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Combined archaeomagnetic and thermoluminescence dating of a kiln excavated at Fontanetto Po (Northern Italy)

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Combined archaeomagnetic and thermoluminescence study was carried out as part of an archaeological rescue operation on a kiln discovered during the installation of methane tubes beneath a rice field, along the southern border of Fontanetto Po (Northern Italy). Hierarchical sampling process has been followed collecting 23 independent brick samples oriented *in situ* using an inclinometer. The presence of the metallic tubes in a depth around 1 m below the structure, and the bad weather conditions, prevented the use of magnetic compass and the sun orientation of the samples, respectively. Investigation of the isothermal remanent magnetization points to Ti-magnetite as the main magnetic carrier, while in some samples a high coercivity mineral, most probably hematite, is also present. Hysteresis cycles obtained for representative samples after heat-treatments up to 800 ˚C indicate that the bricks have been baked at temperatures around 500 to 700^o C, depending on their position in the kiln. Stepwise thermal and AF demagnetization shows no or negligible secondary magnetization components and a very stable characteristic remanent magnetization (ChRM). The calculated mean inclination of the 23 samples is I = 64.9^o with α_{95}= 2.4^o and k = 150. The archaeomagnetic age of the kiln has been obtained after comparison of the kiln's archaeomagnetic inclination with both, the Italian reference secular variation curve, and the reference curve produced by the SHA.DIF.3K European regional geomagnetic field model. Two possible dating intervals result for the last 1000 years calculated at 95 % confidence interval: a first from 1461 to 1604 AD and a second one from 1779 to 1876 AD. In addition, thermoluminescence study has been performed on three samples, using conventional laboratory procedures. Although consistently affected by the relevant water content of the site, the archaeological and annual dose of the samples have been estimated and used to calculate the kiln's age. According to the thermoluminescence results the kiln has been used for last time between 1650 and 1800 AD, but further assessment of the environmental dose is required to restrict this dating interval. This result is in good agreement with the second dating interval obtained by the archaeomagnetic results and suggests that the last firing of the kiln could have occurred as late as the 18th century AD.