

The authors of "Flying through the plasmasphere to optimize low energy ion measurements" utilize the Juice spacecraft's flyby of Earth to improve the measurement scheme of the JDC instrument. Observations from the low-energy plasmasphere revealed that the voltage stepping of the instrument differed substantially from expectation. Performing laboratory experiments with the ground-copy of the instrument, the authors demonstrate that the observations can be correctly re-ordered to remove these stepping artifacts, which are further validated by a simple numerical model of the expected plasmasphere observations. Understanding the origins of the stepping issue, the authors present new voltage stepping patterns to maximize the scientific return of the JDC instrument during Juice's primary science mission at the Jovian moons. This work highlights the value of in-flight calibration to identify, understand, and correct for instrument artifacts, and with the Juice spacecraft en route to the Jovian system, is timely. A few minor revisions are suggested.

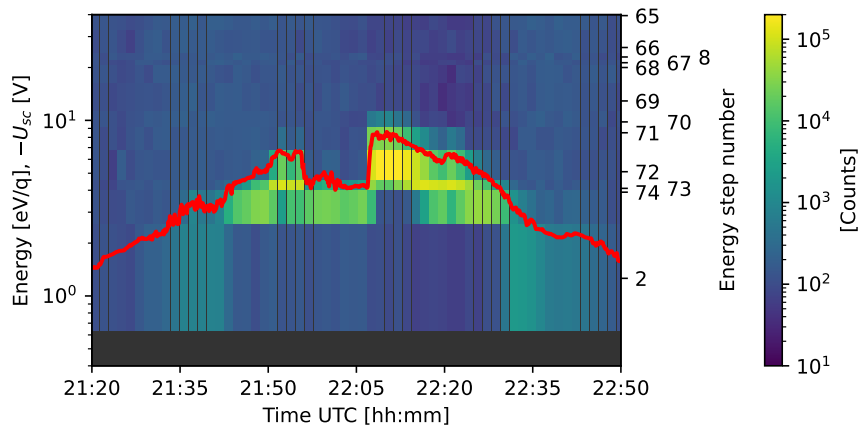
- In section 2, the authors are recommended to describe how JDC makes measurements of negative ion and electrons. Although the focus of the work is on the positive ions observed during the Earth flyby, the manuscript makes mention in several places about the negative-charged particle measurements, including how the voltage stepping will affect them too (e.g., lines 261-263). A sentence or two description early in the work would help readers that are less familiar with this type of instrumentation.

We propose to add the following text in Section 2: By changing the polarity of the voltages applied to the electrostatic analyser and the deflection system electrodes, JDC can alternatively measure positively charged ions or negatively charged ions and electrons.

- Can the authors comment on the systematically low count rate below ~ 1 eV in Figure 5? The numerical simulation of the plasmasphere (Figure 7) suggests large fluxes may be present at these energies. Since the manuscript discusses the comparison between the re-ordered observations and the numerical simulation results, including the "holes" in the flux (line 225), it would be valuable for readers to understand if the low count rate in Figure 5 below ~ 1 eV is expected to be related to the actual plasmasphere (e.g., differences in ion species and temperatures) or an instrumental feature (e.g., related to geometric factor).

Firstly, Figure 5 contains a plotting mistake: bin 72 is plotted twice, the lowest energy bin should be shown as NaN values in the reconstructed spectrum (there was no energy bin below 1 eV, as shown in Figure 4). For visual impression, the colour bands fill the space between two energy bin centres, even if the energy difference between two bins is larger than the energy resolution. Below is the corrected Figure 5 including the correct unit counts, and not counts per second.

Secondly, the model we use is extremely simple. At energies below 1eV it is not expected that the model will reproduce the measured data. Any protruding spacecraft structure like solar panels or any booms will result in near spacecraft ion trajectories that are significantly different from those obtained near a point-like spacecraft as in our model. Model fluxes may thus differ from the observed ones at these energies. We suggest adding a few sentences to stress this in the paper.



- A distinction between JDC's capability to resolve mass versus mass-per-charge would be beneficial to include in section 2. Traditionally, reflectron instruments are primarily capable of distinguishing species of different mass-per-charge. Does JDC enable resolution of mass and charge state? If so, that would be valuable to clarify since the plasmasphere can contain multiply charged species (e.g., line 104). If JDC only resolves mass-per-charge then it should be clarified if these plasmasphere observations are assumed to contain only singly charged species.

