EPSC Abstracts,
Vol. 4, EPSC2009-700-1, 2009
European Planetary Science Congress,

Reflected solar wind in the foreshock region: a Venus-Mars comparison by Venus Express and Mars Express

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Abstract

The ASPERA-4 experiment on board Venus Express quite often observes protons in the foreshock region of Venus. Characteristics of these ions are similar to those of the field-aligned beams (FAB) at the terrestrial foreshock region: they travel away from the quasi-parallel bow shock of Venus, nearly along the interplanetary magnetic field with a pancake-like perpendicular distribution, and the energy is about 2~6 times that of the solar wind proton energy. At the boundary of this FAB region in the Venus foreshock, we often observe two population with energy-pitch-angle dispersion. Unlike the Venus case, Mars Express, with the same instrumentation, does not observe the FAB region in the Martian foreshock region. We instead observe effective perpendicular acceleration. Therefore, this difference must come from the different gyroradii of the ions dictated by the different solar wind conditions observed between those near Venus and those near Mars.