

EGU2020-20871

<https://doi.org/10.5194/egusphere-egu2020-20871>

EGU General Assembly 2020

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Using Swarm to study ionosphere-thermosphere coupling

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Properties and dynamics of ionosphere-thermosphere coupling may be investigated using observations from the Swarm electric field instruments (EFI). We illustrate this claim using measurements of vertical ion drift and electron temperature made by the EFIs, within the context of ambipolar diffusion parallel to the geomagnetic field. The associated ambipolar electric field is difficult to measure directly. Rather, under conditions where the ambipolar electric field is assumed to be specified, the ion-neutral momentum transfer collision frequency may be derived from the EFI measurements. In this talk, the theory, measurements and methodology of this approach are presented. Statistical analysis reveals highly-correlated ion upflow and electron temperature. Derived collision frequencies are found to be within an order of magnitude of empirical estimates at Swarm altitudes. We speculate on the feasibility of using this technique to examine the dynamics of ionosphere-thermosphere coupling using Swarm.