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Stable Isotopes and Mg/Ca, Sr/Ca Ratios in a Sclerosponge Archive

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Several studies have highlighted the potential of sclerosponges (coralline sponges) to record environmental changes occurring in the marine environment due to man's impact (Druffel & Benavides 1986, Böhm *et al*. 1996, Swart *et al*. 1998, Lazareth *et al*. 2000). For instance, the potential for using coralline sponges as tools to reconstruct the ocean uptake of excess CO_2 is highlighted by the fact that the decrease in $\delta^{13}C_{DIC}$ from the early 19^{th} century to present, is recorded by sclerosponge skeletons in close match with CO_2 increase in ice-cores (Swart *et al*., 1998, Lazareth *et al*., 2000, Böhm *et al*. 2002). Sclerosponges appear to secrete their skeletons in carbon and oxygen isotopic equilibrium with seawater (Druffel & Benavides, 1986, Böhm *et al*., 1996, 2000) and absence of photoautotrophic symbionts enables them to live below depths reached by corals (typical range of occurrence: 20-250m). Furthermore, the lifespan of sclerosponges exceeds the one of corals ($>$ 300 years) adding to their uniqueness for pre-industrial climate reconstructions (Lang *et al*. 1975, Swart *et al*. 1998, Rosenheim *et al*. 2004).

δ^{13}C, δ^{18}O, Mg/Ca- and Sr/Ca were measured along transects parallel to the growth axis of a *Ceratoporella nicholsoni* specimen, collected in 1985 off Acklins Island, Bahamas (30m depth). U/Th dating indicated that the proxy records extended beyond the past 220 years, in agreement with growth rate values based on *in situ* labeling of 10 specimens with calcein over a 10 year interval in Jamaica (Willenz & Hartman, 1999) and confirming a relatively constant mean growth rate of 230 μm/yr. The

δ^{13}C-record was detrended in order to figure out if more significant information could be deduced, besides the Suess-effect. Therefore, a moving average filter was used to suppress stochastic measurement-noise. These two signal processing steps revealed a clear periodicity of about 50 years. Similar analysis of the δ^{18}O, Mg/Ca, Sr/Ca and Ba/Ca records confirmed this cyclicity. Correlations between proxies indicate a common origin for the observed cyclicities.

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