

Statistical field-aligned current maps determined from SuperDARN HF radar measurements of ionospheric vorticity

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Measurements of ionospheric plasma vorticity are a proxy for the field-aligned currents (FACs) that dynamically couple the magnetosphere to the ionosphere. Hence, studying spatiotemporal variations of ionospheric vorticity will help to understand this coupling. We have developed a new method for determining ionospheric vorticity using line-of-sight velocity measurements made by the SuperDARN radars. Using 6 years (2000-2005) of vorticity measurements from 6 SuperDARN radars in the northern hemisphere we have determined statistical maps of vorticity that cover the whole of the northern polar ionosphere. We test the validity of our method by studying the statistical variations of vorticity with geomagnetic latitude, magnetic local time (MLT), season, and interplanetary magnetic field (IMF) direction. The resultant statistical maps are a close match to previous statistical maps of field-aligned current from the northern hemisphere ionosphere, confirming the validity of the method.

