

# Iron isotopes in sedimentary pyrites from the Baltic Sea

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The Fe isotope composition of sedimentary pyrites has been used to identify biological processes in the Archean [1] and trace changes in the oxygen content of the early atmosphere [2]. However, only one study focused so far on the investigation of recent sedimentary environments where pyrite is forming [3]. In the present study, sediments of the Gotland basin in the Baltic Sea, which were deposited after the last deglaciation during the last ~10,000 years, are explored. Pyrite and FeS formation is thought to have occurred under three distinct conditions in the Gotland Deep due to the change from oxygenated bottom water in a mainly limnic environment to periodically euxinic conditions and brackish water [4]. The effect of these changes onto the Fe isotope composition of bulk samples, pyrite and labile Fe is investigated.

Samples, which were deposited under oxygenated limnic conditions have bulk Fe isotope compositions, which are identical to that of average igneous rocks. In contrast, bulk samples from the periodically euxinic brackish units have lighter  $\delta^{56}\text{Fe}$  of  $-0.13 \pm 0.04$  ‰ (variations in  $^{56}\text{Fe}/^{54}\text{Fe}$  relative to the IRMM-14 standard). Furthermore, pyrites from this section have pronounced negative Fe isotope compositions with a mean value of  $-1.1 \pm 0.2$  ‰  $\delta^{56}\text{Fe}$ . This value is very similar to the one determined by [3] for pyrites from two locations at continental margins. Preliminary data suggest that pyrites from the uppermost part of the limnic sediments have slightly lighter Fe isotope compositions. In contrast, Archean pyrites can have  $\delta^{56}\text{Fe}$  as light as  $-3.5$  ‰, whereas samples from the Paleoproterozoic can display  $\delta^{56}\text{Fe}$  up to about  $+1.2$  ‰. However, further work on samples from distinct environments is needed to assess the present range in Fe isotope compositions for sedimentary pyrites. The slight negative  $\delta^{56}\text{Fe}$  values of the bulk samples deposited under euxinic conditions might be related to intense pyrite formation and redox cycling. Complementary positive  $\delta^{56}\text{Fe}$  signatures might be accumulated in the uppermost sedimentary layers or heavy iron may have diffused out into the water column. Alternatively, the change in Fe isotope compositions could be related to a change in Fe source material, e.g. associated with organic matter accumulation. Further data will be presented for the labile Fe fractions of these samples. **References:** [1] Archer and Vance (2006) *Geol.* **34**, 153-156. [2] Rouxel et al. (2005) *Science* **307**, 1088-1091. [3] Severmann et al. (2006) *GCA* **70**, 2006-2022. [4] Sternbeck and Sohlenius (1996) *Chem. Geol.* **135**, 55-73.