A coral ensemble approach to reconstructing mean climate and seasonality from the central Pacific

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While tropical Pacific coral $\delta^{18}O$ records faithfully quantify interannual temperature and precipitation anomalies associated with ENSO, changes in *mean* tropical Pacific climate are poorly constrained due to the existence of substantial mean offsets across overlapping coral sequences. We test a new approach of reconstructing changes in mean climate using a large ensemble of bulk $\delta^{18}O$ measurements on fossil corals from Kiritimati that span the last 6,500 years. In contrast to the traditional method of high-resolution sampling to reconstruct monthly climate conditions, we implement a bulk approach, which dramatically reduces the analysis time needed to estimate mean coral $\delta^{18}O$ and enables a large number of corals to be analysed in the production of an ensemble of mean climate estimates. High resolution records are used to constrain changes in the amplitude of the seasonal cycle. The capabilities, limitations and uncertainties of this joint bulk/high-resolution sampling approach are explored with pseudo-coral experiments and a Linear Inverse Model. We implement a broad set of screening tools to test for diagenesis in this large set of modern and fossil coral records and based on this data, we provide a roadmap for scoring coral records based on their alteration potential. Applications to high resolution and bulk $\delta^{18}O$ measurements are discussed.