Geophysical Research Abstracts
Vol. 20, EGU2018-7313, 2018
EGU General Assembly 2018

Systematic analysis of machine learning techniques for Kp prediction

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The Kp index is a global measure of geomagnetic activity and it represents short-term magnetic variations driven by space weather. Kp index is used as an input to various thermosphere and radiation belt models, and it is therefore important to predict it accurately. Previous works in this area have mostly employed artificial neural networks to nowcast Kp and based their inferences on the recent history of Kp and solar wind data. In this study, we systematically test how other machine learning techniques apart from neural networks perform on the task of nowcasting and forecasting Kp for longer prediction horizons. Additionally, we investigate the longer time history inclusion into the models and the influence of the 27-day recurrency and persistence on the predictive performance during disturbed and quiet times. Finally, we evaluate and report the optimal combinations of machine learning models with the 27-day recurrency and persistence for different levels of geomagnetic activity.