

EGU22-2685

<https://doi.org/10.5194/egusphere-egu22-2685>

EGU General Assembly 2022

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Idealised modelling of freshwater pulses

Bouke Biemond¹, Huib E. de Swart¹, Henk A. Dijkstra¹, and Manuel Díez-Minguito²

¹Institute for Marine and Atmospheric research Utrecht, Utrecht University, Utrecht, The Netherlands

²Andalusian Institute for Earth System Research, University of Granada, Granada, Spain

Freshwater pulses, during which the freshwater discharge by rivers exceeds three times its long-yearly average value for no longer than one month, are common features in many estuaries around the world. The goal of this study is to develop a tool to describe the salinity response to freshwater pulses. To this end, a new model is presented, which generalises a number of assumptions often used in studies of estuarine adjustment, but retains their idealised character. This model is applied to observed freshwater pulses in the Guadalquivir Estuary (Spain) and the effect of different assumptions is quantified. Results show that it is important to adequately simulate the vertical salinity structure during a freshwater pulse. Assuming the depth-averaged salinity at the estuary mouth to be fixed during freshwater pulses ignores important feedback mechanisms between river discharge and stratification at the mouth. Prescribing instead the salinity at the bottom only circumvents this problem.

More precisely comparing simulated and observed salt intrusion lengths shows that the idealised model captures the essence of the estuarine salinity response. Overall, the results indicate that the model can be used as a tool to quantify the dependence of the estuarine salinity response to different parameters.