The latitude relation between small-scale magnetic field variations and energetic particle precipitation in the low-altitude cusp

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We have studied more than 50 cases of cusp crossings by low-altitude satellites during the February 16-22, 2002, SIRCUS campaign period. About half of them were inferred from DMSP F-13/14/15 particle spectrometer observations and the other half from measurements of small-scale magnetic field variations made onboard the Ørsted and CHAMP satellites. The locations of the satellites during the detection of the respective cusp signatures were converted into AACGM coordinates, and the geomagnetic latitude of these signatures set in relation to the statistical, IMF-Bz dependent "particle cusp" latitude derived by Newell et al. (1989). The observed particle cusp latitude (inferred from DMSP measurements) matches the statistically expected cusp latitude well while the small-scale magnetic field perturbation regime appears to cover not only the cusp but also the poleward section of the low-latitude boundary layer (LLBL) close to noon. We suggest that the perturbations resulting in the small-scale magnetic field variations are generated in the LLBL-cusp transition zone, possibly associated with turbulence in the process of opening geomagnetic field lines and merging them with the interplanetary magnetic field.