Geophysical Research Abstracts
Vol. 18, EGU2016-6450, 2016
EGU General Assembly 2016

Estimation and propagation of uncertainties associated with palaeomagnetic directions

David Heslop and Andrew P. Roberts
The Australian National University, Research School of Earth Sciences, Acton, ACT, Australia (david.heslop@anu.edu.au)

Principal component analysis is a well-established technique in palaeomagnetism, and provides a means to estimate magnetic remanence directions from stepwise demagnetisation data. Derived directions constrain past geomagnetic field behaviour and form the foundation of chronological and tectonic reconstructions. Principal component analysis does not, however, lend itself to the quantification of uncertainties associated with estimated directions. Thus, inferences drawn from palaeomagnetic reconstructions suffer from an inability to propagate uncertainties from individual specimens to higher levels, such as palaeomagnetic site mean directions and pole positions. Additionally, the relatively small number of demagnetisation data points used to quantify remanence directions for an individual specimen can result in unstable or distorted principal component solutions. We will show how a probabilistic reformulation of principal component analysis can be used to rigorously quantify uncertainties associated with remanence directions estimated from demagnetisation data. These uncertainties can be propagated readily through each step of a palaeomagnetic reconstruction to provide rigorous quantification of uncertainties for all stages of the data interpretation sequence. Proper uncertainty determination helps to protect against spurious inferences being drawn from uncertain data.