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Climatic changes during the current interglacial period, the Holocene in Europe

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The hydrological balance of the Black Sea, during the current interglacial period, is characterised by the inflow of low-salinity water from European rivers over the NW-drainage area, Danube (∼65 %), Dnjepr (∼15 %), Dnjestr (∼5 %) , and the N-drainage area, Don (∼10 %) and the inflow of high-salinity water from the Mediterranean Sea over the SW-corridor, Dardanelles - Marmara Sea - Bosporus (Preisinger and Aslanian, 2004). The inflow of medium-salinity water from the Caspian Sea over the NE-corridor, Manych valley - Asov Sea - Strait of Kerch after the last glacial maximum was ended by the Younger Dryas (Ferronsky et al., 1998). The inflow of high-salinity water (35‰) over the Bosporus has led to a continuous increase of the salinity in the Black Sea during the last 9500 years reaching 11‰ ∼ 3500 years ago at the beginning of the blooms of *Emiliania huxleyi* in the Black Sea. Today the salinity at its surface is ∼18 ‰. The increase of the salinity parallel to that of the SO_4-content of the Black Sea water led to the continuous increase of the amount of biomineralised greigite (Fe_3S_4) in sulfate reducing bacteria (SRB) which could be measured by the number of framboidal greigites formed in the Black Sea (Preisinger and Aslanian, 2003). This study shows that the nanostructure of the biomineralised framboidal greigite formed in the Black Sea is different from the biomineralised greigite in the Caspian Sea as well as from the biomineralised iron sulfide formed in the Marmara Sea, transported over the Bosporus to the Black Sea (Preisinger et al., 2005). The statistical distribution of these framboidal greigites in gravity cores of the Black Sea shows characteristic periodicities, which correspond to the ratio of water inflow from the Danube and from the

Bosporus. More water from the Danube corresponds to the melting of Alpine glaciers during warm periods, less water to the growth of Alpine glaciers during cold periods. A comparison of glaciers in the Alps, Greenland ice cores and framboidal greigites in the Black Sea shows periodicities of 352 years (Preisinger and Aslanian, 2003). The periodic change between cold and warm climate every 176 years is reflected in the number of framboidal greigites as well as the 11-year cycles by blooms of *Emiliania huxleyi*. These cyclicities could be a result of the sun spot cycles averaging 11 ± 1 years as well as long periods of 176 ± 11 years (16 times 11). Recordings of the last 300 years (http://www.sidc.oma.be/index.php3) show that from 1833 on the average number of sunspots per 11 ± 1 year cycle has been 50 % higher than the average number of sunspots during the preceding cold period, the Maunders minimum. The end of the cold periods can be found by extrapolating the transition from cold to warm occurring with a periodicity of 352 years back into the past. During the cold periods, a stronger NE wind blows along the Bulgarian Black Sea coast and leads to the formation of up to 6m high dunes. Dune formation at the isthmus of Sozopol (Apollonia), at the necropolis in the Bay of Harmanite south of Sozopol, and at the mouth of the river Veleka is described and proved by historical data.

References

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