The application of paleo- and rock magnetism in Antarctic Environmental Research: review and outlook

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West Antarctic Ice Sheet is experiencing a mass loss at an increasing rate, which has raised wide concerns regarding its impact on sea level rise and climatic change. Modern observation can provide rich high-resolution data that monitors the variation of short timescale. However, in order to improve the model to better predict the evolution of the WAIS in future, it is also necessary to investigate its past variation by studying geological records. Paleomagnetism and rock magnetism have been widely involved in studies of marine sediments to establish the time framework and to reconstruct climate change. The paleomagnetic records preserve the global variation of the geomagnetic field, making it an essential and universal chronologic tool. Using the magnetic age model, Antarctic marine records can be reliably compared with global records, which enables detailed investigation of inter-hemispheric correlation of climatic events. On the other hand, the magnetic properties of marine sediments are sensitive to environments, providing a means of reconstructing local information. The magnetic susceptibility has been shown to be sensitive to glacial and interglacial variation, and it is a powerful way to synchronize the records from adjacent marine sediment cores due to the similar environmental conditions. Paleomagnetic results of sediment cores collected by DSDP/ODP/IODP expeditions in the Antarctic region are summarized to give an overview of the age distribution of the sedimentary records. Nevertheless, there remain many challenges in the Antarctic research for using magnetic approaches to gather further information due to the extreme natural conditions. In recent two decades, with the advantage of rock magnetic methods, we have the potential to carry out more comprehensive investigations into the magnetic properties and the underlying environment driving force. Techniques such as component analysis and hysteresis measurements are introduced in this presentation as a part of outlook. These techniques can reveal details in the constituent magnetic minerals in the sediments, providing insightful information regarding their origin, provenance and environmental significance.

Keywords: paleomagnetism, rock magnetism, magnetostratigraphy

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