



HOW DO SEDIMENTS GET MAGNETIZED?

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Invited talk

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Paleomagnetic analyses have been carried out on sedimentary rocks for over 65 years. Throughout much of this time, sedimentary magnetization acquisition has been associated with the depositional remanent magnetization (DRM) and post-depositional remanent magnetization (PDRM) concepts, where dominantly detrital magnetic particles align passively with the geomagnetic field either during or after deposition. Single domain magnetic particles will align almost instantaneously with the geomagnetic field, yet observed magnetizations are generally about 1% of the saturation magnetization. Using a statistical approach, we demonstrate that high-fidelity paleomagnetic recording can occur even for a randomly oriented assemblage of magnetic particles with a small bias toward the ambient field direction (sometimes less than 1 degree). Our simulation suggests that geomagnetic torques could provide a small directional bias that gives rise to widely observed inefficient, yet directionally faithful, detrital magnetizations. Biogenic magnetite is increasingly recognized as an important source of sedimentary paleomagnetic signals and can give rise to two types of magnetization. If the magnetotactic bacteria that produced the magnetite lived in the water column or surface sediment mixed layer, the magnetic particles that they produce would contribute to the magnetization in a similar manner as detrital particles and would contribute to a DRM or PDRM. If magnetotactic bacteria live below the surface mixed layer, their magnetic remains have been proposed to give rise to a biogeochemical remanent magnetization. We provide a critical evaluation of these types of magnetization, but much remains to be learned about sedimentary magnetization acquisition despite the longevity and importance of this subject.

Keywords: Paleomagnetism, sediments, depositional remanent magnetization, post-depositional remanent magnetization