



Transfer Entropy between South Atlantic anomaly and global sea level for the last 300 years

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We have applied a recent information-theoretic tool, transfer entropy, to measure the possible information flow between two time series for the last 300 years: the South Atlantic Anomaly (SAA) surface extent at the Earth's surface and the Global Sea Level (GSL) rise. The results seem to support the existence of a link between the geomagnetic field and the Earth's climate, with more information transferred from the SAA to the GSL than vice versa.

We have estimated the transfer entropy following two different methodologies: coarse graining and generalized correlation integrals. Due to the scarcity of data we have also calculated the effective transfer entropy, which was shown to mitigate the finite sample effects.

The physical mechanisms proposed to explain this connection are still under discussion. Considering the recent outcomes, they support an internal mechanism as the most probable: the coupling is probably due to a common internal cause, as, in particular, a convective dynamism in the outer core causes a variation of the magnetic field and an elastic deformation up to the Earth's surface.