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Prediction of geomagnetic storms from solar wind data with the use of a neural network

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Abstract. An artificial feed-forward neural network with one hidden layer and error back-propagation learning is used to predict the geomagnetic activity index (D_{st}) one hour in advance. The B_z-component and $<sigma>_{Bz}$, the density, and the velocity of the solar wind are used as input to the network. The network is trained on data covering a total of 8700 h, extracted from the 25-year period from 1963 to 1987, taken from the NSSDC data base. The performance of the network is examined with test data, not included in the training set, which covers 386 h and includes four different storms. Whilst the network predicts the initial and main phase well, the recovery phase is not modelled correctly, implying that a single hidden layer error back-propagation network is not enough, if the measured D_{st} is not available instantaneously. The performance of the network is independent of whether the raw parameters are used, or the electric field and square root of the dynamical pressure.

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