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Magnetic study of four turbidites

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Turbidites are usually discarded from paleomagnetic studies, and therefore their remanence and magnetic properties are poorly described. Turbidites are exempt of bioturbation and acquire their remanent magnetization over a short time period. We have studied magnetic characteristics of four different quaternary turbidites sampled in marine sediment cores. Downcore coarsening of both magnetic and sedimentary fractions indicates that coarser sedimentary and magnetic grains reached the bottom first. As coarse magnetic grains have no reason to preferentially cluster with coarse sediment particles during their fall we infer that flocculation, if any, was not dominant before the particles reached the surface of the sediment. This observation goes against the concept that aggregates would be the dominant factor impeding alignment of magnetic grains in natural sediments. Another significant result is a progressive shallowing of magnetic inclinations between the upper and bottom layers of turbidites, while the axes of magnetic susceptibility are randomly scattered. The amplitude of shallowing increases with the size of the events and obeys a simple linear scaling law. We infer that hydrodynamic conditions appear to control the orientation of the magnetic moments. The small spherical grains are randomly oriented with zero resultant magnetization in the most turbulent conditions. The small elongated grains are also subjected to competition between the gravity and the magnetic forces, but in the most turbulent conditions they rest at the bottom with their long axes parallel to the surface yielding shallow inclinations. The absence of magnetic perturbations present in the smallest (11 cm thick) and thus weakly turbulent event supports also this model.