Modelling bottom trawling-generated sediment flows in La Fonera submarine canyon (Northwestern Mediterranean Sea)

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Bottom-trawling is one of the anthropogenic activities with a stronger and more widespread impact on the seafloor. Physical processes involved in sediment resuspension due to trawling and the resulting sediment-laden flows are not fully understood. The amount and fate of remobilized sediments are of the utmost relevance for establishing present-day continental margin sediment budgets. Resuspension by bottom trawling leads to massive transfer of sediment from shallower to deeper areas practically worldwide. La Fonera submarine canyon is a large, deeply-incised active canyon in the Northwestern Mediterranean Sea. It presents complex sediment transport dynamics associated to littoral drift and extreme events such as dense shelf water cascading and severe storms. Recent studies have revealed recurrent peaks in near-bottom current speed and suspended sediment concentration in the northern flank of the canyon synchronously with trawling.

Aiming at simulating sediment-loaded fluxes triggered by trawling and their interaction with the seafloor in La Fonera canyon, we have implemented a numerical process-based model developed to reproduce such flows. Mooring data have been used both to calibrate the modelled sediment fluxes. Good agreement between model and monitoring data has been found, with modelled peaks of suspended sediment concentration values exceeding 120 mg·l^{-1} and current speed measurements of up to 40 cm·s^{-1} at the mooring site.

Moreover, we have quantified fishing activity over the canyon flanks through modelling and have obtained the propagation pattern of sediment flows from the fishing ground downward the canyon. Our results confirm the value of numerical models to complete and enlarge our understanding of the sedimentary transfer processes from shallow to deep in the ocean. Besides, they allow establishing quantitative comparisons between trawling impact and natural forcing on the sediments dynamics of La Fonera submarine canyon.