Project: **1244**

Project title: **APOC - Anthropogenic impacts on particulate organic carbon cycling in the North Sea**

Principal investigator: **Wenyan Zhang**

Report period: **2023-01-01 to 2023-12-31**

The allocated resources have been used successfully to reach the project goals set for the allocation period. We will not use any more CPU node hours until the end of the allocation period.

Three model setups were used to meet the project goals for this year:

1. **A coupled hydro-/sediment-dynamics-macrobenthos model (SCHISM-SED-TOCMAIM) for the North Sea**. This model was run for six years, each with six scenarios, including four different human use scenarios (Figure 1). The results have been published in Porz et al. (2024).
2. **A coupled hydrodynamics-ecosystem model (SCHISM-ECOSMO) for the North Sea.** This model has been run from 2000-2005 with and without the effects of bottom trawling resuspension, using two different implementations of bottom trawling resuspension (Figure 2).
3. **A coupled hydro-/morphodynamics model (SCHISM-SED) for the German Bight.** This setup has been used to investigate the sediment trapping mechanisms controlling the development of the Helgoland Mud Area (Figure 3).

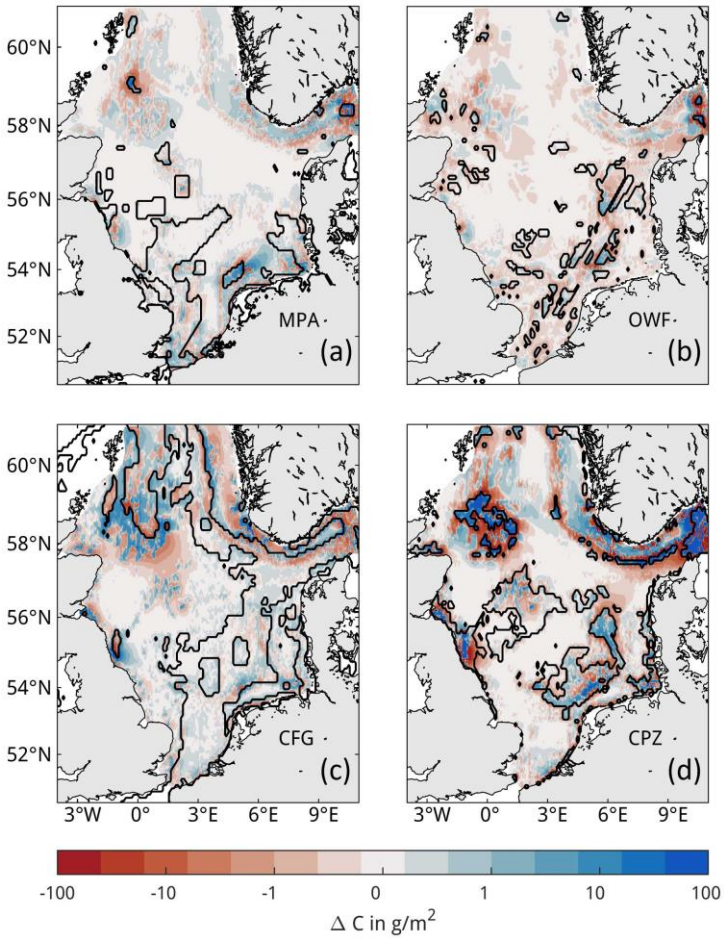

Figure 1. Changes in sedimentary carbon in response to different scenarios of fishing pressure redistribution in the North Sea. Positive and negative values indicate an increase and decrease in sedimentary carbon compared to the reference scenario with actual fishing pressure, respectively. Source: Porz et al. (2024)

