DEPOSITIONAL ENVIRONMENTS ON THE NORTHWESTERN BLACK SEA OUTER SHELF AND CONTINENTAL SLOPE DURING LATE PLEISTOCENE AND HOLOCENE

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Introduction

Neoeuxinian sea-lake appeared 25-30 ky ago and was the last isolated basin in the Black Sea region. It was characterized by very narrow shelf connected with the continental slope and rise. Due to subsequent the sea-level rise, a wide shelf was formed along the NW Black Sea where the basin coastline has been traced by thick sandy nearshore deposits at the depths of 87-88 m below pre-sent sea level. The changes affected the sedimentation in the shelf-continental slope transitional area. This work is aimed at reconstructing depositional environments of the region during Late Pleistocene and Holocene.

Materials and Methods

Mineralogy, lithology, and thickness of sediments have been investigated based on more than 600 gravity cores from a depth range of 100 to 2,200 m, including more than 400 points on the continental rise and abyssal plain. Lithofacies have been established according to similarity in the lithogical features of the sediments. These data, along with faunal complexes within the sediments and geomorphology of the investigated region have been used for reconstructing depositional environments.

Results and Interpretation

Late Neoeuxinian time. Depositional environments of nearshore neritic, avandeltas, and outer shelf neritic zones are replaced by upper bathyal, middle, and lower continental slope settings and continental rise environments, as well as bathyal submarine canyons facies which consist of aleuritic (silty) and pelitic mud, silt, and clay (Kakaranza, Larchenkov, 2007; Fig. 1). Mass movement of sediments, creeping, slumps, and turbidite currents were rather active on the upper part of the slope. Turbidite fans were most important source of sediments on the continental rise. Gravity deposition of sediments from seawater (nepheloid sedimentation) was the main depositional mechanism on the abyssal plain. Neoeuxinian sediments show some evidence of rhythmic changes in seawater salinity and also periodic fluctuations of sea level (Ivanov and Kakaranza 2006).

Early Chernomorian time. Eustatic sea-level rise opened a connection between the Neoeuxinian Lake and the Mediterranean Sea 10.5-10.0 ky ago, and there are many indications of this connection in the sediments (Ivanov and Kakaranza 2006; Sorokin *at al.* 1984; Yanko-Hombach 2006). Rapidly formed seawater stratification due to the difference of salinity between the upper and lower seawater layers, and emission of H_2S from bottom sediments were the main causes for the 200-m-deep $H_2S/0_2$ boundary. Sapropel layers, sapropel mud and much less common clayey mud were common at that time. Depositional environments of neritic outer shelf, upper bathyal, middle and lower parts of the continental slope and rise, submarine fans, and the abyssal plain have been reconstructed (Fig. 1). Maximum thickness of sapropel sediments has been measured on the upper part of the slope, submarine canyons and fans, as well as the abyssal plain, with thinner sedimentary layers on submarine highs and hills.

Late Chernomorian time. Improved connection with the Mediterranean Sea after 6.2 ky ago caused a lowering of the $H_2S/0_2$ boundary, and sediment layers enriched by euryhaline *Mytilus* and *Phaseolinus* have accumulated on the shelf and continental slope. These layers unconformably overlie older horizons, which suggest unstable conditions during accumulation. The sediments with *Mytilus* overlap sapropel layer and they are gradually overlapped by deposits with *Phaseolinus* in the western part of the study area. However, there is visible difference on the eastern part, where layers with *Mytilus* overlap Neoeuxinian mud and shelly debris or are absent in the sequences of some zones (Fig. 1).

