Feasibility Study of Imaging Observation of the Hot Oxygen Corona on Mars

Kensuke Sunouchi[1]; Takeshi Sakanoi[2]; # Shoichi Okano[3]; Shigeto Watanabe[4]

[1] Planet. Plasma Atmos. Res. Cent., Tohoku Univ.; [2] PPARC, Grad. School of Sci., Tohoku Univ.; [3] PPARC, Tohoku Univ.; [4] Earth and Planetary Sci., Hokkaido Univ

Mars, with almost no intrinsic magnetic field, may have an atmospheric escape mechanism different from the magnetized planets such as the earth. Distribution and escape of non-thermal atmospheric constituents are important for understanding the atmospheric evolution and the interaction between non-magnetized planets and the solar wind. Hot oxygen atoms are produced by dissociative recombination of molecular oxygen ion, which is the major ion in the Martian ionosphere. The produced hot oxygen atoms near or above the exobase form a hot oxygen corona and escape from the planet.

For the study of the Martian oxygen corona, remote sensing of the resonance scattering of the solar UV by hot oxygen atoms will be useful. Four missions to Mars, the Mariner 6, 7 and 9 missions and the Mars Express mission, have had a UV spectrometer or spectrograph on board, and observed OI 130.4nm emission lines. Shinozaki [1994] calculated the intensity distribution by taking a multi scattering process into account but by assuming a spherically symmetric model atmosphere in which oxygen density depends only on altitude. It's necessary to use more realistic spherically asymmetric model for the discussion on the structure of the exosphere. In order to calculate the intensity of the resonance scattering, we developed a spherically asymmetric model for three-dimensional density distribution of hot oxygen atoms produced by dissociative recombination of molecular oxygen ions, using the Monte-Carlo method. Then, observational feasibility was estimated for two-dimensional imaging of Martian hot oxygen corona with the XUV imager designed by Yamazaki et al. [2004].

In this presentation, calculated intensity distribution of OI 130.4nm resonance scattering by hot oxygen corona will be given along with discussion on feasibility of 2-dimensional imaging observation.