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An archaeomagnetic study of Upper Mesopotamia and Central Anatolia between 2500 and 700 BCE. Further evidence for an extremely strong geomagnetic field ca. 3000 years ago

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The distribution of archaeomagnetic data in eastern Europe and the Near and Middle East shows a remarkable gap in Turkey. This study presents the first archaeomagnetic results from eight different archaeological sites in Central and Southeast Turkey. We sampled furnaces, burnt mud-brick walls, and granite and ignimbrite foundation stones. The rock magnetic experiments indicate that in the majority of the samples the dominant magnetic carrier is magnetite, which is stable to heating to temperatures of 700˚C. In general, the demagnetization diagrams are single component and all sets display well-defined characteristic magnetizations and clustered directions. For the period between 2500 and 700 BCE, the declinations are between 350˚ and 20˚ while inclinations are in the range of 49–64˚. The directional results are compared with the global geomagnetic field models (CALS7k.2, ARCH3k_cst.1 and CALS3k.4) and the data from the archaeomagnetic database GEOMAGIA50v2. The results are coherent with both the data and the models except for two near-contemporaneous sets dating ∼2000 BCE, which are offset to the east by more than 20˚ with respect to CALS7k.2. Archaeointensity measurements were made using the microwave and conventional thermal Thellier methods, as well as the multi-specimen method. These different methods yielded comparable and intriguing results. While intensities from the furnaces are slightly higher than the CALS7k.2 model and in agreement with the GEOMAGIA50v2 and the Middle East data, the results from mud-brick walls suggest a high intensity of 100.8μT (17.7 x 10^{22} Am^2)at ∼1000 BCE. This result is in excellent agreement with recent claims of extremely high intensity measured in other regions of the Middle East for this time period though less consistent with these being associated with extremely short-lived events. Finally, we discuss our new and other recently published archaeointensity results in terms of geomagnetic intensity versus climate.