Microbiological control on the cycling of Fe and its isotopes in Antarctic sea ice

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Iron plays a pivotal role in regulating the rates of primary production and the flux of carbon and nutrients to the deep sea in the Southern Ocean. Iron may accumulate in the sea ice reaching levels up to two orders of magnitude higher than in the underlying seawater. The objective of the present study is to identify the main processes that control this accumulation of Fe in the sea ice. Samples of brine, seawater and sea ice were collected in September-October 2003 during the ARISE, cruise V1 (64-65°S/112-119°E, *RV Aurora Australis*) and from November 2004-January 2005 during the ISPOL cruise (ANT XXII-2, 67-68°S/54-55°W, *RV Polarstern*). Dissolved and particulate Fe concentrations and natural isotopes ratios have been measured together with some relevant physico-chemical and biological parameters. Results suggest that the organic matter could play an essential role in trapping Fe in the sea ice and that dissolved and particulate iron isotopic compositions are controlled by the autotrophic and heterotrophic activities of the microbial communities.

Interpreting high-precision U-Pb zircon dates: New insights from volcanic and plutonic rocks

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As the precision of U-Pb zircon dates approaches and exceeds the timescales of zircon crystallization in magmas, there appears an inexorable difficulty with interpreting these dates a priori as "crystallization of a pluton" or "eruption of a magma". This problem has become exceedingly apparent in ID-TIMS U-Pb analysis, such that it is now common to see spreads of several hundred kyr in zircons from single plutonic or volcanic rocks. Such dispersion exists despite increasing efforts to eliminate Pb-loss and ameliorate measurement accuracy. Though prolonged growth and/or inheritance of zircon can be inconvenient for those wishing to find "an age" for pluton crystallization or ash deposition, this phenomenon can also provide an opportunity to better understand the evolution of magmatic systems as a function of time.

We present ID-TIMS U-Pb zircon data from two onging studies: one which explores the rates and timing of biologic extinction and subsequent recovery at the Triassic-Jurassic boundary by dating zircons from volcanic ash layers interlaced within stratigraphy of the Pucara basin, northern Peru; and one which looks at magma generation and emplacement timescales within gabbroic to tonalitic rocks of the southern Adamello batholith, northern Italy. Utilization of new EARTHTIME mixed U-Pb tracer solutions, combined with low-blank CA-TIMS analysis on well-calibrated ion counters and faraday cups, allow for internal precision on single zircon dates of $\geq 0.05\%$ of the age. More precise data afforded by the new tracer solutions reveals signifacnt spreads in single zircon dates for samples which gave statistically signifcant clusters of dates using older tracer solutions and larger uncertainties (calling into question the applicability in general of weighted-mean dates).

Durations of zircon growth of at least several hundred thousand years recorded in single ash beds and tonalite samples requires new means to quantify antecryst inheritance vs. lead-loss in magmatic systems. Combining zircon U-Pb dates with geochemical constraints from the same zircons provides a means to distinguish growth of grains from a single, evolving magma body from those crystallized in compositionally distinct magmas of similar age. Thus, examining zircon growth and distribution in well-characterized plutonic systems can aid in the interpretation of despotisional ages inferred from zircon dating in ash-beds.