Geophysical Research Abstracts
Vol. 12, EGU2010-14172, 2010
EGU General Assembly 2010


# Fe-snow and FeS floating in Ganymede's core: Possible mechanisms for a dynamo?

Doris Breuer, Tilman Spohn, and Tina Rückriemen
DLR, Institut für Planetenforschung, Berlin, Germany (doris.breuer@dlr.de, +49 30 67055 303)

One of the most compelling discoveries of the Galileo mission was the detection of a self-sustained magnetic field at Jupiter's moon Ganymede. It has been suggested that a compositionally driven dynamo is the most likely mechanism for Ganymede (1,2). The compositional convection, however, can be very different from that in the Earth. Recent experimental work have identified two important aspects of the Fe-FeS phase diagram: 1) at pressures less than 14 GPa the eutectic melting temperature decreases with increasing pressure and 2) the S content at the eutectic decreases with increasing pressure.
A negative slope melting temperature in the core will have profound implications. Other than at the elevated pressure of the Earth's core where the eutectic melting temperature increases with pressure, Fe may precipitate at the core-mantle boundary (CMB) rather than in the center and may fall as iron snow. Furthermore, with a sulfur content higher than the eutectic composition. Because of the unknown oxidation state of the interior during differentiation, however, it is not known whether Ganymede's core composition is on the Fe- or FeS-rich side of the eutectic. If the composition were sufur-rich, iron sulfide (FeS) would precipitate instead of Fe. Solid FeS has a lower density than liquid Fe-FeS in the pressure range of Ganymede's core and would float upward from the deep core to form a solid FeS layer on top of the core. In this study, we will discuss the various possible scenarios of present Ganymede's dynamo and present preliminary results on the thermodynamic implication for these specific dynamo regimes.

References:
(1) Hauck, S. A., Aurnou, J. M. and Dombard, A. J. (2006). J. Geophys. Res., 111.
(2) Bland M.T., Showman A.P.. Tobie G. (2008). Icarus, 198, 384–399.