



Hemispheric asymmetries seen in Birkeland currents

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We reduce measurements made by the Active Magnetosphere and Planetary Electrodynamics Response Experiment (AMPERE) to give the total Birkeland (field-aligned) current flowing in both hemispheres in monthly and hourly bins. We analyse these totals using 6 years of data (2010–2015) to examine solar zenith angle-driven variations in the total Birkeland current flowing in both hemispheres, simultaneously, for the first time. We identify both diurnal and seasonal variations which are consistent with variations in the solar zenith angle, and find that more current flows in the summer hemisphere. For months close to equinox, more current is found to flow in the Northern Hemisphere, contrary to our expectations that the current should be equal between the two hemispheres. We conduct a test of the Milan (2013) model for estimating Birkeland current magnitudes, modified to account for variations in photoionisation due to solar zenith angle. We find that the model shows good correlation with the observed currents, and interestingly, we find that the correlation of the residuals is consistent with systematically larger current flowing in the Northern Hemisphere. From this, we infer that there is a hemispheric asymmetry in Birkeland current flow.