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Energy input in the dayside polar cap during IMF By dominated conditions: Summer vs. Winter

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When IMF By is dominant, which is the typical situation, a highly vortical convection pattern is seen inside the dayside polar cap in the summer hemisphere. In the winter hemisphere, however, the convection is mainly from noon to midnight with little vorticity inside the polar cap. Combined with the vastly different ionospheric conductance between summer and winter due to solar EUV irradiance, these differences in convection cause large summer/winter differences in the Birkeland currents in the dayside polar cap. Hence, the joule heating rates will be very different in the dayside polar cap between summer and winter during the IMF By dominant periods, which is typically associated with weak geomagnetic activity inside the auroral oval. This presentation will focus on the hemispheric differences in e.g. joule heating during such conditions, which will be quantified using the newly developed LOcal Mapping of Polar ionospheric Electrodynamics (Lompe) data assimilation technique. The Lompe technique is similar to the Assimilative Mapping of Ionospheric Electrodynamics (AMIE) technique, but allows the electrodynamics to be described only in a limited region to reflect the observational coverage. The prescribed conductance will be provided from UV imaging of the aurora (in addition to EUV), allowing also the energy from precipitation to be estimated. While existing empirical models [e.g. Weimer 2005, doi:10.1029/2004JA010884] capture some aspects of the hemispheric asymmetries, this presentation will focus on how recent advances in data assimilation techniques allows us to quantify these asymmetries on an event basis, showing how these typical conditions can lead to vastly different energy input into the two hemispheres.