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Late Glacial to Holocene Sedimentological, Trace Element and Stable Isotope Data From the Western Black Sea

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A transect of 6 gravity cores from the continental slope in the northwestern Black Sea was studied using high-resolution XRF-scanning, bulk grain-size, stable isotope (d18O), and trace element (Mg/Ca, Sr/Ca) data. Two cores, GeoB 7616-4 from 168 m and GeoB 7608-1 from 1202 m water depth, were chosen as representative for the shelf and deep water facies, respectively and were AMS 14C-dated using mollusc and ostracode shells. We obtained high-resolution profiles for d18O on bivalve shells (GeoB 7616-4; covering the period between 12.5 – 15.5 ka) and d18O, Mg/Ca and Sr/Ca on ostracodes (GeoB 7608-1; period between 8 – 30 ka), while the other cores were sampled in low resolution for d18O and trace element analysis on ostracodes. Since it is possible to correlate GeoB 7608-1 with the other cores from the slope using the XRF-data, our records present an excellent opportunity to reconstruct paleoclimatic and hydrological changes in the Black Sea region as well as to obtain insight into the evolution of the structure of its water column during the last ca. 30 kyrs.

Our different proxy records suggest that stable climatic conditions throughout the Last Glacial Maximum were followed by a series of meltwater pulses originating from the Scandinavian ice sheet between 18 and 15.5 ka. High-frequent oscillations in the XRF-record suggest a probable link to the arctic climate regime and complex ice sheet - climate feedbacks. A temporal freshening of the Black Sea during this period is indicated by depleted d18O values, while after 15.5 ka a stepwise trend towards heavier d18O is observed in all cores.

Comparing the major trends in d18O at different water depths, the records appear to diverge since ca. 14.5 kyr BP: while cores from intermediate water depths (1592 to 465 m) have d18O values in the range of GeoB 7608-1 (1202 m), the shallow core GeoB 7616-4 (168 m) shows a trend to values up to 1.5 ‰ lighter than GeoB 7608-1. d18O from the deepest core GeoB 7604-2 (1977 m), on the other hand, is up to 2 ‰ heavier than those in GeoB 7608-1 at 13.9 kyr BP. This difference diminishes during the Younger Dryas, temporarily increases during the Early Holocene, but at 9.0 kyr BP both d18O-records are similar again. Another diverging trend is observed since ca. 12.5 kyr BP, when GeoB 7610-1 from 468 m water depth starts to show depleted values relative to GeoB 7608-1. This development mirrors the interaction of deep water formation and changes in the relative position of the cores to the Danube Delta during changing Black Sea level.