

## Origin of isotopically heavy Fe in pyrite from 2.75 Ga Wilgie Mia BIF, Western Australia

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The 2.75 Ga Wilgie Mia Formation, Yilgarn Craton, Western Australia consists of a sequence of banded iron formation (jaspilitic chert, magnetite BIF), interlayered with minor black shales. Pyrite occurs abundantly in black shales and in trace amounts in BIFs, and has been studied for Fe and S isotopic composition using SIMS. Clustered framboidal diagenetic pyrite in shales is isotopically heterogeneous both in S ( $\delta^{34}\text{S}$  from -6.9 to +4.7‰) and Fe ( $\delta^{56}\text{Fe}$  from -3.3 to +0.5‰). Analyzed BIF samples (c. 50 m stratigraphically above shale samples) exhibit a narrower range in  $\delta^{34}\text{S}$  (-3 to +1‰) that overlap with  $\delta^{34}\text{S}$  of secondary pyrite in veinlets in shale. Fe is considerably heavier in BIFs compared to shales with individual  $\delta^{56}\text{Fe}$  measurements in three studied samples ranging from 0.6 to 1.3‰, 0.8 to 2.1‰ and 1.5 to 2.7‰. These  $\delta^{56}\text{Fe}$  values from the Wilgie Mia BIF are among the heaviest so far reported from sedimentary rocks. Textural observations show that pyrite is the latest Fe phase in BIFs, post-dating both early hematite in jaspilitic chert and later hydrothermal magnetite. Pyrite formation in BIF appears to be related to hydrothermal S remobilization from shales and infiltration of framboidal pyrite derived sulfide bearing fluids into BIF. The S isotopic composition of dissolved hydrothermal sulfide was homogenized with respect to framboidal pyrite, and from this homogenized S source pyrite formed in veinlets and BIFs. Previous Fe isotopic data using mineral separates [1] have indicated the presence of heavy pyrite with  $\delta^{56}\text{Fe}$  values from 0.81 to 0.94‰ in the Wilgie Mia BIF. This was explained through the isotopic equilibrium of pyrite with magnetite ( $\delta^{56}\text{Fe}$  from 0.37 to 0.60‰) and hematite-jaspilite ( $\delta^{56}\text{Fe}$  from 0.54 to 0.72‰) [1]. As the  $\delta^{56}\text{Fe}$  of many pyrite crystals studied here is heavier than predicted by equilibrium fractionation with Fe-oxides, and since pyrite is texturally late (clearly post-dating Fe-oxides) alternative fractionation mechanisms need to be considered. These may include the selective leaching of Fe-oxides by infiltrating sulfidic hydrothermal fluids, or equilibrium between magnetite/hematite and  $\text{Fe}^{2+}_{\text{aq}}$ .

[1] Czaja *et al.* (2010) Abstract 5IAS

## Nutrient content of mineral aeolian dust and its impacts on temperate forest nutrient cycles

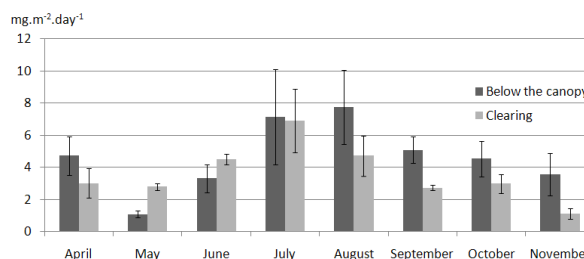
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In Europe, mineral Aeolian dust is known to bring nutrients to Mediterranean forests [1] but its impact on acidic temperate forests has received little attention up to now. This study aims at quantifying the amount of nutrients released from Aeolian dust into the nutrient pool of two beech stands in the North of France. Mineral Aeolian dust was continuously collected in a clearing and below the canopy (throughfall and stemflow), showing deposition rates of  $14 \pm 3$  and  $18 \pm 6 \text{ kg ha}^{-1}$  in 2010, respectively.



**Figure 1:** Aeolian dust deposition rates ( $\text{mg.m}^{-2}.\text{day}^{-1}$ ) at the experimental site of Montiers-sur-Saulx

Particle size distribution, determined by a laser Coulter, was dominated by the fraction under  $50 \mu\text{m}$ . Scanning electron microscopy and X-ray diffraction analyses of particles revealed the presence of quartz, phyllosilicates and feldspars. Our results suggest that Ca amounts released into forest nutrient pool by Aeolian dust and by soil weathering [2] are of the same order of magnitude.

[1] Avila *et al.* (1998) *Atmos Environ* **32**, 179–191. [2] Fichter *et al.* (1998) *Geoderma* **82**, 295–314