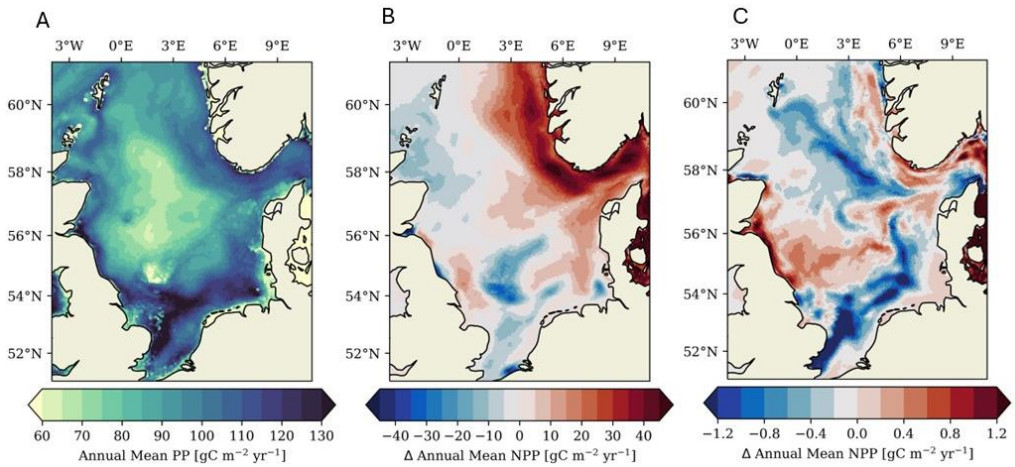

Figure 2. Mean annual vertically integrated primary production from 2000 to 2005 for the reference simulation (A) and absolute change for the trawling experiments using parameterizations 1 (B) and 2 (C). Note the different color axis limits between (B) and (C).

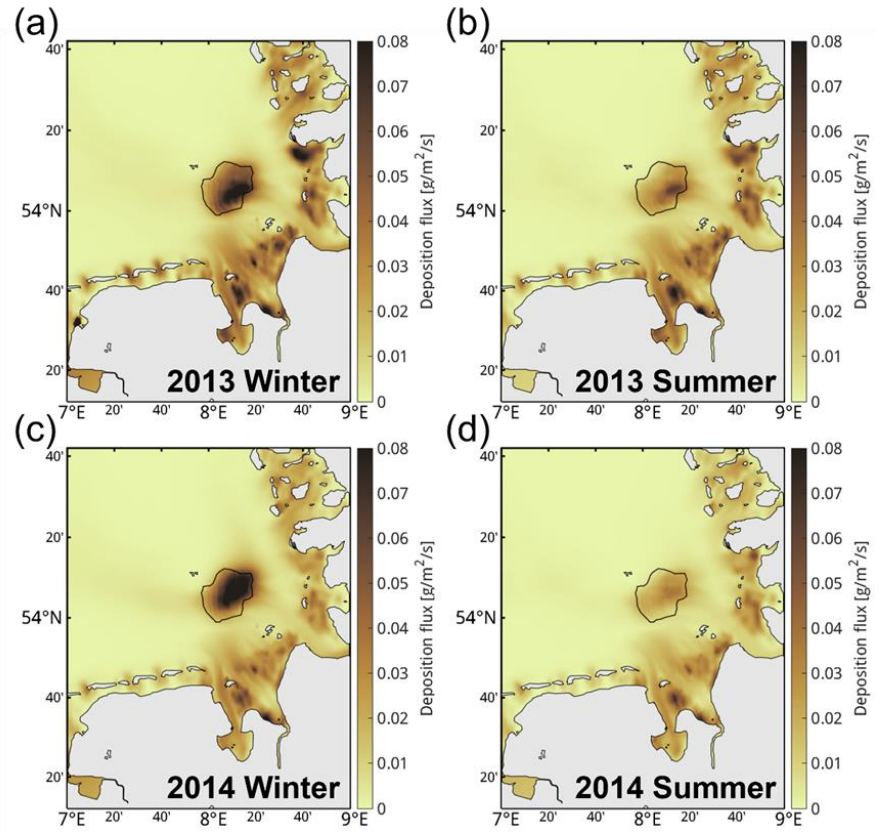

Figure 3. Net sediment depositional flux during the winter and summer periods in 2013 and 2014. (a) winter 2013 from December 2012 to February 2013, (b) summer 2013 from June 2013 to August 2013, (c) winter 2014 from December 2013 to February 2014, (d) summer 2014 from June 2014 to August 2014.

References

Porz, L., Zhang, W., Christiansen, N., Kossack, J., Daewel, U., Schrum, C. Quantification and mitigation of bottom-trawling impacts on sedimentary organic carbon stocks in the North Sea. Biogeosciences 21, 2547–2570. https://doi.org/10.5194/bg-21-2547-2024, 2024.