Auroral Electrodynamics on Arc and Oval Scales

Octav Marghitu (1, 2)

(1) Institute for Space Sciences, Bucharest, Romania
(2) Max-Planck-Institut für extraterrestrische Physik, Garching, Germany

The auroral arc and the auroral oval are low altitude fingerprints of the magnetosphere – ionosphere (M–I) coupling. Although the typical spatial scales of the arc and oval differ by 1–2 orders of magnitude, the respective standard models share a number of common features:

- azimuthal homogeneity;
- connection to the magnetosphere through a pair of upward / downward field-aligned current (FAC) sheets;
- meridional closure of the FACs through ionospheric Pedersen current;
- divergence free Hall electrojet in azimuthal direction.

These features reflect an ideal configuration, and in principle it is easy to agree that the real arc and oval deviate from it. In practice, the symmetry of the ideal configuration is both attractive and convenient, so that the deviations are quite often neglected.

The amount and accuracy of the experimental data nowadays, together with a wide variety of numerical tools, offer the means to check the real arc and oval more thoroughly, and try to answer questions like:

- What methods / techniques do we have to check the real configuration? On what spatial / temporal scales can we use them?
- When / where does the ideal configuration fit the arc / oval? When / where should we expect significant deviations?
- Are the deviations related to the location of the arc within the oval, and to the relative positions of the FAC, precipitation, and convection boundaries?
- How substantial and how typical are the deviations from the ideal configuration? Should we be concerned about them at all?
- Are there significant implications for understanding magnetospheric dynamics and for the M–I coupling models?