SM13B-07 - Time-scale dependence of solar wind-based regression models

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Abstract

The solar wind influence on geospace can be described as a sum of a directly driven component, following dayside reconnection, and an unloading component, associated with the release of magnetic energy via nightside reconnection. The two processes are poorly correlated on short time scales, but exactly equal when averaged over long time windows. Because of this peculiar property, regression models that are based on solar wind data are time scale specific: Models derived with 1 min resolution data will be different from models derived with data averaged over, say, 1 h. We explain and quantify this effect on simple linear regression models of various geomagnetic indices. We also derive a time-scale dependent correction factor that can be used with the Average Magnetic field and Polar current System model. Finally, we show how absolute estimates of the nightside reconnection rate can be calculated from solar wind measurements and geomagnetic indices.

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