Age and composition of corals from the deep ocean: Response to climate

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Coral populations exist in every ocean basin, from tropical shallow reefs to the depths of the Southern Ocean. Hypotheses link their modern distribution and structural composition (which may include aragonite, calcite or proteinaceous gorgonin) to seawater chemistry, but there have been few systematic studies testing these ideas. Calcified skeletons can be preserved on the seafloor for hundreds of thousands of years forming a long-term record of coral biogeography, which we seek to exploit.

In this study we examine the microscale skeletal composition of aragonite and calcite forming stylasterid corals from the Southern Ocean crossing strong geochemical gradients in seawater. We also use radio-isotopic methods (including rapid ^{14}C methods and laser ablation U-Th methods, as well as traditional isotope dilution U-Th analyses) to date thousands of sub-fossil corals (scleractinia and stylasterids) from the Atlantic, Pacific and Southern Oceans, identifying clear changes in the distributions of the corals, both by location and by depth.

By combining these modern and historic data sets, we explore the geochemical controls on deep-sea coral based ecosystems, with reference to the changes in climate and oceanography that occurred in the oceans during the major transition from glacial to interglacial conditions.