Characteristics of Isolated High-latitude Aurora

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Introduction

Transpolar arcs (TPAs) are often observed during northward interplanetary magnetic field (IMF). When transpolar arcs move in the dawn or dusk direction across the entire polar region in response to IMF Bz change, they are termed “auro" - aaron the near-ecliptic meridian. Closset et al [1998] selected events from 4-5 year period when IMF Bz is northward for at least 1 hour before and at least 3 hours after a sign change. For northward IMF Bz, we change aurora’s are almost always formed in the northern hemisphere, regardless of IMF dipole tilt [Crooker et al., 2002].

Generally, the strongest VUV emissions measured in the aurora occur in the summer hemisphere. We then identify arc signatures which occur above 87 degrees magnetic latitude seen as the satellite moves in the dawn-to-dusk (dusk-to-dawn) direction along the DMSP satellite track) range between 100 and 950 km and horizontal plasma drift in the ionosphere.

• Small-scale arcs are embedded in the large-scale convection pattern in either sunward flow regions or very weak flow (reduced anti-sunward flow). The convection associated with the thin arcs is localized and has little influence on the large-scale convection. We then see a weak positive correlation between particle energy and dipole tilt.

• Generally, the strongest UV emissions measured in the summer aurora occur in the summer hemisphere. We then identify arc signatures which occur above 87 degrees magnetic latitude seen as the satellite moves in the dawn-to-dusk (dusk-to-dawn) direction along the DMSP satellite track. The lower right quadrant is that in which both northward IMF and increasing IMF magnitude are observed. The particle drift is then always anti-sunward and the convection associated with the thin arcs is localized and has little influence on the large-scale convection.

• All types of convection patterns are seen during these events (dominate one-cell, 2-, 3- and 4-cell; e.g., Cumnock et al., 1993). The largest group (52) is dominated 1-cell patterns; 15 are 2-cell, 13 are 3-cell, 10 are very structured, only three are 2-cell. For most of the events (61) negative potential cells dominate.

Statistics results: Ion integral energy flux vs. dipole tilt (r = 0.39). We see a weak positive correlation between particle energy flux (averaged over the arc) and dipole tilt where the largest energy flux structures are associated with large positive dipole tilt. The electron energy flux and maximum ion and electron temperature have negative correlations with the sun flow with dipole tilt.

Previous Results:

- For steady northward IMF and a B sign change, theta aurora are almost always formed in the northern hemisphere, regardless of IMF dipole tilt [Crooker et al., 2002].
- Generally, the strongest VUV emissions measured in the aurora occur in the summer hemisphere.

New Results:

- Most of the 73 isolated arc events identified occur during northward IMF conditions and changing B (42 events follow a positive B sign change).
- The highest electron and ion integral energy fluxes measured in the arcs occur in the summer hemisphere. There is a weak positive correlation between particle energy and dipole tilt.
- Strongest (positive) correlations for energy flux were found with magnetic field strength in the solar wind (vswB2) and the anti-aligned (cross-satellite track component) horizontal plasma drift in the ionosphere.

Observations

Transpolar arcs (TPAs) are often observed during northward interplanetary magnetic field (IMF). When transpolar arcs move in the dawn or dusk direction across the entire polar region in response to IMF Bz change, they are termed “auro" - aaron the near-ecliptic meridian. Closset et al [1998] selected events from 4-5 year period when IMF Bz is northward for at least 1 hour before and at least 3 hours after a sign change. For northward IMF Bz, we change aurora’s are almost always formed in the northern hemisphere, regardless of IMF dipole tilt [Crooker et al., 2002].

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