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Fired clay from Neolithic houses – the role of past environment revealed in mineral magnetic properties

Neli Jordanova, Diana Jordanova, Deyan Lesigyarski, and Maria Kostadinova-Avramova
National Institute of Geophysics, Geodesy and Geography, Bulgarian Academy of Sciences, Sofia, Bulgaria
(neli_jordanova@hotmail.com)

Human behavior and especially the use of fire increasingly influence our environment during the Anthropocene epoch. Balkan Peninsula is on the road of the ancient human dispersal during the Neolithic period. Burnt Neolithic remains are often related to ancient houses which ended their existence as a result of extensive fire. Materials from burnt clay remains from house destructions originating from 18 Neolithic sites from Bulgaria were studied using rock magnetism. Mineral magnetic studies and equivalent firing temperature estimates were carried out. The aim of the study was to explore the magnetic signature of fired clay materials in relation to the most important environmental factors. The main magnetic minerals identified were magnetite, maghemite and hematite, in several cases also epsilon-Fe_2O_3. Magnetic susceptibility enhancement is dependent on the raw clay mineralogy and the firing intensity, being higher for sites developed on loess materials. Sites located in river valleys from South Bulgaria show lower susceptibility enhancement. Magnetic susceptibility and percent frequency dependent magnetic susceptibility at site level were considered in relation to the climatic conditions during the Neolithic as revealed by anthracological studies already published for the study region. Firing temperature estimates, comprising 198 single determinations in total, vary in the range 580 – 1050°C across the sites. Estimated average firing temperatures at site's level showed higher values in Early Neolithic sites (Tfire average=815°C) as compared to Late Neolithic ones (Tfire average = 746°C and 713°C). Several possible hypotheses for the trend observed are considered: difference in climate regimes across the territory leading to different "fire weather"; difference in the vegetation fuel used in house construction; and intentional burning of Early Neolithic houses. This study is financially supported by the project KP-06-COST/2, funded by the Bulgarian National Science Fund.