Magnetic study of turbidites

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Résumé

Turbidites induce sedimentary reworking and re-deposition caused by tsunami, earthquake, volcanic processes, and other catastrophic events. They result from rapid depositional processes and are thus not pertinent for magnetic records compared to pelagic sediments. No attention has ever been paid to the magnetization of turbidites which is justified given their rapid deposition. In certain conditions like channeled turbidity currents, levees of sediment are generated and then associated with relatively calm although very fast redeposition. Such conditions govern the subsequent acquisition of magnetization through mechanical lock-in of the magnetic grains. This situation is actually quite similar to what happens during sediment redeposition experiments in laboratory. Therefore, combining laboratory experiments and studies of natural turbidites help constrain the processes involved in the acquisition of magnetization. We selected and sampled four different turbidites associated either with spillover of channeled currents or with co-seismic faulting. Each event has a different thickness from ten to a few dozen of cm, different lithology and different mean granulometry (from a few dozen to a few hundreds of micrometers). We carried out measurements of magnetic susceptibility, magnetic remanence and anisotropy of magnetic susceptibility. We scrutinized also the evolution of various rock magnetic parameters (ARM, IRM, S ratio, magnetic grain sizes, hysteresis parameters) within each turbidite and the overlying hemipelagic sediments. The sediment granulometry shows significant coarsening in the lower layers of all turbidites, similarly to what is observed in laboratory redeposited sediments. In most cases the magnetic grain sizes follow a similar pattern. The inclination of remanent magnetization deviates from the expected value at each locality. This deviation increases with depth and reaches a maximum at the base of the turbidite. It is not linked to the magnetic mineralogy, and the anisotropy of susceptibility does not show a relationship with compaction. We speculate that it is related to the deposition processes inherent to the onset of the turbidite, more specifically to the massive and turbulent flux of particles.

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