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Paleomagnetism and Relative Paleointensity of Estremenho Limestone Massif stalagmites, from Portugal

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Speleothems magnetism is considered an excellent recorder of short-lived variations of the Earth's magnetic field. Here we provide new geochronological, petrographic, paleomagnetic, and rock magnetic data of a stalagmite from the Estremenho Limestone Massif (from Central Portugal). The stalagmite was dated at 114.7 (±1.5) *k.y.* B.P. to 106.3 (±1.6) *k.y.* B.P. based on the U-Th series. This time interval is coeval with the age of the Blake Geomagnetic Excursion (~116.5 ± 0.7 *k.y.* B.P. and 112.0 ± 1.9 *k.y.* B.P.). Petrographic observations under a binocular stereo microscope of two thin sections located at the lower part of the stalagmite and scanning electron microscopic observation of rock fragments show the alternance of porous and compact columnar calcite and dendritic calcite, which are typical features of primary calcite precipitation. No significant gap in the calcite growth was identified along the two thin sections. After alternating field demagnetization, a viscous secondary magnetization was cleaned below 10 mT, followed by a primary magnetization pointing to the origin. Magnetic vectors have an average declination of 60.3° with a mean inclination of 20.1°. No geomagnetic excursion or reversal was identified along the stalagmite. Analysis of Isothermal Remanent Magnetization curves shows the presence of two components. Component 1 has a mean coercivity of ~35 mT and DP ~0,20-0.25, typical of pedogenic/detrital magnetite, and contributed to 75% of the total remanence. Component 2 has a mean coercivity of ~95 mT and DP ~0.30, interpreted as being hematite, and contributing to 25% of the total remanence. We also calculated relative paleointensity (RPI) based on the Pseudo-Thellier method. The RPI curve exhibits a consistent and gradual increase from the base to the top of the stalagmite, with a pattern of variation comparable to the reference curves of marine sediments from the Portuguese margin, in the same time interval. In summary, petrographic and magnetic data point to a primary origin for the calcite precipitation and the corresponding remanent

magnetization. The absence of the record of the Blake excursion in this stalagmite still remains to be resolved.

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