMES ecosystem model. As a result, the OMES model reproduced the observed salinity profiles with high fidelity. The workflow presents a framework for projecting future salinity regimes in the dynamically evolving Schelde estuarine system.