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# Organic matter transport by cyclonic eddies formed in eastern boundary upwelling system supports heterotrophy in the open oligotrophic ocean

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Mesoscale eddies formed in Eastern boundary upwelling systems are elementary components of ocean circulation and play important roles in the offshore transport of organic carbon and nutrients. Yet, most of our knowledge about this lateral transport and its influence on biogeochemical cycles relies on modelling studies and satellite observations, while in situ measurements of biogeochemical parameters are scarce. For example, little is known about the effects of mesoscale eddies on organic carbon distribution, microbial activity, and organic matter (OM) turnover in the open oligotrophic ocean. To address this gap, we investigated the horizontal and vertical variability of phytoplankton and bacterial activity as well as dissolved organic carbon along a zonal corridor of the westward propagation of eddies between the Cape Verde Islands and Mauretania in the Eastern Tropical North Atlantic (ETNA). We additionally collected samples from a cyclonic eddy along this transect at high spatial resolution. Our results indicate a strong impact of cyclonic eddies on both microbial abundance and metabolic activity in the epipelagic layer (0–200 m). Generally, all determined parameters (bacterial abundance, heterotrophic respiration rates, bacterial biomass production, bacterial growth efficiency, bacterial carbon demand and net primary production) were higher in the eddy than in the stations along the meridional transect. Along the transect, microbial biomass and activity rates were gradually decreasing from the coast to the open ocean. We further observed high variability of biogeochemical parameters within the eddy with elevates microbial abundances as well as process rates in the south-western periphery. This can be explained by the rotational flow of the cyclonic eddy, which perturbs local OM and nutrient distribution via azimuthal advection. The local positive anomaly of microbial activity in the cyclonic eddy compared to all other stations including the near coast ones results from eddy pumping of nutrient into the epipelagic layer that promotes growth of phytoplankton. Overall, our study supports that cyclonic eddies are important vehicles for the transport of fresh OM that fuel heterotrophic activity the open ocean, highlighting the coupling between productive EBUS and the adjacent oligotrophic ETNA.