

Bi-streaming electron conics observed by Akebono

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We have found bi-streaming electron conics in Akebono observations at altitudes of several thousands km above the auroral oval. By definition the bi-streaming conics are peaked at both pitch angles of 20-70 and 110-160 degrees, and their shapes and intensities are almost symmetric between both directions. They tend to be observed near the edge of the inverted-V type electron accelerations, or when the field-aligned electric fields are developing above the observation location, but rarely when the potential difference exists below it. Their energies are equal to, or lower than, that of precipitating electrons in the field-aligned direction. The statistical results show that the cone angles are apt to approach the field-aligned directions, but outside the atmospheric loss cone. Thus the bi-streaming conics exist in the trapped/inhibited region of the phase space, and the upward and downward components are most likely of the same origin. Another important property is that they have a flat-topped distribution function, of which the temperature above the shoulder energy is similar to that of the precipitating electrons above the peak energy of an accelerated Maxwellian distribution. While previous DE-1 and Viking observations observed upward electron conics which are interpreted as due to perpendicular heating by upper-hybrid waves, we suggest that the bi-streaming electron conics are generated by the field-aligned electric field above the satellite growing with time.