Sensitivity of M_2 tidal magnetic signals to seasonal and spatial variations of ocean electric conductivity

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SUMMARY

Electrical conductivity of the Earth's oceans is an important oceanographic parameter related through its dependence on temperature and salinity to the state of the ocean. The tidally induced magnetic field then provides a directly and globally observable physical variable affected by the ocean conductivity spatial and temporal distribution. This contribution addresses two topics of the impact of the ocean conductivity variations on the principal lunar semi-diurnal magnetic signals. First, using high-resolution forward modelling, we investigate the sensitivity of the magnetic field to seasonal conductivity variations. Here we find, that the differences between magnetic signatures calculated for individual monthly conductivity climatologies are small, and localized to the marginal seas of the global ocean. Second, we formulate an inverse problem to constrain the ocean conductivity in the upper 1000 m of the ocean, and test it using a synthetic dataset, providing a proof-of-concept for such an approach.

Keywords: Ocean tides, electrical conductivity of oceans, 3-D inversion