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Proxy-reconstruction of SST anomaly in the Black Sea for the last 2000 year using biogenic carbonate records in the deep-sea laminated sediment

G.V. Laptev

Ukrainian Scientific and Research Institute for Hydrometeorology, Ukraine

(glaptev@uhmi.org.ua)

Sedimentologic studies of sediment cores recovered from the deep anoxic floor and continental slope of the Black Sea allow reconstruction of the basinwide Holocene environmental history of the Black Sea. Most of these core typically constitute at the top 25-45cm section of finely laminated coccolith ooze (Unit I) followed by dark-colored sapropels of Unit II. Lithologic boundary between the two Units was previously dated as $\sim$2000 yBP (Hay et al, 1991) – time when modern salinity and (bio)geochemical conditions in the Black Sea have been established and marked with permanent return (after short term first Invasion Period) of coccolitho-phorid species *Emiliania huxlei* – major contributor to white, coccolith(carbonate)-rich material into varve couplets of laminated top section of sediment.

Variation in amount of biogenic carbonate in individual varve couplets and groups of varve couplets produce distinctive cm-scale color bands which vary along the core profile from top down to the Unit I/Unit II boundary and showed dramatic correlation between most of the recovered cores distanced over 1000km across the sea floor (Arthur et al, 1988). This suggest that coccolitho-phorid production for the last 2000 years fluctuated significantly in course of time yet little within the interior basin itself. Given changes in biogenic carbonate content in accumulated laminated sediment sequence are linked to variation in regional climatic conditions in a past, one can consider modern sediment core as a proxy archive keeping records of these climatic variations intact.

One sediment core showing distinct laminated picture (NW continental slope, depth

450m) was radiometrically dated using ^{210}Pb CRS model verified by position of ^{137}Cs and ^{241}Am peak time-markers (1963 and 1986). Mass accumulation rates variations, for carbonate and terrigenous material separately, were calculated over the last 150 years with 3-5 year resolution for the past 50 years and in decadal timestep after. Temporal changes of biogenic carbonate supply to sediment in this period of time were found correlate satisfactory with the Black Sea winter SST anomaly, in decadal scale at least – cold winter provoke intensive coccolitho-phorid bloom following spring and summer due to full CIL overturn bringing nutrient-rich water onto surface (Titov, 2003). The imprint of excessive carbonate flux to sediment (e.g. production of *E.huxlei*) is even more evident in the 80-90s of the 20th century when difference between summer and winter SST anomaly in the Black Sea become remarkably increased.

Digital image of the sediment core slab below of that have been dated with ^{210}Pb ($>$15cm), was used to produce averaged diagram "gray color intensity - carbonate content" (checked by measurements of carbonate content in selected intervals) *vs* depth", then roughly extended into chronological scale with decadal resolution using average mass accumulation rate calculated by ^{210}Pb CRS model for last 150 y and sediment properties for entire core.

Chronology of the reconstructed values of winter SST anomaly in the Black Sea for full sediment sequence using correlation coefficient determined for ^{210}Pb dated sediment section corresponding to period of recent instrumental observations (1950-2000) certainly carry some extent of uncertainty. Further validation and minimization of uncertainty of the proposed SST chronology can be made by cross-comparison with reported data of proxy-reconstruction of climatic conditions change alongside with evidences of contemporary ambient anomalies descriptions given in Old Southern Russian narrative texts of XI-XVII centuries.

Method proposed is need to be further elaborated, however is already seen as useful tool in analysis of natural climatic variations in the Black Sea basin over the millennia timescale as well as to facilitate understanding role of climatic (natural) and anthropogenic factors in changing biogeochemical status of the Black Sea in recent few decades and beyond.

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