CHARACTERIZING GEOMAGNETIC STORMS BASED ON MULTI-SCALE WAVELET DECOMPOSITION: A CASE STUDY

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Abstract

Geomagnetic storms are recognized as a worldwide decrease of the horizontal component of the Earth´s magnetic field measured at middle and low latitude magnetometers. Those disturbances can be viewed in general as a result of a chain of electrodynamical processes from the Sun to the Earth. In this work the behavior of raw magnetogram data recorded at Kakioka magnetic station, with one minute time resolution, related to periods of magnetic storms were analyzed. From the 189 storms reported by the WDC Kyoto in the chosen interval from January 1997 to December 2004, 28 moderate (-100 <= Dst <= -50 nT) and 25 intense (Dst <= -100 nT) storms were analyzed. The methodology applied consists in the use of the orthogonal Daubechies 4 discrete wavelet transform applied to magnetogram data in order to identify thestorm period using a multiscale hard threshold set of the wavelet coefficients. The wavelet coefficients amplitudes of the first three orthogonal wavelet decomposition levels using a proper threshold allow to characterize the storm time taking into account the amount of energy of the transients during the main phase of the storm. The purpose is to establish a method to classify the storms according to storm intensity, the main phase duration and transient features in this period.