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A greigite-based magnetostratigraphic time frame for the Late Miocene to Recent DSDP Leg 42B cores from the Black Sea

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In 1975, during DSDP Leg 42B to the Black Sea, three sites were drilled with a total of 2318 m cored and a recovery of 55%. While to modern scientific standards this may not be very impressive, these sites still represent the longest available records of sedimentation in the basinal part of the Black Sea. The main stratigraphic objectives of DSDP Leg 42B were to 1) obtain a complete Pleistocene litho- and biostratigraphic section and 2) study interactions between the Black Sea and Mediterranean Sea, focusing on glacio-eustatic sea level change, periods of lacustrine sedimentation, periods of anoxia, and 3) to establish a paleoclimatic record. Major problems establishing a timescale emerged after drilling due to a) the general shortage of definitive paleontological age markers and b) the general lack of agreement on correlation and time zonation of sedimentary units.
Magnetostratigraphic dating could have solved these timescale problems but was hindered by the presence of the little understood authigenic iron sulphide mineral greigite (Fe3S4) as main magnetic carrier. In recent years, the understanding of greigite has significantly improved and is considered a reliable magnetic carrier. Especially in the circum-Black Sea region, many Miocene to recent, land-based sections are magnetostratigraphically dated with greigite as magnetic carrier. We therefore resampled the cores of DSDP Leg 42B to see whether after 40 years of storage any of the original signal is preserved.
Our results show these cores are still surprisingly useful for magnetostratigraphic dating. Complications arise due to the presence of hiatuses, especially in the near-Bosporus locations. Our age model gives important new insights into the response of the Black Sea to major paleoenvironmental and climatic changes related to the late Miocene Messinian salinity crisis and throughout the Pleistocene. More generally, our results show that for future deep-sea drilling expeditions to the Black Sea, the creation of a high-resolution age model will not be as problematic as during the original study of the DSDP Leg 42B records.