Wavelet multiresolution analysis of low frequency fluctuations in the Jupiter's magnetotail

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Wavelet multi-resolution analysis enables one to decompose a time series in orthogonal frequency bands. This method allows to study physical phenomena with different periods which are superposed in a time series. This is the case for Jupiter's magnetosphere observations, where the Jovian rotation signal strongly dominates much of the observed data. In this work, the Meyer wavelet transform is applied to Galileo magnetometer data during one crossing of the Jupiter magnetotail (June 1997). The magnetic field data are decomposed in orthonormal frequency levels using wavelet multiresoluton data. Further, in each of these band pass filtered levels, the multiple taper spectral technique is applied to find the most statistically significant signal frequencies. The results obtained are compared with previous works regarding periodicities other than the Jovian rotation in Jupiter's magnetosphere. The main periods found in this case study are: in the range of 1.3-3.3 days, possibly related to global instabilities in the Jupiter's magnetosphere; and from 5 to 10 days, which could be due to variations related to external (i. e. solar wind), or internal (e.g., volcanic activity at Io or global magnetospheric reconfiguration events) conditions. The method presented in this case study could be applied to other data sets from different planetary magnetosphere observations.

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