

REGRESSION FORECASTING OF THE PLANETARY GEOMAGNETIC INDEX K_p

Space weather forecasting is very important to our lives. The most straightforward approach to space weather prediction is to study the whole complex chain of physical processes involved in magnetospheric dynamics and conjugate them in a global model of the evolution of the magnetosphere under the influence of the solar wind. Unfortunately, this is not yet possible due to our poor understanding of the physics of the interaction between the solar wind and the magnetosphere. For this reason, different approaches should be tried.

We saw that most of the methods have a common feature: they lead to a regression relation at some point, so it seems natural to skip all the preliminary steps and instantly use the regression analysis without unnecessary multiplication of entities.

Described approach, named "regression modelling", allows achieving accurate short-term forecasts of geomagnetic indexes, which are using as quantitative characteristics of space weather. The proposed method is statistical, but has some features of empirical models. It is based upon the regression analysis and the mathematical statistics. This approach involves inductive construction of a regression relation between output and input values. Also it can provide accurate short-term and medium-term forecasts and gives new information about the underlying physics, thus contributing to the solar-terrestrial physics.

The proposed approach appeared to be more than adequate for space weather forecasting. For the forecasting per se, its main advantages are quite good correlation, adaptability to any samples, and very fast forecasting code. For the identification of geoeffective parameters it is extremely convenient and easy to use.

We developed models for forecasting the K_p index with 3 hours lead time. The linear correlation coefficient between the model output and the measured value is 80%. The prediction efficiency is about 60%. Used as a training sample ranging from 1 January 1976 to December 2003. The software utilizing this method is fast enough to be used in operations.