



Prediction of the Dst, AL, AU Indices Using Solar Wind Parameters

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Geomagnetic indices indicate the average characteristics of geomagnetic activity and are an integral part of many studies of space weather. Since magnetospheric dynamics are to a large extent directly controlled by the solar wind, geomagnetic indices can be predicted based on upstream solar wind measurements. We have developed a rather accurate model to predict the Dst index, an hourly index, solely based on solar wind measurements. However, on shorter time-scales magnetospheric activity seems less predictable. We demonstrate this by using two empirical models (one simple and one complex) to predict the AL index, a measure of the Earth's auroral activity derived from magnetometer stations in the Northern Hemisphere. Though both models were optimized to predict the 10-min averaged AL index, both models predict a longer-averaged AL index very well while predicting the difference between 2-hour averaged AL and the 10-min AL poorly, implying much less predictability for shorter time-scale variations. The models show that the AL index is strongly dependent on the solar wind magnetic field and velocity but is practically independent of the solar wind density. We will also show our recent results of predicting AU and AE ($AE = AU - AL$) based on upstream solar wind measurements.