



Secular variation of the geomagnetic field strength in Central America: impact of the critical analysis of the dataset on geomagnetic modelling

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Global geomagnetic models of the secular variation over the Holocene are mainly limited by the inhomogeneous spatial and temporal distribution of data. The unequal quality of data has also a high, often underestimated, effect that is clearly illustrated by the analysis of the secular variation intensity in Central America. In this area, the number of absolute data from lava flows and archaeological baked clays is higher than 150. They cover the last four millennia with most data dated in the first millennium CE. The data show a strong variability during this period with a variation from one to four. In order to know if this apparent dispersion indicates a fast secular variation event similar to a geomagnetic spike or is due to experimental artefacts, we performed a critical analysis of the dataset. The first criterion was the precision in time and intensity of the data. In a second time, we selected only data acquired using a Thellier-Thellier protocol with pTRM-checks and corrections (if necessary) of the TRM anisotropy and cooling rate effects. The acceptance of only $\sim 30\%$ of the data yields to a more consistent trend of the secular variation. The variability cannot be interpreted by a fast secular variation event. Moreover, low quality data usually overestimate the intensity, which results in a smoothing and an up to 30% bias of the SHA.DIF.14k model that is built without prior selection of data. The temporal distribution of accepted data highlights the need of new data, especially in the millennia BCE and the second millennium CE. The example of the Central America clearly demonstrates the need to perform a critical analysis of the global database before to build global geomagnetic models.