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Average Pitch Angle Distributions in the Magnetotail: The Effect of Geomagnetic Activity

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We present results from a statistical study of proton and electron pitch angle distributions in the terrestrial magnetotail using data from the PEACE and CIS-CODIF instruments on the Cluster spacecraft. Our data indicate that, on average, protons follow the established picture of magnetotail structure. In contrast, we find that the expected extended, isotropic electron plasma sheet is not present. Instead the electron pitch angle distributions are dominated by field-aligned particles in all regions except those with the very highest values of proton beta, where they are dominated instead by particles moving perpendicular to the field. Here, we investigate the properties of these average pitch angle distributions at different levels of geomagnetic activity, considering the strength of the auroral electrojets and the size/location of the auroral oval, amongst other parameters.