Computations of wind-driven ocean-induced magnetic fields

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We present the results of computations of the secondary magnetic field induced by ocean motions. Ocean velocities are computed using the baroclinic ocean model LSOMG. The velocities are then used to determine the Lorentz force which is plugged into the magnetic induction code TLAM as a principal forcing. The TLAM is a 2D magnetic induction code based on the thin-shell approximation (Vivier et al., 2004; Tyler et al., 1997). In this approximation, the equation of magnetic induction simplifies significantly, time derivatives of main and induced magnetic fields are neglected as well as the self-induction term. The price for simplification of governing equations is the limited applicability of the resulting system. It is only suitable for slowly evolving processes. In order to meet the condition, we restrict ourselves to the wind (buoyancy) driven ocean circulation, although the LSOMG model is able to model both tidally- and wind-driven circulations. We assess the accuracy of thin-shell approximation in our setup by comparing the results with the Swarm satellite magnetic data.

References

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