DMSP and ISS Auroral Charging Events
17-18 March 2013 GEM-CEDAR Storm

Joseph I Minow
NASA Technical Fellow for Space Environments

GEM Mini-Workshop
CEDAR-GEM Modeling Challenge Session
San Francisco, CA
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joseph.minow@nasa.gov
17-18 March 2013 Storm Period

- Equinox period is not conducive to strong DMSP auroral charging
  - Only a few weak auroral charging events during period
- Weak ISS charging, strongest events (few volts) in southern hemisphere

<table>
<thead>
<tr>
<th>Date</th>
<th>Satellite</th>
<th>Charging Event Time</th>
<th>Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>$\phi_{s/c}$, volt</td>
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<tr>
<td>17 March 2013</td>
<td>F16</td>
<td>12:15 UT</td>
<td>-18</td>
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<tr>
<td></td>
<td>F16</td>
<td>16:14 UT</td>
<td>-26</td>
</tr>
<tr>
<td></td>
<td>F18</td>
<td>19:49 UT</td>
<td>-28</td>
</tr>
<tr>
<td></td>
<td>ISS</td>
<td>Multiple orbits ~11 – 19 UT</td>
<td>few volts</td>
</tr>
</tbody>
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Acknowledgements:
DMSP SSJ, SSIES records are provided courtesy of the US Air Force and NOAA’s National Geophysical Data Center.
F16: 17 March 2013 ~16:14 UT event
F18: 17 March 2013 ~19:49 UT event
ISS: 17 March 2013 ~12 – 18 UT events

auroral charging
• Slides 13 – 14: Examples of kilovolt level DMSP charging
• Slides 15 – 20: DMSP 17-18 March 2015 summary plots
• Slide 21: Extreme DMSP charging levels as function of integral electron flux for three energy thresholds (>30 eV, >9.4 keV, >13.9 keV)
F16: 13 June 2010  ~1000 V charging

DMSP F16/SSJ 2010/06/13

[Graph showing data over time with various energy thresholds and particle types (electrons, ions).]

NASA/MSFC
F17: 16 June 2011 ~1000 V charging
No charging events
F17: 18 March 2013

No charging events
F18: 17 March 2013
F18: 18 March 2013

No charging events
Correlation with Integral Number Flux

All potentials in event  Maximum Potential  1-10 nA/cm\(^2\)

Gussenhoven et al. 1985 criteria for auroral charging:

\[ E_{\text{crit}} \geq 14 \text{ keV} \text{ and } F_{\text{crit}} > 10^8 \text{ e-/cm}^2\text{-sec-sr} \]

Critical energy is somewhat arbitrary and flux threshold is lower if a lower energy of 5 keV to 14 keV is used

from Minow et al., 2014