



## Mg-lattice associations in red coralline algae

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Recent investigations have shown red coralline algae to record ambient temperature in their calcite skeletons. Temperature recorded by variation in Mg concentrations within algal growth bands has sub-annual resolution and high accuracy. The conversion of Mg concentration to temperature is based on the assumption of Ca replacement by Mg within the algal calcite skeleton at higher temperatures. While Mg-temperature relationships in coralline algae have been calibrated for some species, the location of Mg within the calcite lattice remains unknown. Critically, if Mg is not a lattice component but associated with organic components this could lead to erroneous temperature records. Before coralline algae are used in large scale climate reconstructions it is therefore important to determine the location of Mg. Synchrotron Mg-X-ray absorbance near edge structure (XANES) indicates that Mg is associated with the calcite lattice in *Lithothamnion glaciale* (contemporary free-living, contemporary encrusting and sub-fossil free-living) and *Phymatolithon calcareum* (contemporary free-living) coralline algae. Mg is deposited within the calcite lattice in all seasons (*L. glaciale* & *P. calcareum*) and thallus areas (*P. calcareum*). These results suggest *L. glaciale* and *P. calcareum* are robust Mg-palaeotemperature proxies. We suggest that similar confirmation be obtained for Mg associations in other species of red coralline algae aiding our understanding of their role in climate reconstruction at large spatial scales.