MULTIPLE MAGNETIC CORRELATION SCALES IN THE SOLAR WIND

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ACE, Cluster, Geotail, IMP-8, Interball, THEMIS, and Wind data from many different intervals in the solar wind are employed to determine the correlation coefficient versus spatial separation function. This function has been used to derive the magnetic correlation scale for solar wind magnetic field turbulence. For this study we define the correlation scale as the exponential decay constant of the correlation coefficient as a function of spacecraft separation and it is one of the fundamental scale lengths in turbulence. We find that the correlation coefficient vs. spacecraft separation, organized by the angle between the separation vector and the mean magnetic field, is well fit by a sum of two exponentials. For this study we interpret the exponential decay constants as characteristic scale lengths of the turbulent plasma. We believe the largest decay length is the magnetic correlation scale for the unperturbed solar wind; it is on the order of several million kilometers. The second decay length is of the order of tens of thousands of kilometers; we believe this second decay length characterizes the scale sizes of coherent flux tubes. We investigate this hypothesis by examining subsets of the data inside and outside of the foreshock region.