

EGU23-11568, updated on 21 Feb 2024
<https://doi.org/10.5194/egusphere-egu23-11568>
EGU General Assembly 2023
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On the Response of the near-Mercury Environment to Different Interplanetary Conditions from full-scale 3D Hybrid Simulations

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While waiting for further insights from the upcoming data from the BepiColombo mission, this work presents some results from full-scale 3D hybrid (ions kinetic and electrons fluid) computer simulations of the near-Mercury environment under different interplanetary conditions. During its orbit Mercury passes from an high density high magnetic field intensity region (Perihelion) to a low density low magnetic field intensity region (Aphelion). Such environment change drastically influences the response of its magnetic environment, including the stand-off distance of both Bow-Shock and Magnetopause. Being these latter not distant from each other nor from the Hermean exosphere, such a dynamics may lead to important interactions between the planetary and interplanetary environments, as well as lead to unpredictable scenarios whenever the interplanetary conditions occasionally result more extreme than those average values currently known.

Here we aim to give more insights into the near-Mercury environments under more significant interplanetary conditions by means of full-scale 3D multi-species hybrid simulations, including the Aphelion and Perihelion conditions known to date, as well as more extreme conditions, and compare these results with currently available in-situ observations and recent similar computer simulations.