Energization of Ionospheric Ions around the Cusp/Cleft Region

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We seek a possibility of low-frequency (0.2 - 4.0 Hz) electric-field fluctuations (LEFs) as a energy source of transverse ion heating around the cusp/cleft region from Akebono onservations. Intense LEFs and transversely heated ions (ion conics) have an occurrence peak at the prenoon region. They both have a similar dependence on high-speed solar wind streams, interplanetary magnetic field components By and Bz. We also found a significant correlation between the power spectral density of LEFs and the energy of simultaneously observed ion conics. Ion conics with a conic angle near 90 degrees and those more aligned with magnetic field lines both had an equivalent correlation with the local intensity of the LEFs. LEFs associated with near-perpendicular ion conics were, however, generally more intense than those associated with folded conics. The difference was clearer for low-energy conics. These results are in agreement with a scenario of height-integrated heating of ions and energization of ions by electromagnetic energy supplied by local LEFs. Ions generally stay in the energization region during their upward motion along the field line, so that more folded ion conics with weak energization reach the same energy level as near-perpendicular conics with strong energization due to the difference in integration time. The limit on residence time in the intense heating region causes the clearer difference for low-energy conics. We set up a simple model to examine the relationship between the energization rate and the evolution of ion conics along the field lines, and obtained good agreement with the observation results.