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# Electromagnetic characteristics of ENSO

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The motion of electrically conducting sea water through Earth's magnetic field induces secondary electromagnetic fields. Due to its periodicity, the oceanic tidal-induced magnetic field is easily separable from magnetic field measurements and therefore detectable. These tidal-induced signatures in the electromagnetic fields are also sensitive to changes in oceanic temperature and salinity distributions. We investigate the impact of oceanic heat and salinity changes related to the El Niño/Southern Oscillation (ENSO) on oceanic tidal-induced magnetic fields. Hydrographic data containing characteristic ENSO dynamics have been derived from a coupled ocean-atmosphere simulation covering a period of 50 years. By applying a 3D induction model the corresponding tidal-induced magnetic signals have been calculated. By means of the Oceanic Niño Index (ONI), based on sea surface temperature anomalies, and the Magnetic Niño Index (MaNI), based on anomalies in the oceanic tidal-induced magnetic field, we demonstrate that evidence of developing ENSO events are found in the oceanic magnetic field statistically 4 months earlier than in sea surface temperatures. The analysis of subsurfaces processes incorporated into the MaNI and spatio-temporal distributions of electromagnetic anomalies is used to increase this lead even further.