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EDITED AND REVIEWED BY
Kenneth Philip Kodama,
Lehigh University, United States

*CORRESPONDENCE
Richard Douglas Elmore,
delmore@ou.edu

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Editorial: Reviews in geomagnetism and paleomagnetism

Richard Douglas Elmore[1]*, Ramon Egli[2] and Steven P. Lund[3]

[1]University of Oklahoma, Norman, United States, [2]Central Institution for Meteorology and Geodynamics (ZAMG), Vienna, Vienna, Austria, [3]University of Southern California, Los Angeles, CA, United States

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Editorial on the Research Topic
Reviews in geomagnetism and paleomagnetism

The objective of this Research Topic summary is to highlight some recent advances in paleomagnetism which we hope will stimulate new research. Two of the papers report on methods of analysis (high-temperature susceptibility data and high frequency microwave heating), one paper is on inclination shallowing in rapidly deposited sediment, and one paper is on rock magnetic cyclostratigraphy.

Philippe et al. report results from rapidly deposited layers of different sizes and origins (turbidites and hyperpycnites) to document the influence of sedimentary and magnetic parameters on detrital remanent magnetization acquisition. The authors report that the degree of inclination shallowing and magnetic grain size increases with the magnitude of events which can be explained by a logarithmic dependence on the bed thickness. Inclination and magnetic grain sizes are correlated to each other by a logarithmic law. The effects on inclination are interpreted to be caused by turbulence during the rapid deposition of the sediment. The inclination shallowing is interpreted to be caused by the preferential alignment of magnetic grains particles in the flow direction. The basal part of the turbidites do not experience post-depositional reorientation due to the fast accumulation of the upper sediment which prevents grain mobility and long exposure to bioturbation. Muxworthy et al. report on analysis of high-temperature susceptibility (HT-χ) data of common naturally occurring magnetic minerals. Because some minerals (e.g., sulphides) are unstable during heating, interpretation of HT-χ data can be challenging. The authors report results from iron oxides, iron oxyhydroxides, iron sulphides, iron carbonate, iron phosphate, ferritchromites, and titanium-substituted iron oxides. The authors investigated "near pure" natural samples and also provide examples of how to interpret more complex signals. They propose that the paper will be a reference paper for interpretation of HT-χ data.

Lloyd et al. report on the use of a high frequency microwave system as a primary method, or as part of a multimethod approach, to study samples in order to determine accurate absolute palaeointensities. The use of high frequency microwaves minimizes the alteration that can occur during heating and cooling steps during palaeointensity experiments. The authors present results which show that the method can be used to accurately recover weak, ancient paleointensities in rocks that are strongly overprinted. They also suggest that the method is well suited to the study of archaeomagnetic samples and to ancient

rocks. Zhang et al. conducted lithologic and rock-magnetic measurements, as well as cyclostratigraphic analysis, on lacustrine mudstones and sandstones in a borehole in the Songliao Basin (NE China) in order to reconstruct the paleoenvironment and to explore the astronomical origin of the sediments. The authors report an inverse correlation between magnetic susceptibility and lithology, with the highest values in mudstones and the lowest in sandstones. The main magnetic carriers are pseudo-single-domain and/or multi-domain magnetite with minor hematite. Cyclostratigraphic analysis of the magnetic susceptibility signal revealed sedimentary cycles of 113, 34, 13, and 6 m which were interpreted as long and short eccentricity, obliquity, and precession cycles. The results suggests that the lake level oscillations in the Songliao Basin are caused by long and short eccentricity, precession, and semi-precession cycles during the Early Cretaceous.

Author contributions

RiE: Writing–original draft. RaE: Writing–review and editing. SL: Writing–review and editing.

Conflict of interest

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