Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

PCG32-P13 Room:Convention Hall Time:May 26 18:15-19:30

A simulation study of the Kelvin-Helmholtz instability at the Martian ionopause

AIZAWA, Sae[1*] ; TERADA, Naoki[1] ; KASABA, Yasumasa[1]

[1]Dep. Geophysics, Graduate School of Science, Tohoku Univ.

Because the Mars has no intrinsic magnetic filed, the solar wind flow directly interacts with the planetary ionosphere. Under the circumstances, planetary ionopause is a density discontinuity surface and a velocity shear surface between the magnetized solar wind flow and the planetary ionosphere. The ionopause is subject to the Kelvin-Helmholtz (KH) instability [Amerstorfer et al., 2010], which is expected to play a role in removing ionospheric materials from the planet. In addition, the KH instability may cause a dawn-dusk asymmetry at the magnetopause because of the finite Larmor radius (FLR) effect of ions [Nagano, 1978]. At an ionopause, for the same reason, the KH instability may cause an asymmetry in the direction of the solar wind motional electric field.

Terada et al. [2002] pointed out that the KH instability at the Venusian ionopause develops asymmetrically through the acceleration of ionospheric ions in the direction of the solar wind motional electric field, using a global hybrid simulation. It is well known that the ion FLR effect, the gravitational stabilizing effect, the effect of the thickness of the boundary layer, etc. determine the initial growth of the KH instability. Unfortunately, it was difficult to separately evaluate each contribution of these effects with a global simulation. In addition, a study of the ion FLR effect with the parameters around the Martian ionopause is yet to be done.

In this study, we will estimate the escape rate of the Martian atmosphere by the KH instability considering the ion FLR effect and the gravitational stabilizing effect. We will investigate contribution of each effect to the linear growth rate and non-linear evolution of the KH instability in a parameter range around the Martial ionopause. As a first step of this study, we compare an ideal MHD simulation to an MHD simulation including the FLR effect to investigate its effect on the linear growth rate and non-linear evolution of the KH instability. In this presentation, initial results obtained by these numerical simulations will be presented.

Keywords: the Kelvin-Helmholtz instability, the finite Larmor radius effect