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Sediments fail to record geomagnetic transitions

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We have studied four records of the last Matuyama-Brunhes reversal from sediment cores from the equatorial Indian Ocean, west equatorial Pacific Ocean and North Atlantic Ocean with deposition rates of 4cm/ka and 2cm/ka for one equatorial core. All measurements were performed using 8cc cubic samples. In three records the demagnetization diagrams of the transitional samples are of bad quality. In the best samples the characteristic component of magnetization is defined with a large error that is reflected by an increase of the MAD value by at least a factor 10 with respect to non-transitional samples. Although not being frequently reported in papers which tend to exhibit the best demagnetization diagrams, this behavior is actually typical of most transitions studied in sedimentary sequences and somehow questions the reliability of the records. It is frequently considered that failure to isolate the initial magnetization component is due to weakly magnetized transitional samples with magnetization about ten times lower than outside the reversal. However, the magnetization intensity of transitional samples is much stronger in two of the present cores than the non-transitional samples of the other cores. The VGP paths that were tentatively derived from these transitions are quite complex and very different from each other. After rescaling all results to the same resolution the length of the transitional intervals remains different between each core suggesting that different magnetization processes were at work and yielded different records of the rapid field changes during the transition. Because similar magnetic grains recorded different directions, demagnetization fails to isolate a characteristic component. The sediment from west equatorial Pacific is an interesting exception with nice univectorial transitional diagrams decreasing towards the origin. The inclination remains close to zero, while the declination rotates smoothly between the two polarities. As a consequence the VGPs follow a simple longitudinal trajectory like expected for a rotation of the dipole. This unrealistic scenario likely results from heavy post-depositional processes that integrated various amounts of pre- and post-transitional magnetic directions within each sample. These results confirm that sediments are mostly inappropriate to extract suitable information about geomagnetic reversals.