

## **Evaluation of the Ca Isotope System ( $\delta^{44}\text{Ca}$ ) in Carbonate Polymorphs as a new Proxy for Seawater Temperature and Secular Variations of Ca Concentration and Fractionation throughout Earth history (CASIOPEIA, FP08)**

We propose the investigation of the thermodynamic and paleo-oceanographic principles of calcium (Ca) isotope fractionation ( $\delta^{44}\text{Ca}$ ) during biomineralization and inorganic precipitation of calcium carbonate ( $\text{CaCO}_3$ ). This is important because recent findings indicate that the Ca isotope system represents a new proxy for the reconstruction of past seawater temperatures and for variations of the Ca seawater concentrations throughout Earth's history. Both aspects are crucial for paleoceanography and -climatology because they interfere with the global carbon cycle influencing the concentration of important greenhouse gases like  $\text{CO}_2$  throughout time. The concept to validate the Ca isotopes as a paleo-proxy is to test its sensitivity to temperature calibration, the preservation of primary isotope signals, the knowledge of inter-specific differences and of past initial isotope ratios. These requirements will be investigated in laboratory and culturing experiments on inorganically precipitated  $\text{CaCO}_3$  and on major groups of marine calcifying organisms previously used as proxy archives (foraminifera, bivalves, coccolithophorids). The proposed experimental cross-calibration of the Ca isotope system to temperature sensitive metal to calcium ratios (Mg/Ca, Sr/Ca, Ba/Ca, etc.) and other isotope systems ( $\delta^{18}\text{O}$ ,  $\delta^{11}\text{B}$ ,  $\delta^{25}\text{Mg}$ , etc.) will be completed by field and down-core experiments offering the unique opportunity to refine their application as paleo-proxies in a multi-proxy approach.

**Anton Eisenhauer\***, Kiel University, Kiel, DE

**Adrian Immenhauser**, Vrije Universiteit, Amsterdam, NL

**Martin Dietzel**, Graz University of Technology, Graz, AT

**Dirk Frei**, Danmarks Og Grønlands Geologiske Undersøgelse, København, DK

\* Project Leader