



## Sedimentary record of Late Maunder Minimum in the Black Sea

Emin Gungor (1), M. N. Cagatay (2)

(1) Çekmece Nuclear Research and Training Centre Istanbul, (2) Istanbul Technical University, EMCOL and Geological Engineering Department (cagatay@itu.edu.tr/ phone: +90-212-2856211)

Four undisturbed cores from east and west Black Sea basins were analyzed for organic carbon, inorganic carbon (carbonate) and various elements, and dated by the  $^{210}\text{Pb}$  method.

The sedimentary history of the Black Sea in the last 2700 yr has been marked by a high  $\text{CaCO}_3$  flux of coccolithophore, *Emiliania huxleyi*. As a result the uppermost mud unit contains up to 85% wt total carbonate (as  $\text{CaCO}_3$ ) in the deep sea. The highest carbonate peak occurs at different core-depths in different cores, corresponding to an age of ca 1700±45 AD according to the  $^{210}\text{Pb}$  chronology. The widths of the peaks represents an event lasting ca 100 years, starting at ca 1650 AD and ending at ca 1750 AD. This period of high *E. Huxleyi* production in the Black Sea can therefore be correlated by the Late Maunder Minimum, the coldest phase of the Little Ice Age. The same period in the cores is characterized by an 0.5 ‰ increase in  $\delta^{18}\text{O}$  values, considerable decrease in Sr/Ca ratio and increases in normalized lithogenic elements (e.g., Ti, Li, La, Nb, Rb, K, Ce, Th). These results strongly suggest a decrease in sea surface temperature and increase in detrital input during this period. These conclusions correlate well with the historical data that shows that the Late Maunder Minimum period was characterized by glacier advances in the Northern and Southern Hemispheres, average annual temperatures 1-2°C lower than the present, and an increased precipitation in most of Europe. It appears that a high *E. Huxleyi* production during the cold periods in the Black Sea was caused by a relatively fast water circulation and high nutrient input to the surface waters. Two smaller carbonate peaks each, predating and postdating the Late Maunder Minimum peak, probably also correspond to small scale cooling events in the last 2700 years.