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## How can REE-bearing minerals help us refine our understanding of crustal evolution and Archean tectonics?

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Delineating the evolution of the Earth's dynamics and interactions between its different silicate reservoirs (ocean crust, continental crust, mantle) is key to understanding planetary differentiation and the conditions of surface habitability. Today, plate tectonic processes play a major role in creating and destroying the Earth's crust, and modifying its silicate mantle. For this reason the Earth is unique in the solar system. Reconstructing its long-term evolution is, however, extremely difficult since the Hadean record is essentially missing and most Archean rocks have experienced reworking and overprinting of their original signatures.

In this presentation, we will explore the constraints available with isotopic and chemical information from REE-bearing minerals in magmas that appear at different times during Earth history. We present, new geochemical data on these phases from a compilation of granitoids that cover a large span of the geological record from the Archean to the Phanerozoic. We demonstrate that trace element analysis and detailed petrographic work can give direct information about the petrogenesis of the host magmas even when these granitoids have been affected by metamorphism. Other studies focusing on rutile have shown that it records important information on metamorphic conditions in the Archean. On the other hand, and also helpfully, all three minerals are resistant to secondary processes and erosion, and thus may also offer significant archives of pertinent information in the detrital rock record. Development of such petro-geochemical tools could deliver complementary information to that provided by zircon and have significant potential for provenance studies and for tracing the secular evolution of the Earth.