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The ion foreshock of Venus in a global hybrid simulation

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We study the ion foreshock of Venus using a 3-dimensional global hybrid simulation. The ion foreshock forms in the upstream region ahead of the Venusian quasi-parallel bow shock. The interplanetary magnetic field is connected to the bow shock upstream of the quasi-parallel shock and the angle between the shock normal and the magnetic field is smaller than \sim 45 degrees. This configuration allows the reflection of solar wind ions back upstream leading to the formation of the ion foreshock. Backstreaming ions are a source of free energy for excitation of plasma waves. In a hybrid simulation, ions of solar wind and planetary origin are treated as particles moving under the Lorentz force, while electrons form a charge-neutralizing fluid. Ion velocity distributions evolve according to the model calculation and are self-consistently coupled with the evolution of the magnetic field. In this simulation study, we analyze the morphology and wave modes of the Venusian ion foreshock.