Exploring mass independent fractionation in aqueous phase sulfur chemistry: The contribution of magnetic isotope effects

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Archean sulfur mass-independent fractionation (S-MIF) has been widely recognized as the most reliable proxy for the rise of atmospheric oxygen. A decade after its discovery, the wide-ranging implications of sulfur-MIF have been discussed extensively although relatively little is known about the mechanisms causing sulfur-MIF in natural environments. A number of studies on gas-phase processes have started to advance our understanding of the possible involvement of the more usual suspects in this regard, however, experimental evidence has also implicated aqueous interactions as potential candidate for MIF in several isotope systems (most prominently for mercury). In order to test whether processes other than gas-phase UV photochemistry have contributed to mass-independent fractionation in the sulfur system throughout Earth's history, we investigated an experiment first reported by Step *et al*. regarding anomalous ^{33}S fractionation during aqueous-phase UV photolysis of phenacylphenylsulfone (PPS) as a model system for initial investigation. SF_6 high precision quadruple sulfur isotope analysis of the residual PPS after UV photolysis confirmed MIF for the ^{32}S-^{33}S-^{34}S triad but showed only small, purely mass-dependent fractionation between ^{32}S-^{34}S-^{36}S. The result confirms that MIF in this system is caused by the magnetic ^{33}S isotope and excludes other mechanisms such as nuclear volume effects or vibronic coupling that would produce concomitant MIF in the ^{32}S-^{34}S-^{36}S triad. This provides a starting point for discussing the implications of magnetic isotope effects as a mechanism for mass-independent isotope fractionation in the chemical evolution of the sulfur cycle.

[1] Step *et al*. (1992) Magnetic effects in the photolysis of micellar solutions of phenacylphenylsulfone. *Chemical Physics* **162** (1) pp. 189–204

MagIC database: Comprehensive archiving and visualization of rock- and paleomagnetic data using web 2.0 technology

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Relational Database for Rock and Paleomagnetism

The Magnetics Information Consortium (MagIC) implements and maintains an online portal (http://earthref.org/MAGIC/) and relational database of rock and paleomagnetic data. The goal of MagIC is to archive all existing measurements and derived properties for future studies of paleomagnetic directions (inclination, declination) and intensities, and for rock magnetic experiments (hysteresis, remanence, susceptibility, anisotropy).

New Web 2.0 Online User Interfacing

To address this task the MagIC Online Database has undergone significant revisions in the past six months, with new features including a much more responsive Web 2.0 interface, result set filtering, integrated and asynchronous plotting and mapping, advanced saving options, and a rich personalized tabular layout. Queries can be saved for future use and can be built based on location, reference, methods applied, material type and geological age, as well as a visual FlashMap interface to browse and select locations. Users can also browse the database by data type (e.g. inclination, intensity, virtual geomagnetic pole (VGP), hysteresis, susceptibility) or by data compilation to view all contributions associated with previous databases, such as the Paleointensity Database (PINT), the Global Paleomagnetic Database (GPMDB), the Paleosecular Variation of Recent Lavas (PSVRL), or other user-defined compilations. The MagIC Database is continuously striving to enrich and promote Rock- and Paleomagnetic research by providing the scientific community with the tools for retrieving and analyzing previous studies, and for organizing and collaborating on new activities.