Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

Small-scale intermittency and shocks in high Reynolds number compressible turbulence[1] DIEGO DONZIS, Texas A&M University — In many flows of interest turbulence interacts with shock waves. A canonical configuration is isotropic turbulence convected through a normal shock. Even without this shock, compressible flows develop so-called shocklets, which may affect the overall dynamics. It is also well-known that due to intermittency scales smaller than the mean Kolmogorov scale (associated with very large gradients) develop at high Reynolds numbers. It is, therefore, of interest to assess whether and under what conditions intermittent gradients can be comparable to those of shocks. Information about the most intense turbulence gradients is obtained from scaling exponents of structure functions. It is shown that in turbulence obeying Kolmogorov scaling, turbulence gradients become weak compared to shock gradients as Reynolds number increases. However, for turbulence with anomalous scaling, gradients are comparable to that of shocks. This provides a plausible mechanism for so-called broken regimes in shock-turbulence interactions where flow properties undergo smooth changes instead of a quasi-discontinuous jump across the shock. Furthermore, our DNS database is used to show that large gradients and velocities are correlated, an effect that increases the effectiveness of turbulence to disrupt shocks.

[1]Support from NSF and AFOSR is greatly acknowledged.

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Date submitted: 07 Aug 2012 Electronic form version 1.4