# Tracing the secular evolution of the upper continetnal crust using the Fe isotopes of glacial diamictites

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Iron is the fourth most abundant element in the continental crust and influences global climate and biogeochemical cycles in the ocean. Continental inputs, including river waters, sediments and atmospheric dust are dominant sources (>95%) of iron into the ocean[1]. Therefore, understanding how continental inputs may have changed through time is important in understanding the secular evolution of the marine Fe cycle.

We analysed the Fe isotopic composition of twenty-four glacial diamictite composites, which serve as proxies of the average upper continental crust[2], with ages ranging from the Mesoarchean to the Paleozoic eras to track how $\delta^{56}$Fe may have changed in the continental crust through time. The diamictites generally have elevated chemical index of alteration (CIA) values and other characteristics of weathered regolith (e.g., strong depletion in soluble elements such as Sr), which they inherited from their upper crustal source regions. $\delta^{56}$Fe in the diamictite composites ranges from -0.59 to +0.23‰, but most diamictites cluster around an average $\delta^{56}$Fe of 0.11±0.20 (2σ), overlapping juvenile continental material such as island arc basalts, which show a narrow range in $\delta^{56}$Fe from -0.04 to +0.14 ‰[3]. There is no obvious correlation between $\delta^{56}$Fe of the glacial diamictites and the CIA. The data suggest that the Fe isotope compositions in the upper continental crust has been constant throughout Earth history. Anoxic weathering pre-GOE (Great Oxidation Event) does not seem to generate different Fe isotopic signatures from the post-GOE oxidative weathering environment in the upper continental crust. Therefore, the large Fe isotopic fractionations observed in various marine sedimentary records are likely due to other processes occurring in the oceans (e.g., biological activity) rather than abiotic redox reactions on the continents.

**References:** 1.Fantle and DePaolo (2004) *EPSL*. 2. Li et al. (2016) *GCA*.. 3. Dauphas *et al*. (2009) *EPSL*.