PREDICTING GEOMAGNETIC ACTIVITY INDICES

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Magnetically active times, e.g., Kp > 5, are notoriously difficult to predict, precisely the times when such predictions are crucial to the space weather users. Taking advantage of the routinely available solar wind measurements at Langrangian point (L1) and nowcast Kps, Kp and Dst forecast models based on neural networks were developed with the focus on improving the forecast for active times. To satisfy different needs and operational constraints, three models were developed: (1) a model that inputs nowcast Kp and solar wind parameters and predicts Kp 1 hr ahead; (2) a model with the same input as model 1 and predicts Kp 4 hr ahead; and (3) a model that inputs only solar wind parameters and predicts Kp 1 hr ahead (the exact prediction lead time depends on the solar wind speed and the location of the solar wind monitor.) Extensive evaluations of these models and other major operational Kp forecast models show that, while the new models can predict Kps more accurately for all activities, the most dramatic improvements occur for moderate and active times. Similar Dst models were developed. Information dynamics analysis of Kp, suggests that geospace is more dominated by internal dynamics near solar minimum than near solar maximum, when it is more directly driven by external inputs, namely solar wind and interplanetary magnetic field (IMF).

Kp, Dst, prediction, geomagnetic activity indices

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