ARTEMIS Observations of Lunar Pickup Ions in the Terrestrial Magnetotail Lobes

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Previous Measurements by KAGUYA/SELENE Spacecraft

[Tanaka et al., GRL, 2009]
## Pickup Ion Variables

<table>
<thead>
<tr>
<th>What We Know</th>
<th>What We Don’t Know</th>
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<tbody>
<tr>
<td>Pitch angle and gyrophase bunched</td>
<td>Ion mass</td>
</tr>
<tr>
<td>Centered at sub-solar point</td>
<td>Ion origin (surface or exospheric)</td>
</tr>
<tr>
<td>Magnetic field vector</td>
<td>Convection velocity</td>
</tr>
<tr>
<td>Continuous range of parallel energies up to ~75 eV</td>
<td>Sheath potential</td>
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<tr>
<td>Perhaps two discrete species</td>
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</tbody>
</table>
Maximum Perp. Ion Energy [eV] vs. Mass, Convection Speed
Convection Velocity

Halekas et al., 2011
Convection Velocity

[Diagram showing the convection velocity and high/low energy reflected photoelectrons around the moon.]
Summary and Future Work

• Observations of pick-up ions of lunar origin in the magnetotail lobes

• Centered at sub-solar point, possibly two discrete species

• Many pieces of information missing (convection velocity, ion mass), but working to constrain these as much as possible

• Use modeling to help understand pickup ion signatures

• Continuing to collect observations for statistics
  • 4-5 ARTEMIS dayside passes per spacecraft every tail crossing
  • Not every dayside pass in the tail lobes