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Holocene History of the Mediterranean Inflow and Its Influence on Formation of the Channel Network Complex and Redox Conditions in the Istanbul Strait Outlet Area of the Black Sea

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İstanbul Strait (Bosphorus) is the only connection of Black Sea to the world ocean via the Sea of Marmara and Çanakkale (Dardannelles) Strait. The İstanbul Strait outlet area of the Black Sea (ISBS) includes the shelf and upper slope areas, and is characterized by the Mediterranean inflow that is responsible for the ventilation and sluggish deep circulation of the anoxic Black Sea basin. Presently, a two-way current system occurs in the Bosphorus channel, with the Black Sea water forming the upper current and the warm and saline Mediterranean Water (MW) the undercurrent. Shallow sill depth of the Istanbul Strait together with the oxygen consumption by organic matter mineralization is responsible for the establishment of a permanent oxic-anoxic boundary (chemocline). The oxic-anoxic boundary is presently at 100-150 m depth, but may have varied in the past as result of the changes in the amounts of the MW, of riverine water input, circulation dynamics and global sea level.
High resolution seismic profiling and sediment coring along depth transects from -75 m to -307 m on the shelf and upper slope areas showing the evidence of two unconformities: a post-Younger Dryas shelf-crossing unconformity (α) and a younger unconformity ($\alpha 1$) that form the base of the channel leveé complex that is dated at ca. 7 ka BP. The $\alpha 1$ unconformity was formed by the latest saline Mediterranean incursion that deposited the fan-delta complex under mainly submarine conditions and initiated the anoxia development. The oxic/anoxic boundary and changes in the bottom water conditions in the slope area are detectable by Mn, S and Fe anomalies in the cores, which show the rise of the redox boundary to depths between -120 m and -150 m by ca. 6.8 ka BP. Mediterranean inflow initially used the main channel trending NW, transporting oxygenated waters to the western side of the ISBS area. This NW-directed transport slowed down considerably at 5.3 ka BP, with an eastwards shift, resulting in anoxic conditions in the western upper slope area. This observation is supported by sediment record in the Bosphorus channel and present day oceanographic measurements. The ventilation effect of MW can be observed until today in the eastern part of the outlet area down to at least -307 m (depth limit of the transects), as indicated by high Mn counts on the XRF scanner profiles. Such Mn anomalies in upper slope cores of the eastern ISBS area, not associated with Fe and S anomalies are most likely formed by the deposition of Mn (II) from the suboxic water column. In addition to Mn anomalies, the transition from oxic to anoxic conditions are shown by changes in mud colour from gray green through gray and dark gray to black, and by the disappearance of the euryhaline bivalves and benthic foraminifera. Research presented here is carried out within the framework of the EC FP7 HYPOX project.