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The IMF B_z Dependence of Cusp-Aligned Arcs

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Occasionally, the auroral oval is filled with arcs pointing from the night side towards the cusp. These aurorae are known as cusp-aligned arcs. While there have been some theoretical predictions about their origins, the cause of these arcs remains unknown. For this study, we have identified both cusp-aligned arcs and regular transpolar arcs from DMSP satellite data. We investigate the correlation between the appearance of cusp-aligned arcs and various solar wind parameters, with a focus on IMF B_z and solar wind velocity. These results are then compared to the occurrence of regular transpolar arcs with respect to the same parameters. We see that cusp-aligned arcs appear almost exclusively when the IMF is northward for a long period of time, contrary to regular transpolar arcs which can have a varying, but typically northward on average, IMF. This result is in agreement with previous studies. No clear correlation between the solar wind velocity and cusp-aligned arc occurrence frequency can be seen. The results indicate that cusp-aligned arcs might be caused by Kelvin-Helmholtz instabilities at the flanks, as has been previously suggested. We also discuss other potential causes and models of cusp-aligned arcs in further detail. Additionally, we investigate the conjugacy of cusp-aligned arcs, based on DMSP data.