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Exchange Processes Induced By A Mesoscale Eddy In The North West Black Sea

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In this paper, the process of shelf- deep sea exchange is studied using remotely sensed data on chlorophyll, sea surface temperature and altimetry as well as in situ data on current velocities. The study is focussed on exchange processes induced by an individual mesoscale eddy off the North West coast of the Black Sea in the summer 2005. The shelf edge front in the NW part of the Black Sea separates biologically productive and often eutrophicated shelf waters from the open sea waters. The eddy had a diameter of about 120 km and it was generated SW of the Crimean peninsula in the spring 2005. Analysis revealed the internal structure of the eddy and the mechanism of formation, development, and decay of a cross-shelf jet, which facilitated exchange between the shelf and deep-sea waters. The exchange process was caused by a mechanism which was different from the common 'Gulf-Stream Rings' mechanism. The pre-formed eddy attached itself repeatedly to the shelf-break front separating productive shelf waters from the oligotrophic waters of the deep sea. The peripheral part of the eddy generated a cross-frontal jet and a spiral filament surrounding the eddy. This jet sustained an average cross frontal flux of shelf waters of 0.3 Sv over the period of 40 days. The total transport of water in our case study was equivalent to 40% of the overall volume of water on the shelf. Formation of the filament significantly increased the length of contact between shelf and deep sea waters from 70 km at the base of filament to about 800 km along its sides, thus providing a highly efficient mixing mechanism.

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