THE DISTAL DANUBE DEEP-SEA FAN IS THE LAST "SINK" OF ITS EPONYMOUS RIVER BASIN:

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Abstract
The Danube River Basin and the Black Sea represent a unique natural laboratory for studying source to sink and global change. In the last decade, many of the geosciences studies carried out in the Black Sea have focused on the Holocene marine transgression. This topic has been fully discussed and is still a matter of debate. Since the DSDP drillings, the lithology and mineralogy of deep sediments from the Black Sea have been well studied. However, only few recent studies have focused on the deep-sea morphology and turbidite sedimentation in the western Black Sea basin, where the main depositional feature is the Danube submarine fan. Recent oceanographic surveys demonstrate that the deep basin deposits bear the record of the Late Quaternary paleoenvironmental changes.

Keywords: Deep sea basins, Sediment transport, Canyons, Swath mapping, Black Sea

This study focuses on the deep water architecture of the western Black Sea deep basin and its sedimentological characteristics. The Late Quaternary Danube turbidite system (to the North) displays a well-constructed morphology, underlined by several channel-levee systems associated with distal lobe complexes, reaching the 2200 m isobaths. The adjacent deposits, onlaping the Danube Turbidite System distal lobes in the deep basin, show a linear, drape-like morphology, represented by thick continuous reflections on seismic profiles. They generally consist of distal turbidite deposits supplied from the Turkish margin. Most of these turbidite sequences show a thick upper unit composed by homogeneous clastic clays, thus forming thick mud turbidites. Following previous work in similar basin settings, we interpret these facies to result from large volume unchannelized turbidity currents generated by successive mass-wasting events. The abrupt break of slope at the bathyal plain transition enhances the rapid deposition of coarse-grained material and limits channel development in the bathyal plain. We relate the origin of these deposits with the very high seismic activity of the North Anatolian Fault on the Turkish margin. This work is based on data collected at the boundary of influence of the Danube Turbidite System and the Turkish margin, and provides a new record of the changes in sedimentary supply, climate and sea level that occurred in the Black Sea region since the last ~ 25 ka. The deep basin deposits bear the record of the Late Quaternary paleoenvironmental changes (Lericolais et al., 2012). The Last Glacial Maximum Period (~25 to 18 ka BP) was characterized by an important and relatively stable sediment supply with sediment transferred to the deep basin from both the northern Danube Turbidite System and the southern Turkish margin. The relative stable LGM period was followed by an increase of sediment transport to the deep basin, which is locally illustrated by progradation of lobe deposits from the Danube turbidite system in the deep basin, downlaping the Turkish deposits. Influx of meltwater to the Black Sea resulted in a early highstand sea level. The following Bolling Allerod Preboreal warm period and the Younger Dryas cold event have experienced alternative sea level lowstands and highstands that are not clearly underlain in the deep basin sediments (Lericolais et al., 2012). The onset of sea-level highstand after the Holocene marine invasion (~ 9 kyr BP) (Lericolais et al., 2012; Soulet et al., 2011) induced the end of the activity of the Danube Turbidite System whereas the gravity supply from the Turkish margin remained active throughout the Holocene. We conclude that the western Black Sea basin constitute an asymmetric subsident basin bordered by a northern passive margin with confined mid-size, mud-rich turbidite systems, and a southern turbidite ramp built in a tectonically active margin setting.

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