Abstract

The further we look back in time, what is known about Earth's magnetic field becomes more and more of a mystery. It is hypothesized that Earth's magnetic field is influenced by the thermal state of the core and mantle. The modern outer core convection is driven by the formation of the inner core, but we don't know when this process started. The Laramie Anorthosite Complex (LAC), in Wyoming, formed 1.4 billion years ago, within the time frame when the inner core may have begun to form. We wanted to determine whether dispersed iron oxide particles or the iron oxide inclusions in plagioclase feldspar could explain geomagnetic intensity variations recorded by rocks from the LAC. We analyzed the abundance of large opaque grains to measure the concentration of dispersed iron oxides and the reflectance of large, elongated plagioclase grains to estimate the concentration of inclusions present. The data gathered were also compared with magnetic susceptibility, a measure of the rocks' bulk magnetic properties. The deepest core samples we analyzed, gathered from the plagioclase-rich rocks from lower in the intrusion and categorized as site LW1, had the lowest average reflectivity results in addition to the highest magnetic susceptibility results. However, sites from the same zone of the intrusion had the lowest concentration of dispersed oxides. It is inferred from the darker coloration and high magnetic susceptibility measurements that magnetic susceptibility in these samples may be heavily influenced by magnetite inclusions found inside large plagioclase grains. Understanding the occurrence of magnetic inclusions can explain some variations in the magnetic record of the LAC rocks.

Peter A. Selkin (Mentor)

Kasey Sadler