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Changes of the dust-influenced carbon pump in the Mauritanian upwelling: results from two long-term sediment trap flux records

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Long-term data characterizing the oceans' biological pump are essential for understanding impacts of climate variability on marine ecosystems. Bakun (1990) and others suggested that increased trade winds due to on-going climate change would cause an intensification of coastal upwelling. This should result in increasing deep ocean particle fluxes as well. Here we present long continuous time-series of bathypelagic particle fluxes from two sediment trap locations in the Canary Current (CC) Eastern Boundary Upwelling System (EBUEs): the coastal upwelling (CBeu: 2003-2016) and the offshore, wind curl-driven upwelling (CBmeso: 1988-2016). The site CBmeso is the longest time-series record of fluxes in a coastal upwelling regime with high economic importance. A relationship between winter and spring BSi (Biogenic silica) fluxes to the North Atlantic Oscillation (NAO) index was best at the offshore site CBmeso. There, the flux record showed no signs of increasing upwelling. Organic carbon and BSi (mainly diatoms) fluxes were two- to three-fold higher at the coastal upwelling site CBeu compared to the offshore site CBmeso, respectively, and showed a higher seasonality with flux maxima in spring. Lithogenic (dust) fluxes regularly peaked in winter when frequent low-altitude dust storms and deposition occurred, decreasing offshore by about 3-fold. We found synchronous flux variations at both study sites with an anomalous year 2005, which is characterized by high BSi and organic carbon fluxes under low NAO conditions. Furthermore, a shift in plankton composition (.e.g. of diatoms) since 2005 at the coastal site CBeu was recorded and organic carbon and BSi fluxes revealed a decreasing trend between 2006 and 2016. Our findings point to coastal upwelling relaxation during the last decade rather than to an increase in coastal upwelling and contradicts Bakun's hypothesis.