

# Abiotic modelling options of estuarine areas as building blocks for ecological predictions

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Most current ecological models focus on the improvement of underlying biological processes which are of course inherent to any model trying to simulate ecosystem components and processes. However, the importance of both the physical and chemical dimensions of an environment cannot be overlooked as ecological model performances are often limited by oversimplified, not representative or mismatching abiotic data of current velocity, DO, water temperature, conductivity, etc.

Estuaries, being characterized by their complex interplay of tidal movements, freshwater discharges, topography, geometry and atmospheric influences, show a high variability in their physical and chemical properties over both time and space. Researchers of estuarine phytoplankton dynamics, larvae dispersal and fish movement patterns are faced with a complex ecosystem and a wide range of data-driven and process-based methods to choose from. This choice is most often guided by limited data availability, previous modelling efforts and required temporal and spatial resolutions but often goes without a profound justification or recognition of the unknown uncertainty. This could therefore lead to the identification of key processes and variables based on artefacts, resulting from bad coupling between hydrodynamic, biogeochemical or ecological components of the model, rather than identifying real ecological trends.

In this study, we explored different modelling approaches in the Scheldt Estuary. Namely, within the framework of the European LifeWatch Observatory, a network of acoustic receivers was installed in the Scheldt Estuary to track fish with an acoustic tag. To analyse their behaviour, it is necessary to relate knowledge about the abiotic environment to the tracking data. Nevertheless, to deal with the major concern of the limited use of a wide spectrum of modelling approaches, the review is expanded to other estuaries and the simulation of their abiotic dimensions as a reference for the current set of modelling options in the Scheldt estuary. This setup allows us to provide a general overview of existing modelling approaches in estuaries and to characterize them in the light of different objectives.

Keywords: abiotic models; ecological models; estuaries; Scheldt estuary