Comparison of CME and CIR driven geomagnetic storms using the artificial neural network model

Milos Revallo (1), Fridrich Valach (2), Pavel Hejda (3), and Josef Bochnicek (3)

(1) Earth Science Institute, Slovak Academy of Sciences, Bratislava, Slovakia (geofmire@savba.sk), (2) Geomagnetic Observatory, Earth Science Institute, Slovak Academy of Sciences, Hurbanovo, Slovakia (fridrich@geomag.sk), (3) Institute of Geophysics, Academy of Sciences of the Czech Republic, Prague, Czech Republic (ph@ig.cas.cz, jboch@ig.cas.cz)

A model of geomagnetic storms based on the method of artificial neural networks (ANN) combined with an analytical approach is presented in the paper. Unlike our previous studies, here we focus on medium and weak geomagnetic storms caused by coronal mass ejections (CMEs) and those caused by corotating interaction regions (CIRs). As the model input, the hourly solar wind parameters measured by the ACE satellite at the libration point L1 are used. The time series of the Dst index is obtained as the model output. The simulated Dst index series is compared with the corresponding observatory data. The resulting Dst index series are inspected and typical features of CME and CIR driven storms are isolated. The model reliabilty is assessed using the skill scores, namely the correlation coefficient CC and the prediction efficiency PE. The general observation is that in the case of medium and weak geomagnetic storms the model performance is worse than in the case of intense geomagnetic storms studied in our previous paper. Due to more complex Dst index record, the model response for CIR driven storms is worse than in the case of CME driven storms.