USING THIRD MOMENTS TO STUDY TURBULENCE AND HEATING IN THE SOLAR WIND

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The inertial-range scaling and amplitude of certain mixed third-order moments of velocity and magnetic field fluctuations in turbulent MHD plasma such as the solar wind are theoretically related to the cascade rates in the inertial range and therefor to dissipation rates of the energy and cross-helicity in the turbulence, when appropriately applied. We have used a decade of in-ecliptic ACE data as well as out-of-ecliptic Ulysses data in a study of these third-moment expressions, to measure dissipation rates and to characterize the inertial-range cascade in the solar wind under different conditions of wind speed, temperature, and cross-helicity. Third moments in the ecliptic depend strongly on cross-helicity, with some interesting scalings that we will report. We also emphasize that the third moments here are averages of signed fluctuations, making the signal to noise in real data very low, requiring that large amounts of data be used. We will discuss the theory and practice of the convergence of third moments for this kind of turbulence research, as well as the results we have obtained.