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Hemispheric Asymmetries in Holocene Geomagnetic Field Structures: Are they really there?

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Geomagnetic field models based on over 400 years of direct observations show hemispheric asymmetry in geomagnetic field structure between the Atlantic and Pacific hemispheres, but it is not obvious that such hemispheric asymmetry persists in the longer term. Numerous paleomagnetic and archeomagnetic data are available and have been used to construct similar models on millennial and million year time scales. Geomagnetic and paleomagnetic field studies extending to 10∼ka show greater temporal variability in the southern hemisphere than in the north, and lower average field strength. Similarly, data spanning the past few million years typically show north-south asymmetries in field strength and variability. In some cases the paleofield models also suggest the presence of persistent longitudinal structures. However, the temporal and spatial distribution as well as the quality of available data may generate artificial long term and time-varying structures at large spatial scales because of the regularization imposed during the modeling procedure. It has also been suggested that lower field strengths observed in the southern hemisphere stem from dominance of the dataset by sediment records and associated inadequacies in the sediment relative paleointensity records and their calibration against absolute paleointensity data. This presentation will evaluate the need for the hemispheric asymmetry in current Holocene time-varying paleofield models using both a detailed direct assessment of data and carefully chosen norms that allow construction of models penalizing unnecessary asymmetries.