



On exploring the local fractal properties of geomagnetic time series

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The purpose of this work is to present an alternative way to identify the short term geomagnetic field activity related to geomagnetic storms, using magnetograms instead of the processed Dst index. This approach takes into account the nonstationary properties of the data and allows to detect main events, such as Sudden Storm Commencement (SSC).

Here, we investigate the spatial variation of the Hölderian regularity exponent (H) estimated from the Horizontal component of the transient external geomagnetic field recorded by the Intermagnet observatories. The analysis is performed on one minute sampling geomagnetic data recorded during quiet and disturbed days of the solar cycle 23.

The results show that the H exponent can capture and categorize the main geomagnetic features contained in the signal. An abrupt change of H value marks the time of a storm onset, and the major singularities of the geomagnetic field temporal variations, such as SSC, are characterized by very low H values. Another important finding is that a significant correlation is noted between the horizontal component of the Earth's magnetic field and its estimated local regularity, whereas no clear relationship is drawn between these parameters. To conclude, the regularity exponent could be an efficient key indicator of geomagnetic activity and singularity detection.

Keywords: geomagnetic activity, geomagnetic storm, regularity, Hölder exponent