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Dynamics in Marine Protected Areas in the German Bight (North Sea) under different forcing scenarios

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This study is dedicated to the dynamics in Marine Protected Areas (MPAs) in the German Bight under different forcing scenarios. A large amount of data has been collected in the North Sea over the last decades to characterize MPAs, which can shed light on long-term changes in the North Sea dynamics from abiotic part to ecosystem. At the moment, a question is raised about the interconnection between MPAs and their representativeness for the larger area. Nowadays, this issue can be resolved with the existing numerical instruments and accumulated observations. We paid particular attention to the tidal dynamics in the North Sea since tidal residual circulation and asymmetric tidal cycles significantly define circulation patterns, transport and accumulation of biogeochemical material, and the distribution of bedforms in this relatively shallow region. We analyzed in detail the tidal energy transformation and the role of higher harmonics in the domain. The tidal ellipses, maximum tidally induced velocities, energy fluxes and residual circulation maps are constructed and analyzed. The numerical tool used in this study is the FESOM-C model (Androsov et al., 2019), which works with triangular, rectangular or mixed grids and is equipped with a wetting/drying option. A grid with a resolution of up to 10 meters in the flooded areas is used.

Androsov, A., Fofonova, V., Kuznetsov, I., Danilov, S., Rakowsky, N., Harig, S., Brix, H., and Wiltshire, K. H.: FESOM-C v.2: coastal dynamics on hybrid unstructured meshes, *Geoscientific Model Development*, 12, 1009-1028, 10.5194/gmd-12-1009-2019, 2019.