

EGU23-9557, updated on 10 Jan 2024
<https://doi.org/10.5194/egusphere-egu23-9557>
EGU General Assembly 2023
© Author(s) 2024. This work is distributed under
the Creative Commons Attribution 4.0 License.



The influence of extreme drought conditions on spatial patterns of stratification and mixing in a dynamic salt wedge estuary

Marlein Geraeds¹, Julie Pietrzak¹, Martin Verlaan^{1,2}, and Caroline Katsman¹

¹Delft University of Technology, Delft, The Netherlands

²Deltares, Delft, The Netherlands

Under the influence of climate change, estuaries around the world are increasingly exposed to more extreme weather conditions. In recent years droughts specifically have been occurring more frequently and for prolonged periods. During a period of drought, salt intrusion is exacerbated, impacting the availability and quality of water resources and the estuarine ecosystem. As the impacts of droughts can be severe, assessment of droughts and their influence on the estuarine system is of great importance.

Using a high-resolution 3D coupled ocean-delta model we investigate the influence of the record-breaking European drought of the summer of 2022 on the Rhine-Meuse Delta and compare this to the estuarine response under average discharge conditions, putting the drought's influence into perspective. Spatial patterns of stratification, mixing, and straining and their evolution throughout the drought period are studied by a salinity variance analysis. The progression of the salt wedge and retreat of the tidal plume fronts are examined and related to the changing strength of the individual estuarine processes influencing stratification. We show that as the tidal plume fronts retreat during the drought, we see a corresponding change in the structure of the salt wedge, demonstrating the importance of the coupling between the tidal plume fronts and the estuarine dynamics.

How to cite: Geraeds, M., Pietrzak, J., Verlaan, M., and Katsman, C.: The influence of extreme drought conditions on spatial patterns of stratification and mixing in a dynamic salt wedge estuary, EGU General Assembly 2023, Vienna, Austria, 23–28 Apr 2023, EGU23-9557, <https://doi.org/10.5194/egusphere-egu23-9557>, 2023.