R009-03
A 会場 ： 11/24　PM1（13:45-15:45）
14:15〜14:30:00

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Significance of background electron temperature inferred from whistler-mode wave propagation in Mercury's magnetosphere

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In planetary magnetospheres, whistler-mode waves can be excited by free energy sources such as electron temperature anisotropies. Propagation characteristics of planetary whistler-mode waves are thought to reflect the properties of the background cold and cool plasmas. In this study, we focus on the propagation characteristics of Mercury's whistler-mode waves influenced by background electron temperature, proposing that such wave characteristics can serve as a remote-sensing tool to complement in-situ observations for identifying the finite temperature.

We particularly examine wave observations from the fourth flyby of Mercury by BepiColombo Mio Spacecraft. During the fourth flyby, the whistler-mode waves likely were detected with mid-latitude distribution. The Mio spacecraft's unique trajectory during the fourth flyby, which traversed along the north-south direction, provided a rare opportunity to study long-distance propagation away from the magnetic equator. Our analysis suggests that the background electron temperature significantly affects wave attenuation through Landau and cyclotron damping mechanisms. Numerical calculations show that when the background electron temperature exceeds approximately 100 eV, whistler-mode waves at frequencies around 0.45fce experience strong attenuation and are unable to propagate effectively within Mercury's magnetosphere, where fce is the electron gyrofrequency.

By investigating the dependence of wave propagation on the density and temperature of background cold electrons, we aim to assess whether such a cold and cool electron population can exist in Mercury's magnetosphere, which lacks a well-developed ionosphere due to its tenuous atmosphere. In this presentation, we utilizes wave data from the flyby phase prior to Mercury orbit insertion and will discuss the potential presence of cold and cool background electrons in Mercury's magnetospheric environment.