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Magnetic fingerprint of stalagmites

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Dating stalagmite using paleomagnetic methods is still in its early stage of development. Questions still remain regarding the nature and origin of the magnetic carriers and the reliability of the natural remanent magnetization preserved within the thin carbonated laminations of stalagmites. Here we apply high-resolution rock- and paleomagnetic methods on two (altered and preserved) stalagmites in order to identify the magnetic and mineralogical signatures and to assess the stability of the remanence. Scanning Electron Microscopy analyses conducted on material from glass plates that remain in the caves during three months help comparing with the composition of present-day dripping waters as well as unravelling the influence of microbial activity. Our results show that preserved stalagmites contain fine-grained detrital titanomagnetite, transported by dripping waters, and carry a stable and high Natural Remanent Magnetization. A widespread microbial activity developed at the surface of the glass plates but it is essentially represented by fungi which does not produce biogenic iron oxides. Rather, titanomagnetite and secondarily zircon identified in both preserved stalagmites and glass plates argue for a detrital terrigeneous origin. These findings provide new insights for further paleomagnetic and paleoevironmental investigations from stalagmites.