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Impact of the IMF rotation from Northward to Southward on Cusp Boundary Formation and Particle Entries: large-scale global 3D Full particle simulations.

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Large-scale global three-dimensional PIC simulations are performed with higher
resolution (one grid size equal to 0.2 Earth radii) in order to analyse the dynamics of the cusp boundary formation and particle entry as the interplanetary magnetic field (IMF) rotates from northward to dawn-dusk direction.

As the IMF is northward, the cusp boundaries where the ion and electron densities are strongly enhanced, but electrons mainly accumulate along the outer edges of the cusp with a neat enhancement along the night-side edge, while ions fill in the inner part of the cusp. A «pile-up» of B field is observed along the outer edge of the cusp. Reconnection takes place at high elevation of the cusp and spreads along the magnetopause in the night side. The electron current is the strongest at the reconnection location.

As the IMF turns dawn-dusk, new changes take place. The «pile-up» of B field is reinforced along the outer edge of the cusp, while the reconnection region shrinks and slightly moves to night side. The cusp itself fills-in with electrons everywhere while ions are mainly concentrated within the inner part of the cusp. However, particles penetrate (slightly) less deeply the cusp than with North IMF.