Benchmark study of magnetic induction codes forced by ocean electric currents

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We present a benchmark in which magnetic induction codes are tested in a series of modeling studies. Ocean electric currents provide the forcing. We focus on the wind- and buoyancy-driven ocean-induced magnetic field; tides are not considered. The individual benchmarks start with the magnetostatic case of time-invariant forcing and homogeneous surface conductivity, and the benchmark complexity increases gradually from this starting point. We test a rich variety of induction codes. There are codes based on the full equation of electromagnetic induction, as well as codes that utilize certain approximations of the governing equation, e.g. Tyler (1997)'s thin layer approximation. We include both time-domain and frequency-domain codes. In order to assess the performance of the individual codes, we compare the spatial distributions and power spectra of the induced magnetic fields.

References

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