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Sulfur impact on Coccolithophore bio-calcification
A simulated *in vitro* approach linking present with ancient oceans

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Phanerozoic global biotic and environmental disruptions are characterized by biodiversity loss and decrease of CaCO3-producing organisms, with tremendous environmental and climatic consequences. These crisis are coeval with the emplacement of massive basalt flows releasing huge volcanogenic CO2 and SO2 emissions in the Ocean -Atmosphere system. Today, CO2 emitted by anthropogenic activities has provoked ocean acidification (pH decrease), reduction of phytoplankton size and decrease of biocalcification rates. If the impact of CO2 on calcareous plankton is widely acknowledged, high SO2 impact on ocean acidification and biocalcification rates remain unknown.

This study explores the Sulfur (S) impact on Coccolithophores, the most important carbonate producers of the planet. These organisms are suffering a biocalcification crisis in the present-day ocean as it probably occurred in the geological past. S-emissions during both past biological crisis and modern anthropic perturbation may have impacted on Coccolithophore's biocalcification via acidification and/or via SO42- increase in sea-water.

In vitro experiments with monoclonal diluted batch cultures of *Emiliania huxleyi* have been performed in artificial seawater in order to test the impact of increasing sulfate concentrations. The physical and chemical seawater variations as well as Coccolithophore' physiology and morphology have been constantly monitored, specifically the physiological response of cellular and population growth, calcification rates and CaCO3 production. In highest sulfate concentrations there is a significative decrease in biocalcification, expressed by decrease of population growth, calcification rate, PIC, calcite mass as well as coccolith morphology and structure. In highest sulfate concentration coccoliths are more fragile, less thick and in less number around the coccosphere, suggesting, for the first time, the inhibitory effect on coccolithophore biocalcification of high sulfate concentration.