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ガニメデ磁気圏の非 MHD 的特徴について：ガリレオ探査機データに基づく極域波動－粒子相互作用の調査
Non-MHD Aspects of Ganymede's Magnetosphere: Investigation of Polar Wave-Particle Interaction Based on Galileo's data

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Jovian satellite Ganymede has small magnetosphere with characteristic scale lengths comparable to those of Mercury: e.g., size of the solid body, spatial expansion of the magnetosphere, and electron/ion gyroradii of ambient plasma. Comparative study of Ganymede's magnetosphere with Mercury will provide insights on the process universally existing in small planetary magnetospheres.

Basic characteristics of Ganymede's magnetosphere were revealed based on in-situ measurements by Galileo spacecraft during six encounters. Williams et al. (1997a, b, 1998, 2001, 2004) investigated particle dynamics (e.g., loss and pitch angle diffusion) in Ganymede's magnetosphere based on energetic electron/ion observations. Gurnett et al. (1996) and Kurth et al. (1997) indicated that Ganymede's magnetosphere is emitting radio and local plasma waves similar to planetary magnetospheres. Recently, global configuration of the magnetosphere and interaction with Jovian magnetosphere are also intensively investigated based on MHD simulations (Jia et al., 2009, 2010). However, non-MHD characteristics of Ganymede's magnetosphere have not been discussed in detail yet. For example, wave-particle interactions, ion kinetics, and polar field aligned particle accelerations.

This study addresses wave-particle interaction process in the polar cap region based on multi-instrumental observations during Galileo G02 flyby. Observations of high and low frequency wave, particle energy spectra, and pitch angle distribution revealed two kinds of magnetospheric regions: one where strong particle anisotropy by satellite surface loss is accompanied by electron and ion-related electromagnetic waves, and the other where there are weak surface interactions with electrostatic electron wave and no ion-related waves. The latter region corresponds to the ion upflow region (Jia et al., 2009) and locates near the open-closed boundary region of Ganymede's magnetosphere. We found that ion-related low frequency waves have significant energy flux into the Ganymede's polar ionosphere which is comparable to Jovian magnetospheric electron's energy input. This suggests the polar ionospheric heating by the energy from ion-related waves and subsequent ion upflow.

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