Use of Association Rule Mining for Finding Correlation between Interplanetary Magnetic Field and Geomagnetic Field

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It is well known that the geomagnetic field has a close correlation with the interplanetary magnetic field. We generally find the correlation by calculating correlation functions between the two data sets. Recently, data mining technique has advanced to find a correlation which was unknown without it. This technique may help us to discover a new correlation. In this paper, we find a new correlation between interplanetary magnetic field and geomagnetic field using association rule mining.

We use the level-2 observation data (6 kinds of parameters) of the ACE satellite, which is located in interplanetary space between the sun and the earth as data of the interplanetary magnetic field. As data of the geomagnetic field, the AE index (4 kinds of parameters) is utilized. The two data sets are time-series data (4-minute value) of one year duration in 2010. Using the association rule mining, we find some correlations between the two data sets. In the presentation, we will show the results of the correlation analysis. The details of the correlations and physical interpretation will also be described.

Keywords: data mining, correlation analysis, space science