Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Detailed Fit of "Critical Balance" Theory to Solar Wind Turbulence MIRIAM A. FORMAN, Stony Brook University, ROBERT T. WICKS, TIMOTHY S. HORBURY, Imperial College, London — Having first shown in Horbury, et al. (2008) that "critical balance" as proposed by Goldreich and Sridar (1995) is consistent with the tendency of the spectral exponent of the power in solar wind fluctuations to approach -2 when the local mean magnetic field was in the radial direction, we now explore the comparison to "critical balance" in detail. We have derived the exact power spectrum reduced from the critical balance spectrum in k-space, for any frequency and magnetic angle in the solar wind in terms of certain dimensionless variables combining frequency and angle. Then we fit this to wavelet-derived spectra of magnetic field fluctuations from the Ulysses spacecraft at high latitudes in 1995 solar minimum. The fit is very good. However, in the critical balance theory (even as modified for imbalanced turbulence by Lithwick, et al. 2007) the fit requires a rather small outer scale which implies, according to the same theory, unreasonably large dissipation rates in the solar wind. Until this inconsistency with the theory is resolved, the possibility remains that the f^{-2} spectrum at small angles to the local mean magnetic field has some other origin in the solar wind.

Miriam A. Forman
Stony Brook University

Date submitted: 16 Jul 2010 Electronic form version 1.4