JDC does not enable resolution of mass and charge state. We propose to add a clarifying text to Section 2: *Species with same mass per charge, e.g., O^+ and S^{++} , can only be statistically separated using the different energy loss at the time-of-flight start surface.*

- To aid in readers' mapping the different voltage stepping presented in Figures 3-5 it is recommended that the vertical range in Figure 4 is lowered. Comparing Figures 3 and 5, voltage step 73 exhibits a substantial re-ordering from ~ 0.1 eV in Figure 3 to ~ 4 eV in Figure 4. Since this step contains some of the highest count rates it would be valuable for readers to compare the expected vs. actual voltages in Figure 4, however, this is below the vertical axis of the plot.

The energy steps 72-74 in Figure 3 and 4 were nominally at 0 eV and could thus not be represented on the logarithmic scale. We propose to harmonize the vertical axes on Figures 3-5 and adding a note to the caption of Figures 3 and 4:

Figure 3: The corresponding tick-marks on the right-hand vertical axis correspond to the intended energy bin centre. For energy steps 72-74 the intended centre was 0 eV.

Figure 4: The intended voltage setting for energy steps 72-74 is 0 V corresponding to 0 eV (not shown due to the logarithmic vertical scale).

The updated Figures 3 and 4 are shown below.

Figure 3:

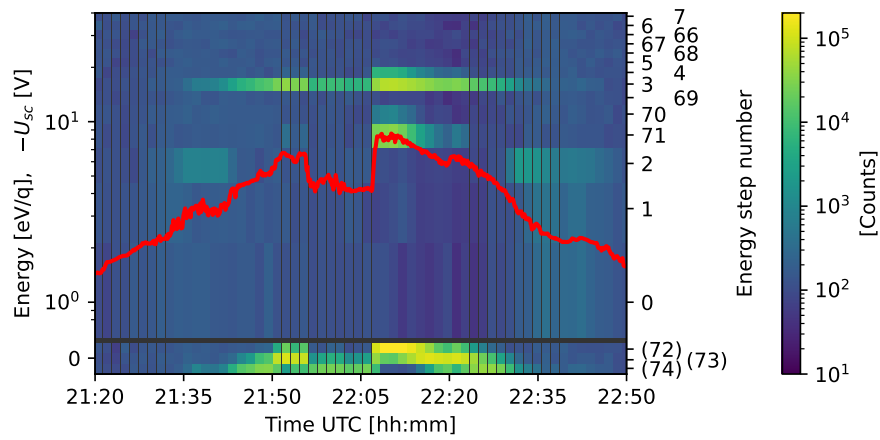
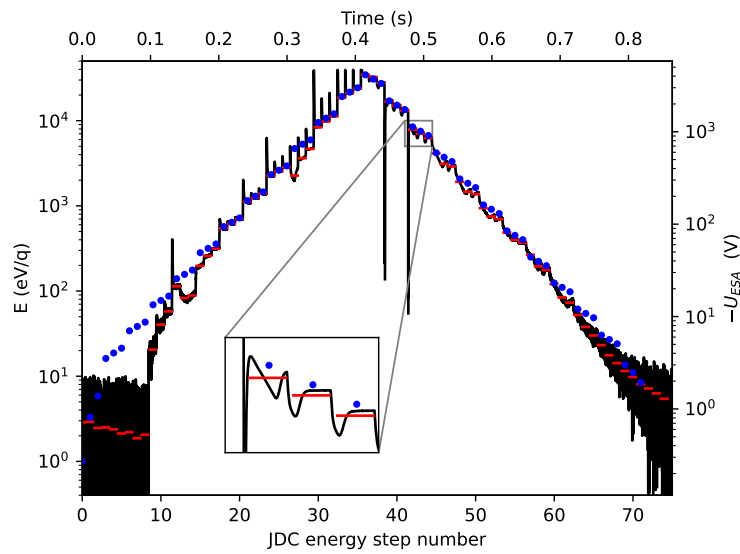


Figure 4:



Technical corrections:

- It should be clarified if Figures 3 and 5 show counts (as listed in the figure caption) or counts-per-second (as suggested by the "cps" label). Showing counts would be helpful to readers since it illustrates the instrument sensitivity (e.g., the 1-count limit) and uncertainty (e.g., Poisson).

The units in Figures 3 and 5 are counts. The figures were corrected in this regard (see updated figures above).