Geophysical Research Abstracts
Vol. 18, EGU2016-10588, 2016
EGU General Assembly 2016

Droughts in the Miocene of the Black Sea region

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Since Miocene the Black Sea has been highly sensitive to fluctuations in the hydrological cycle. These fluctuations were principally determined by Black Sea's recurrently restricted connections to the Open Ocean and by its specific paleogeographic location between the dry Mediterranean domain and more humid higher northern latitudes. To determine the nature of changes in the hydrological budget of the Black Sea occurring during the late Miocene we use compound-specific hydrogen isotope ratios on terrestrial and aquatic biomarkers extracted from two different locations: 1) the sedimentary succession of Zhelezniy Rog land based section of Taman in Russia and 2) the deep sea sedimentary succession recovered in 1975 from the Black Sea (DSDP 42B, Hole 380A). The carbon and hydrogen isotopic composition of n-alkanes as well as alkenones and palynology indicate large environmental changes in the Black Sea and/or in the sources of the water entering the Black Sea during the late Miocene. The hydrogen isotopes of alkenones, showing an enrichment of more than 80 ‰ at the end of the Miocene, imply a major shift in basin hydrology, possibly resulting in severely increased salinity. These changes in hydrogen isotopic composition of the alkenones concur both with sharp shifts in reconstructed sea surface temperature and palynological assemblages. Two intervals with negative water budget were identified, most likely caused by enhanced evaporation. The older and longer dry/evaporative phase predates the Maeotian/Pontian boundary (regional stages) at ∼6.1 Ma. The younger negative water budget phase is partly coeval to the Messinian salinity crisis of Mediterranean. Both shifts to highly evaporative conditions are recorded in both Taman Peninsula (Russia) and DSDP 42B 380A locations. These recurrent dryer phases were, most likely, the result of important hydrological changes over a significantly larger area around the Black Sea area during the upper Miocene.