Abstract

A statistical study of field-aligned currents (FACs) for the northern and the southern hemispheres has been performed using magnetometer data from the Astrid-2 satellite. An automated FAC finding routine has been developed to detect large-scale current structures in the auroral regions between 55° and 85°. Included are $\triangle\mathbf{B}$ variations over a latitude range greater than or equal to 0.57° and current densities greater than or equal to 0.15 $\frac{\mu A}{m^2}$. The currents that satisfy these criteria are considered for analysis.

The FACs show a marked tendency to align themselves with the statistical auroral zone and an even greater tendency, on each pass, to align themselves with each other, as expected for a population of sheet-like auroral currents. We are able to reproduce the familiar statistical location and polarity patterns of the FACs for 2, 3, 4, 5 and 6 consecutive current sheets. Dividing the data set into low and high K_p bins shows the expected contraction and widening of the current circuit for low and high K_p respectively. The size of the current circuit depends also on IMF B_z being contracted for northward IMF B_z and wide for southward B_z. The averaged current densities are nearly twice as strong near noon as in the other regions. The averaged current densities are higher during active periods than during quiet periods. The distribution of averaged current densities for the northward and southward B_z shows a weak correlation between strong (weak) currents and southward (northward) IMF. The current density peak around noon is displaced towards the morning (evening) MLT sectors for IMF $B_y > 0$ ($B_y < 0$).