EGU23-16101, updated on 14 Apr 2024
https://doi.org/10.5194/egusphere-egu23-16101
EGU General Assembly 2023

Coupling of Induced Magnetic Fields of Local Asymmetric Features in Subsurface Ocean Moons

Jason Winkenstern and Joachim Saur
University of Cologne, Institute of Geophysics and Meteorology, Germany

In the recent decades, both ground-based and satellite observations provided indirect evidence for the existence of subsurface oceans within Europa's icy crust (Kivelson et al., 2000; Roth et al., 2014). Since then, the search for icy moons with similar features has been ongoing (e.g., Cochrane et al., 2021). Such a subsurface ocean interacts with the time-varying magnetic field of its host planet, resulting in an induced magnetic field (Khurana et al., 1998; Saur et al., 2010). To model these induction responses, a radially symmetric interior structure is generally assumed (Zimmer et al., 2000; Schilling et al., 2007). Geological arguments, however, can motivate cases for asymmetric features, e.g. tidal heating and the existence of chaos terrain on Europa (Styczinski et al., 2022). We approximate such an asymmetric feature by modelling a radially symmetric subsurface ocean together with a local small-scale water reservoir of spherical shape. This results in a non-linear coupling mechanism between the induction responses of ocean and reservoir. In our presentation we will discuss the nature of such a non-linear coupled induction and its effects on the potential detectability of small-scale water features for future missions such as Europa CLIPPER.