

Mg/Ca palaeothermometry from planktonic foraminifera: a multi species approach

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Information on the hydrographic properties of surface ocean waters during glacial and interglacial conditions is crucially important for understanding past climate change. Sea surface palaeotemperatures (SST) have traditionally been estimated from faunal abundances and, more recently, from C_{37} alkenones in sediments. In principle, SST may also be obtained from the oxygen isotopic composition ($\delta^{18}O$) of planktonic foraminiferal calcite after correction for ice volume effects but this approach can be complicated by local salinity variations, vital effects and diagenesis. Results from inorganic studies have long suggested that Mg/Ca in carbonate minerals is mainly controlled by temperature. More recently, Mg/Ca data from ostracods, corals, and cultured and core top planktonic foraminifera, have suggested that Mg partitioning into biogenic carbonates is also temperature dependent. We present Mg/Ca from a number of sources in order to address the question of the reliability and applicability of this SST proxy. These include (i) a calibration based on a latitudinal section from the North Atlantic, (ii) a comparison of Mg/Ca and $\delta^{18}O$ from the same species together with faunal transfer function SST estimates from three cores from the Southern Ocean, (iii) a comparison of multiple species and faunal transfer function SST and alkenone SST estimates from a NE Atlantic core; and (iv) a detailed evaluation from multiple species and size fractions.