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Deep sediment resuspension and thick nepheloid layer generation by open-ocean convection

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Abstract

The Gulf of Lions in the northwestern Mediterranean is one of the few sites around the world ocean exhibiting deep open-ocean convection. Based on 6 year long (2009–2015) time series from a mooring in the convection region, shipborne measurements from repeated cruises, from 2012 to 2015, and glider measurements, we report evidence of bottom thick nepheloid layer formation, which is coincident with deep sediment resuspension induced by bottom-reaching convection events. This bottom nepheloid layer, which presents a maximum thickness of more than 2000 m in the center of the convection region, probably results from the action of cyclonic eddies that are formed during the convection period and can persist within their core while they travel through the basin. The residence time of this bottom nepheloid layer appears to be less than a year. In situ measurements of suspended particle size further indicate that the bottom nepheloid layer is primarily composed of aggregates between 100 and 1000 μm in diameter, probably constituted of fine silts. Bottom-reaching open ocean convection, as well as deep dense shelf water cascading that occurred concurrently some years, lead to recurring deep sediments resuspension episodes. They are key mechanisms that control the concentration and characteristics of the suspended particulate matter in the basin, and in turn affect the bathypelagic biological activity.

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