Alfvénic arcs observed by FAST and the THEMIS GBO all-sky cameras
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FAST operated until 2009-04-30
Earlier observations

Mende et al., FAST and IMAGE-FUV observations of a substorm onset, JGR, 2002JA009787, 2003

Mende et al., IMAGE-FUV and in situ FAST particle observations of substorm aurorae, JGR, 2002JA009787, 2003
Marking poleward border after substorm onset
Marking poleward border after substorm onset

**FAST Particles Orbit 48950**

- **dB/Tc-V**
- **p (BxV)**
- **v ((BxV)xB)**

**Energy (eV)**

- **>2 eV** Pitch Angle
- **>2 eV** Energy

**Downgoing Upgoing**

**06:54 22.5 3707.6**

**06:55 22.6 3706.2**

**06:56 22.7 3702.0**

**06:57 22.8 3695.0**

**06:58 22.9 3685.2**

**06:59 23.0 3672.7**

**2008–10–02/06:49:00**

**2008–10–02/06:50:00**

**2008–10–02/06:51:00**

** THEMIS-SWG **

September 15, 2011
Poleward border of pulsating aurora

**FAST Particles Orbit 40350**

- **dB/dec, V**
- **p (BxV)**
- **b**

**Energy (eV)**

- **ions 0-30°**
- **ions 2-300 eV**
- **ions >2 eV**

**Pitch Angle**

- **e- 0-30°**
- **e- 2 eV**
- **e- >2 eV**

**GILL**

- **Downgoing**
- **Upgoing**
- **Mapped to 100 km Altitude UT**

**Keogram GILL**

- **Theoretical event detected**

**THEMIS-SWG**

September 15, 2011
Poleward border of pulsating aurora
Single Alfvenic arc poleward of oval
Single Alfvénic arc equatorward of oval
• Alfvénic arcs are most often found at the poleward edge of a system of auroral arcs.
• The fact that they appear on the poleward side of inverted-V-type arcs filling the auroral bulge during substorms suggests clearly an origin at the interface of the stretched tail field and the more dipolar magnetosphere.
• They are characterized by:
  • strongly structured field-aligned currents and electric fields,
  • rapidly varying ray structure,
  • strongly field-aligned fluxes of medium energy electrons, and
  • transversely heated ions, including O+.
• The transversely heated ions coincide with substantial density depletions and are probably causally related [Lundin et al., 1994].
• Another distinguishing feature is that the associated field-aligned current system consists of balanced upward and downward currents over the width of the auroral emissions.

Haerendel, Six auroral generators, JGR, 2010JA016425, 2011