



Ergodic property of the recent geomagnetic field

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The study of the geomagnetic field allows us to understand the peculiar processes of Earth's interior, which act in the outer core and produce the main field. To know whether the field is ergodic, i.e. time averages are equivalent to phase space averages, is an important question since, if this were true, it will be a further evidence for the strong spatio-temporal coupling among the contributions composing the dynamical system that produces and maintains the geomagnetic field. Another consequence would be that many computations, usually undertaken with many difficulties in the phase space, could be made in the conventional time domain. Here, we show the exponential temporal divergence of the errors between several couples of predictive (IGRF and WMM) - definitive (CM4 and POMME) global geomagnetic models from 1965 to 2010, confirming the present state of a chaotic geomagnetic field with no reliable prediction after around 6 years. Also going back in time (using GUFM1 model) we found the same results. These analyses establish the ergodicity of the field and could be used to improve the representation of the geomagnetic field with more detailed secular variation and acceleration.