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The time dependence of reversed archeomagnetic flux patches

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Archeomagnetic field models may provide important insights to the geodynamo. Here we investigate the existence and mobility of reversed flux patches (RFPs) in archeomagnetic field model CALS3k.4b of Korte and Constable (2011; PEPI, 188, 247-259). We introduce topological algorithms to define, identify and track RPFs. In addition, we explore the relations between RFPs and dipole changes, and apply robustness tests to the RFPs. In contrast to previous definitions, patches that reside on the geographic equator are adequately identified based on our RFPs definition that takes the magnetic equator as a reference. Most RFPs exhibit a westward drift and migrate towards higher latitudes. Undulations of the magnetic equator and RFPs oppose the axial dipole moment (ADM). Filtered models show a tracking behaviour similar to the non-filtered model, and surprisingly new RFPs occasionally emerge. The advection and diffusion of RFPs have worked in unison to yield the decrease of the ADM at recent times. The absence of RFPs in the period 550-1440 AD is related to a low in intermediate degrees of the geomagnetic power spectrum. We thus hypothesize that the RFPs are strongly dependent on intermediate spherical harmonic degrees 4 and above. Comparison of tracking of RFPs among various archeomagnetic field models was also performed and gives more complex results.