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Which Parameters control Relative Paleointensity? Results from a South Atlantic Stratigraphic Network

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Eight contiguous sediment cores from the subtropical and subantarctic South Atlantic were combined for comparison of their rock magnetic properties and relative paleointensity records. The cores can be divided in three lithologies, diatom, foram and clay bearing nannofossil ooze. For each core we measured records of magnetic susceptibility κ, wet bulk density ρ, NRM, ARM, IRM and XRF element analysis, and δ^{18}O for two cores. A detailed chronology was established by multi-parameter correlation. For the determination of relative paleointensity (RPI) it is usually assumed that NRM is proportional to the geomagnetic field H and to the concentration of remanence carriers, which is compensated by normalizing the NRM by a concentration dependent parameter N_i(z). Homogeneity of the magnetic mineral fraction is a prerequisite for RPI determination. However it has hardly been considered how the degree of particle alignment may depend upon lithological sediment properties. Assessing the influence of any normalized lithological parameter λ upon RPI is based on a linear approach using an additional factor (1+ $\alpha\lambda$) in which the coefficient α describes the relative influence of λ. When two or more cores are used, an optimal α can be determined by minimizing the least-square distances between the paleofield estimates H_i(z) in function of α. This method has been used to calculate the efficiencies α of many sediment properties. The best coherence for the RPI signals is found by lithological correction using the grain size dependent parameter ARM/IRM. Most noticeably, correction for diagenetic influence using the ratio Fe/κ does not improve correlation significantly. This indicates that reductive diagenesis has only minor impact upon RPI records. Correction with ARM/IRM improves the correlation between the stacked RPI signal and Sint-800. Furthermore the ratio of corrected (λ = ARM/IRM) to uncorrected RPI stack reveals a global climate signal which was not visible in any single record.