From the delta to the sea: Multi-scale modelling of biogeochemical fluxes along the Danube-Black Sea continuum

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The Danube River is the second longest river in Europe. It passes through 10 countries before emptying in the Black Sea. The Danube Delta, largest nearly undisturbed wetland in Europe, plays a buffering role between the river and the sea (Tockner, Uehlinger, and Robinson 2009). Eutrophication in the coastal zone due to the increase of nutrients coming from the river causes important biological and financial losses since the 1970s(Berlinskyi and Cheroy 2020; Strokal and Kroeze 2013). However, despite this and the importance of the Danube-Danube Delta-Black Sea system, the hydro and biogeochemical fluxes in this system remain largely understudied. We aim to model and quantify the interactions between the Danube delta and the Black Sea, from hourly to multi-annual time scales, using an unstructured-mesh hydrodynamic model. More specifically, we aim to evaluate how the biogeochemical fluxes of the North-western shelf (NWS) (i.e. limited by the 100m isobath) impact and are impacted by the small-scale variability of the three branches of the Danube Delta (i.e. Chilia, Sulina and Sfântul Gheorghe). We will then assess the potential impact of climate change and socioeconomic development on the transfer of water, salt and biogeochemical elements to the sea by running the model under different IPCC scenarios (SSP1-2.6 and SSP5-8.5). This will allow us to evaluate the mitigation potential of the Danube delta on eutrophication phenomenon in the Black Sea, linked with humans developments and socioeconomics pathways, and give recommendations to lessen its impacts in the North-western shelf region.

References

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Unstructured-mesh; Hydrodynamic model; Interactions; Eutrophication; Climate change