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Time variation and equatorial symmetry of high latitude geomagnetic flux patches on millennial timescales

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Reconstructions of the geomagnetic field at the core mantle boundary based on historical data are characterised by four intense high latitude flux patches, two in the northern hemisphere and two in the southern hemisphere. These flux patches are situated approximately symmetric about the equator and have been suggested to be the signature of 2 (out of 3) columnar convection rolls in the core, which are reproduced in geodynamo simulations. We investigate the long-term temporal behaviour of such intense flux patches using a new set of time-dependent palaeomagnetic field models spanning the past 9000 years. To test whether or not the data supports equatorial symmetric flux patches we apply separate damping parameters to equatorially symmetric and antisymmetric gauss coefficients. Both westward and eastward drifts are observed throughout the model time period but the last 3000 years, where the models are better constrained, are dominated by westward drift. The motion of flux patches in the southern hemisphere is less dynamic than in the northern hemisphere, possibly as a result of the data distribution. We find that with the current dataset, a persistent equatorial symmetry of intense high latitude flux patches throughout the last 9000 years cannot be ruled out. We investigate this further by introducing a new compilation of palaeomagnetic data from the SW Pacific.