Statistics of magnetic autocorrelation lengths in the Solar Wind

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Abstract

There remain unanswered questions regarding the evolution of turbulent properties in different solar wind regimes, and their role in the dynamics of the Sun-Earth system. In this work we analyze the evolution of the spatial structure of interplanetary magnetic field fluctuations, by examining the heliospheric autocorrelation functions (R) based on "in situ" observations and using classical single-spacecraft techniques. Correlation lengths derived from R can be viewed as a measure of the integral scale of the turbulence. We focus on the evolution of these correlation lengths based on an analysis made at different heliodistances from the Sun, using observations from the Helios, ACE and Ulysses spacecraft. We distinguish different turbulent properties for the Parker-type Solar Wind and different transients, including some geoeffective transients which affect space weather conditions, as interplanetary coronal mass ejections or magnetic clouds.

Keywords: Interplanetary Magnetic Field, Solar Wind, Turbulence, Magnetic Clouds

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