



Simulation of the ocean induced poloidal magnetic field variations by considering the conductivity contrast between ocean and continent

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Observations of the ocean-induced magnetic field by the CHAMP magnetic space mission have the potential to be used as a constraint when examining ocean dynamics. This has initiated theoretical studies on the prediction of the ocean-induced magnetic field. These studies predict the poloidal magnetic field induced by the horizontal ocean-circulation flow by employing a single-layer approximation. Since the toroidal magnetic field cannot be modelled by this approximate model, we treat the ocean as a layer of finite thickness and model the toroidal magnetic field by a matrix-propagator technique with a source of electrical currents in the ocean layer. Although this primary toroidal magnetic field is not observable outside the oceans, it couples with a strong conductivity contrast between the oceans and continents and generates a secondary poloidal magnetic field. This field is observable by magnetic satellite missions and ground-based magnetic observatories situated close to the shoreline. Such constraints are expected to be improved upon by the launch in 2012 of the SWARM magnetic field observing satellites.