# Quantification and reduction of platform immanent bias factors on frequency and time domain coil data.

K. Reeck[1], H. Müller[2] and S. Hölz[3]
[1]Geomar Helmholtz Centre for Ocean Research, kreeck@geomar.de
[2]Federal Institute for Geosciences and Natural Resources
[3]Geomar Helmholtz Centre for Ocean Research

**SUMMARY**

Electromagnetic systems rely on the use of non-conductive materials in proximity of the sensor to minimize bias effects on their sensitivity and measured data. Additionally, for marine sensors used for deep sea surveys, rigidity, compactness and the handling of the platform is essential. Thus commonly a trade-off between rigid, cost-effective and non-conductive materials (e.g. stainless steel vs. fiberglass composites) has to be found. In case of the BGR's GOLDEN EYE frequency domain coil system (developed at the University of Bremen), the compact and rigid design is achieved by a circular fiberglass platform inhabiting several titanium pressure housings. Geomar's MARTEMIS time domain system trades the compact design for a clear separation of up to 15 m between an upper fiberglass frame, holding most critical titanium system components, and its coil and receivers.

For this study, an experimentally verified 3D finite element model was developed in COMSOL Multiphysics to analyze and quantify the static influence of conducting pressure housings on the sensitivity of a frequency and time domain coil system and the effectiveness of calibration procedures to minimize the distortions. In addition, we examine dynamic variations of the conductive components' positions relative to the sensor in field datasets and discuss their effect on the results.

The experiments do not only show the significance of the static bias on the inversion results, produced by high conducting components, but also the efficiency of a system calibration against the calculated response in a known environment. The remaining bias as a function of seafloor conductivity can be minimized by optimizing the dimensions and positioning of the titanium housings and thus reducing the influence on the inversion results. The dynamic variations due to system instabilities however lead to an unpredictable signal bias demanding a rigid structure, heave compensation mechanisms and a careful handling of the system.

**Keywords:** COMSOL, finite-element-modelling, controlled source electromagnetics, bias, calibration