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Trabecular magnetite: towards understanding iron reduction using FORC-PCA.

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Sedimentary environments preserve the record of past climate changes reflected in changes in magnetic composition. The deconvolution of the resulting bulk magnetic signal is one of the largest challenges in environmental magnetism, crucial for understanding the links between climate and magnetic rock record. We approach the issue by applying Principal Component Analysis on suites of First Order Reversal Curve diagrams (FORC-PCA) in a high-resolution case study of a marine core obtained from the Iberian Margin containing a 200000 year record of climate changes. Rock magnetic studies are supported by Transmission Electron Microscopy studies. We identify a previously unknown magnetic component which dominates the bulk susceptibility variations, which is formed through reductive dissolution of goethite. Trabecular magnetite, named for its characteristic internal structure, preserves a record of changes in past diagenetic conditions linked to glacial cyclicity and changing redox conditions.