

David Marchese

Comparison of Costello Geomagnetic Activity Index Model and JHU/APL Models for Kp Prediction

Abstract

The planetary K index, or Kp, is a measure of the level of magnetic activity in the Earth's magnetosphere. Large Kp values have been shown to correlate with high levels of geomagnetic activity often responsible for a range of adverse effects including satellite damage, electric power grid collapse, and the disruption of radio communication and GPS navigation. Models that predict Kp allow preventative measures to be taken against potentially catastrophic system failures making it extremely useful for space weather forecasters to know the probability that a model's predictions will be accurate. Four such models were evaluated; the Costello Geomagnetic Activity Index model and three models developed by the Applied Physics Lab at Johns Hopkins University. Validation studies of these models were performed to find distributions of official Kp values for a given prediction. Various levels of solar activity were tested to look for solar cycle dependency. The overall performance of the Costello model was compared to that of the JHU/APL models. These evaluations demonstrated that the Costello model tends to overpredict Kp consistently for all values. Additional validation studies will need to be carried out to determine if the JHU/APL models perform significantly better than the Costello model.