A global database for the compilation and assessment of Holocene sedimentary palaeomagnetic records

M. C. Brown (1), F. Donadini (2), M. Korte (1), U. Frank (1), and A. Nilsson (3)

(1) Helmholtz-Zentrum Potsdam, Deutsche GeoForschungsZentrum, 14473 Potsdam, Germany(mcbrown@gfz-potsdam.de), (2) Institut für Geophysik, ETH Zürich, Switzerland, (3) School of Environmental Sciences, University of Liverpool, Liverpool, United Kingdom

Global reconstructions of the Holocene palaeomagnetic field can provide powerful information about the geodynamo process and can constrain geomagnetic shielding, important for our understanding of the interaction between the geomagnetic field and cosmogenic nuclide production. Coherent structure is evident in these reconstructions and this has significant implications for controls on the geodynamo. However, the resolution and reliability of current models are limited by: 1) the restricted global coverage of sites, with data especially lacking in the southern hemisphere; 2) the low precision of some magnetic data and independent dates; and 3) an incomplete assessment of data quality. Improving these aspects for sedimentary records is particularly important as loosely constrained sedimentary data strongly influence the model output from spherical harmonic reconstructions of the Holocene geomagnetic field (e.g., differences between CALS3k.3 and CALS3k.4). In addition, the current SECRV00 database lacks data from the most recent sedimentary studies and a number of older studies. We present our current effort to improve the number of studies included in the CALSxk model series and our attempts to assess data quality. In addition, we show the design of a new database for global sedimentary data covering the last 10 ka, which we have implemented as an extension to the GEOMAGIA50 database. Our aim is two-fold: 1) to transparently catalogue all available sedimentary data for the Holocene, so the broader scientific community can access a range of information related to specific cores; and 2) to design a database with the functionally to select palaeomagnetic data based upon parameters that reflect the quality of the data. To make accurate assessments of data quality it is necessary to determine palaeomagnetic, rock magnetic, mineralogical, sedimentary, environmental and chronological parameters that may influence the fidelity of the record. We show these selected parameters and how they are implemented in the database design. All available data are catalogued based on these parameters where they are available. Measurements on the same specimen are tied to their age and/or depth, so it is possible to select data that satisfy specific quality criteria only. The new database also allows retrieval of both core and stacked data, permitting assessment of individual sections of core data, consistency between core records and their relative influence on the stacked record. Compiling a broad range of parameters that can be queried for both core and stacked records will allow a more complete assessment of the fidelity of directional, relative palaeointensity and chronological data. High quality data can then be selected to optimise subsequent global modelling of the Holocene geomagnetic field and the influence of choosing specific data selection parameters on the output of these models can be assessed.