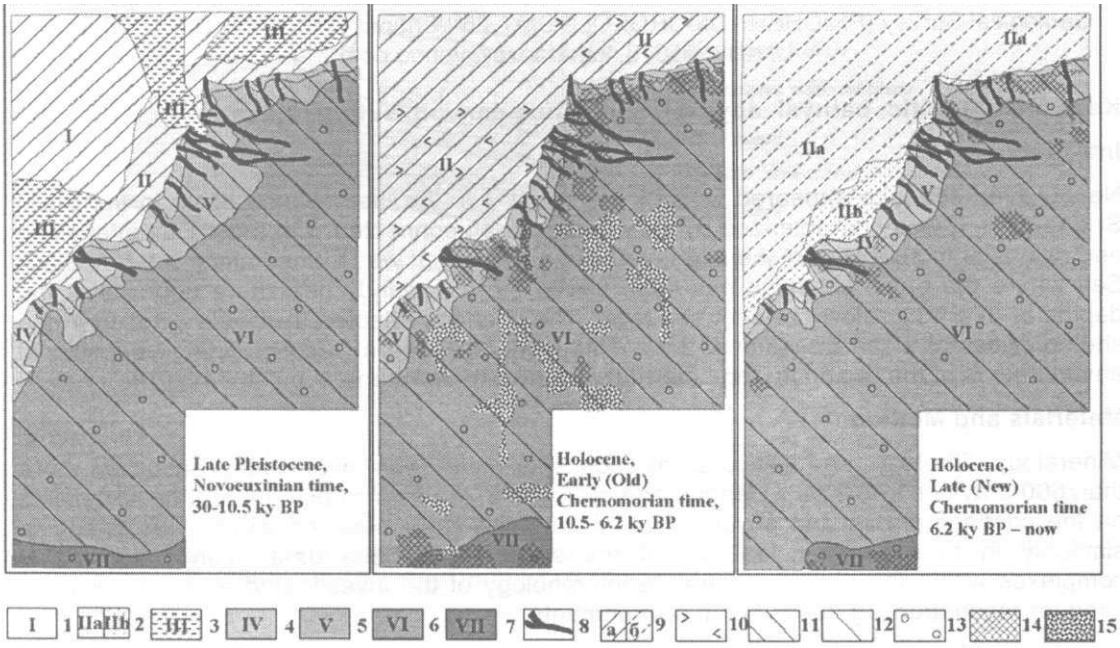

Figure 1. Depositional environments on northwestern Black Sea during Late Pleistocene and Holocene (Kakaranza, Larchenkov 2007): 1 – offshore neritic, 2 – neritic outer shelf (IIa – low salinity, IIb – normal salinity), 3 – avandelta, 4 – bathyal upper part of continental slope, 5 – bathyal middle and lower parts of continental slope and rise, 6 – bathyal submarine fans, 7 – abyssal plain, 8 – valleys of submarine canyons. Lithodynamic conditions of sedimentation: 9 – hydrogenic (9a – waves and currents, 9b – currents), 10 – erosion and equilib-rium, 11 – gravity mass movement, slumps, creeping, and turbidite currents, 12 – turbidite currents, 13 – gravity deposition of sediments from seawater (nepheloid sedimentation). Areas of sediment thickness anomalies (abnormal thickness): 14 – positive, 15 – negative.

The final stage of the Chernomorian (Black Sea) transgression began after the Phanagorian regression 2.5 ky ago (Fedorov, 1983). During that time, rather homogeneous marker layer of coccolith mud and coccolith aleuritic mud accumulated on the continental slope and rise. Pelitic mud was deposited in the deep-water depression due to nepheloid sedimentation. The greatest thickness of the sediments is observed on the slope near submarine canyons and is related to gravity-driven mass movements and turbidity currents. Fades of the outer shelf with low and normal seawater salinity, upper bathyal, middle and lower parts of the slope and rise, submarine fans, and abyssal plain developed during this time.

Conclusions

Holocene transgression affected sedimentation processes on the northwestern Black Sea outer shelf and continental slope. The transgression was accompanied by numerous stillstands, regressive phases, the sea-level and seawater fluctuations, vertical changes of

$H_2S/0_2$ boundary in the water column, and large variations in terrestrial material input to the outer shelf and continental slope and rise.

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