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Modelling a marine sediment paleomagnetic record from geodynamo simulations data

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Analyses of the behaviour of the Earth's magnetic field inferred from computer simulations and detailed paleomagnetic records of the last million years suggest that magnetic instabilities occur often in the dynamo process. However, our perception of the magnetic instabilities obtained from magnetization of rocks at the Earth's surface does not allow us to conclude that these magnetic phenomena occur frequently. Many factors contribute to the hindering of the real frequency in magnetic instabilities. These include the difficulty in extracting the correct information from rocks. Lava records can give us very precise radiometric dating, but usually cannot cover long periods of time. In contrast, sediment records cover long period of times but are contingent to the sedimentation rate of the samples and the interpretation of events on a global scale. Therefore, the process of recording the magnetic field's behaviour from paleomagnetic analyses is a challenging task. We consider the time series of the output magnetic field energy from dynamo simulations (Buffet and Bloxham, 2002) and the time series of a marine paleomagnetic record (Holt et al., 1996) and construct an input/output system with these two time series and model a parametric linear process to predict the paleomagnetic record from the magnetic field energy. Preliminary results show that the process can be modelled by auto-regresive and mixed auto-regressive moving-average models. The predictions reproduce field variability in general agreement with the observed data and display events that are acknowledged by the global geopolarity timescale. We interpret the coefficients of the transfer function as probably

related to both timescales of the sedimentation rate and to core processes.