

## Using Commercial Satellite Data for Space Weather Studies

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Field aligned currents (FACs) flowing into and out of the polar ionosphere and the high-latitude electric potential pattern are important features of magnetosphere-ionosphere coupling. The associated Poynting flux leads to Joule heating of the high-latitude atmosphere and ionosphere. Estimating the global Poynting flux is challenging as it requires knowledge of both the electric and magnetic perturbation fields over a large area. By combining data from the Super Dual Auroral Radar Network (SuperDARN) and the Iridium satellite constellation, global maps of Poynting flux from in situ data are obtained. SuperDARN provides Doppler velocity measurements that allow the ionospheric electric field to be estimated. The engineering magnetometers on the Iridium satellite constellation provide FAC induced, magnetic perturbation data. Using experimental data driven, spherical harmonic expansion methods, the electric and magnetic perturbations are combined to give the global Poynting flux for any magnetic local time and any latitude down to 60 degrees geomagnetic. The time resolution is limited by the Iridium data and is about one hour. A number of examples show the spatially integrated power to be around 50 GW into the polar ionosphere for average conditions. Both afternoon and early morning enhancements in Poynting flux are seen to be localized around 70° geomagnetic latitude, close to maxima of the region 1 FAC system.

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