Revisiting the Inner Magnetospheric Oxygen Torus with DE 1 RIMS


1. Plasmaspheric Heavy and Light Ion Densities

Enhanced heavy ions were found just inside the plasmapause, but could be seen at all local times. H+ and O+ ions are shown here so as to compare their overall distributions with L-value. The plot below shows a definite change in behavior for both light and heavy ions below and above L=2.2. While H+ density falls systematically at higher L-values, O+ density tends to rise relative to H+ out to about L=3.5. For comparison, the H+ and O+ densities for each of the plots from Roberts et al. (1987) figure 1 are shown as yellow markers below.

2. Plasmaspheric Heavy and Light Ion Temperatures

The highest temperatures are exhibited for both H+ and O+ ions. Systemically, H+ temperature shows a distinctive behavior, increasing with radial distance up to about r=2.2 and perhaps decreasing beyond that distance. O+ temperature shows a similar trend in temperature, with O+ temperature no longer well ordered at low values when plotted versus L-value, while it is when plotted versus radial distance. H+ and O+ temperature ratios with H+ are shown along the second row below. Unlike O+ and H+ temperature, the O+ temperature ratio is shown to increase with increasing L-value.

3. Discussion and Summary

There are striking differences in the behavior between the light and heavy plasmaspheric ions. Differences in behavior are often distinct for L-values below versus above L=2.2. The number of moment values naturally weights upon the ability to interpret the indications suggested in this presentation. For reference the number of density and temperature values for each ion available in this dataset are shown in Table 1.

Table 1

<table>
<thead>
<tr>
<th>L-value</th>
<th>H+ Density</th>
<th>O+ Density</th>
<th>O+/H+ Density Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤2.2</td>
<td>3.056</td>
<td>0.81</td>
<td>≥100</td>
</tr>
<tr>
<td>&gt;2.2</td>
<td>4.163</td>
<td>3.34</td>
<td>≤0.1</td>
</tr>
</tbody>
</table>

The numbers correspond to the number of densities and temperatures available for the different combinations of ions. Each value is associated with a time and the number of moments is decreased for the same times. Read from top to bottom, the heavy ions are shown as red markers and the light ions as green markers.

4. References

