Supporting Information for "Explaining the Evolution of Ion Velocity Distributions at a low activity Comet"

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1. Description of Figure set S1.
2. Description of Figure set S2.

Additional Supporting Information (Files uploaded separately)

1. Figure set S1 (.zip file)
2. Figure set S2 (3 .zip files)

Introduction

This supporting information contains additional figures for different projections of the spatial structure of the cometary plasma environment (Figure set S1), as well as a spatially continuous overview of the velocity distribution functions (VDFs) of all three ion species for three individual y-axis locations (Figure set S2). The figures themselves are included as separate .zip files; the content and file name structure and content are described below.

Figure set S1: Spatial structure of the comet magnetosphere

6 additional figures are included in S1. All have the same structure as Figure 1 in the main paper, and are taken at the same simulation time step (270k). The axis and location where the corresponding slice for the figure was taken is included in the document title and listed below.

`y-300_timestep_270000.png`: slice of the x-z plane, taken at $y = -300\,\mathrm{km}$.

`y-600_timestep_270000.png`: slice of the x-z plane, taken at $y = -600\,\mathrm{km}$.

`z0_timestep_270000.png`: slice of the x-y plane, taken at $z = 0\,\mathrm{km}$.

`z-800_timestep_270000.png`: slice of the x-y plane, taken at $z = -800\,\mathrm{km}$.

`x-500_timestep_270000.png`: slice of the y-z plane, taken at $x = -500\,\mathrm{km}$.

`x-1000_timestep_270000.png`: slice of the y-z plane, taken at $x = -1000\,\mathrm{km}$.

Figure set S2: VDFs

VDFs were calculated at three distinct y-axis locations: $y = 0\,\mathrm{km}$, $y = -300\,\mathrm{km}$, and $y = -600\,\mathrm{km}$, and are found in the corresponding .zip files. VDFs for each of the three species (protons, alpha particles, and cometary ions) are grouped in subfolders. Each species has an overview file ending with `..._fields.png` (e. g. `y0_ts=270000_Protons_fields.png`) which shows the locations and labels for all individual VDFs on top of the density data for the corresponding species. The VDFs are calculated between $x = [-800\,\mathrm{km}, 800\,\mathrm{km}]$ and $z = [-800\,\mathrm{km}, 800\,\mathrm{km}]$ with a box size of $(100\,\mathrm{km})^3$ (same as the VDFs shown in the main text). This results in 256 individual VDFs for each species at each y-slice. They are divided into a sub-grid of $400\,\mathrm{km} \times 400\,\mathrm{km}$ which are labelled 1 - 16. The individual boxes are labelled by letters a - p, so that each box can be identified. The 16 VDFs for each sub-grid are shown in the same figure using

this sub-grid number. All three projections ($v_x - v_z$ as in the main text, but also $v_x - v_y$ and $v_y - v_z$) are available and can be identified by the end of the file name. For example, the $v_x - v_z$ VDF for the protons at $y = 0$ for the box location '11e' can be found in the .zip file `SI_02_VDFs_y=0km` under `'Protons/y0_ts=270000_Protons_VDF11_vx-vz.png'` in the panel in row 2, column 1 (also labelled '11e'). The x- and z box boundaries (in km) are also given in the label at the top of each box.