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## *Conrad Observatory*

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## Archeomagnetic dating of an Iron Age pottery kiln from Northeast Iraq

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An archeomagnetic study on an Iron Age pottery kiln from Gird-i Bazar (Northeast Iraq) was conducted. Reconstructed archeomagnetic field values yield high field intensities, which can be associated with the so-called “Levantine Iron Age Anomaly”. The archeomagnetic dating approach is limited by the lack of directional reference data within the Near East.

During the course of archeological investigations in the Peshdar Plain (Northeast Iraq), the wall of a pottery kiln in Gird-i Bazar (Fig. 1) was sampled for the purpose of an archeomagnetic study (for details see Radner et al., 2019, ISBN 978-3-935012-39-3). The site was mainly occupied during the Iron Age, a period, which is associated with remarkably high field intensities in the Near East termed as “Levantine Iron Age Anomaly (LIAA)”.



Figure 1: Excavation of the pottery kiln in Gird-i Bazar.

Magnetic measurements have been carried out at the paleomagnetic laboratory of the Conrad Observatory. Magnetic experiments revealed fine-grained (titanio)magnetite as primary remanence carriers providing an excellent basis for the reconstruction of the ancient field. Archeomagnetic measurements yielded stable characteristic remanence directions (declination  $D = -8.1^\circ$ , inclination  $I = 53.0^\circ$ ) and a rather high cooling-rate-corrected intensity value  $F = 58.7 \mu\text{T}$ , which can be associated with the LIAA (today's field strength is  $\sim 47 \mu\text{T}$ ). The reconstructed field values are compared with reference curves for archeomagnetic dating (Fig. 2). Reference curves were taken from the global field model BIG-

MUDI4k.1 and constructed based on a regional dataset, respectively. Most probable dated ages are younger than 500 BC for both models using the combined approach considering all three geomagnetic components. This is in contrast to the results of radiocarbon dating and the historical context indicating that the last firing of the kiln was likely carried out during the reign of Shalmaneser III (858-824 BC), when Gird-i Bazar and the wider region was integrated into the Assyrian Empire.

Contradictions of archeomagnetic and radiocarbon as well as historical dating approaches arise from differences of measured inclination, which was based only on one oriented sample, however. In this context, tilting of the kiln wall after the last usage is conceivable. Furthermore, new directional data sets from the Near East are necessary to better constrain reference curves for this region.

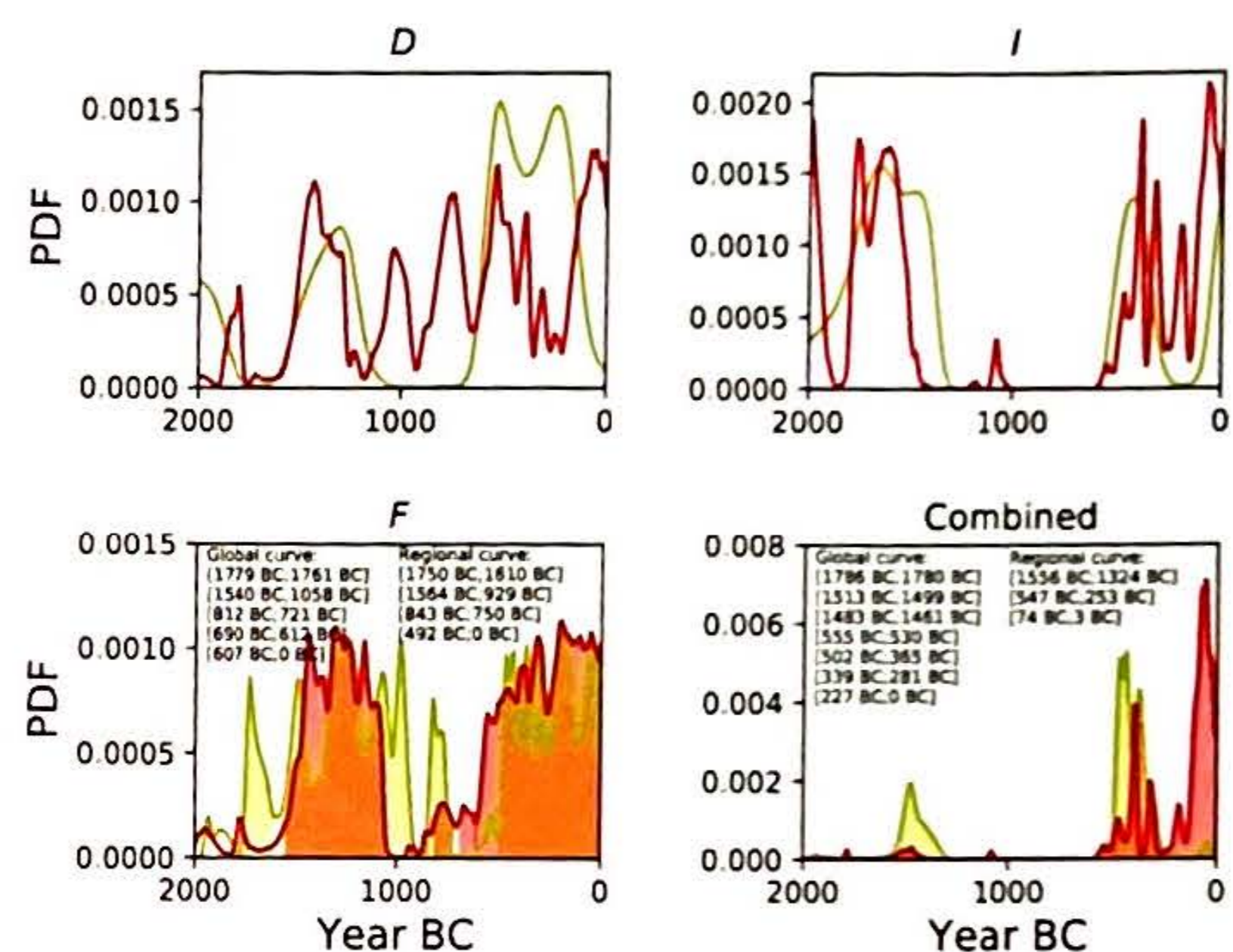


Figure 2: Archeomagnetic dating: probability density functions are given for D, I, F as well as the combined age probability using all three components. Possible age intervals derived from global (red) and regional model curves (yellow) are given for the approach using only F (bottom left) and using all three field components (bottom right).

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