Geophysical Research Abstracts
Vol. 16, EGU2014-9071, 2014
EGU General Assembly 2014

Constraints on the first billion years of the geodynamo from paleointensity studies of zircons

John Tarduno (1,2), Rory Cottrell (1), and William Davis (3)

(1) University of Rochester, Earth and Environmental Sciences, Rochester, New York, United States (john@earth.rochester.edu), (2) University of Rochester, Physics and Astronomy, Rochester, New York, United States, (3) Geological Survey of Canada, Ottawa, Canada, K1A 0E8

Several lines of reasoning, including new ideas on core thermal conductivity, suggest that onset of a strong geomagnetic field might have been delayed by one billion years (or more) after the lunar forming event. Here we extend the Proterozoic/Archean to Paleoarchean record of the geomagnetic field constrained by single crystal paleointensity (SCP) analyses (Tarduno et al., Science, 2010) to older times using zircons containing minute magnetic inclusions. Specifically, we focus on samples from the Jack Hills (Yilgarn Craton, Western Australia). We employ a CO_2 laser demagnetization system and a small bore (6.3 mm) 3-component DC SQUID magnetometer; the latter offers the highest currently available moment resolution. Sample age is analyzed using SHRIMP U-Pb geochronology. Preliminary data support the presence of a relatively strong Paleoarchean field produced by a core dynamo, extending the known record by at least 100 million years, to approximately 3.55 Ga. These data only serve to exacerbate the apparent problem posed by the presence of a Paleoarchean dynamo. Alternative dynamo driving mechanisms, or efficient core/lowermost mantle heat loss processes unique to the Paleoarchean (and older times) might have been at work. We will discuss these processes, and our efforts to study even older Eoarchean-Hadean zircons.