AURORAL ARC STUDIES USING GROUND-BASED OPTICAL IMAGING

INGRID SANDAHL 1, Urban Brändström 1, Tima Sergienko 1, Björn Gustavsson 2

1. Swedish Institute of Space Physics, Kiruna, Sweden, e-mail: ingrid.sandahl@irf.se
2. University of Tromsø, Department of Physics and Technology

A large proportion of the aurora appears in the form of arcs, very long in the general east-west direction and very narrow in the north-south direction. Auroral arcs come in several different scale sizes, from few tens of meters to tens of km. Many arcs are caused by accelerated electrons, but there are also arc-like structures in which there are no signs of particle acceleration. These structures appear in the diffuse aurora and are caused by modulated pitch angle scattering far out in the magnetosphere, perhaps near the equatorial plane. The reason for the arc-like shape in this case is not clear. The situation is similar for black arcs; some are associated with parallel potential drops, while others are not. The structuring of arcs is poorly understood, in particular for the smallest scales. At least in some cases the ionosphere plays a role in the structuring. We will report results on auroral arcs and arc-like structures based on data from ALIS (Auroral Large Imaging System). We have also used data from other ground-based instruments, in particular EISCAT, data from satellites, and active experiments with the EISCAT Heating facility. Arc-like fine structure of diffuse aurora including regions of black aurora was studied simultaneously with ALIS and FAST. The auroral structures could be explained by wave particle interaction with a combination of whistler mode waves and electrostatic cyclotron harmonic waves. In a heating experiment an auroral arc was stimulated. This arc appeared to be caused by accelerated electrons. Unsolved questions and needs for future measurements will be discussed, in particular the possibilities offered by ground-based optical imaging.

auroral arcs, optical imaging, magnetosphere-ionosphere interaction

Ingrid Sandahl, Swedish Institute of Space Physics, Box 812, SE-981 28 Kiruna, Sweden,
tel: +46 (0)980-79084, fax: +46 (0)980-79050, e-mail: ingrid.sandahl@irf.se