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AMPERE and The Electric Current of the Geomagnetic Storm

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The Active Magnetosphere and Planetary Electrodynamics Response Experiment (AMPERE) has revolutionized the way in which we can study the electrical current systems present over the poles of Earth. With high cadence measurements taken in both hemispheres, the data has proven invaluable in developing our understanding of the current systems that couple the magnetosphere and ionosphere and how they change in response to space weather. By employing the AMPERE data set, we aim to offer new insights into the complex and dynamic region 1 and region 2 current systems as they respond to the impact of solar wind disturbances on the magnetosphere and the driving of geomagnetic storms.

We investigate the relationship between the hemispherically-integrated current flowing into or out of each pole and upstream solar wind parameters to understand how these currents are driven. As expected, current magnitude increases with increasing interplanetary magnetic field strength and solar wind speed. A key aim of the analysis is to determine if current magnitude saturates under strongly driven conditions, in the same way that the cross-polar cap potential is known to saturate. We present preliminary results, indicating a variety of behaviours at high driving, and discuss these in terms of theories of solar wind-magnetosphere coupling.