Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

**Quantifying the locality of nonlinear interactions in turbulence** JULIAN DOMARADZKI, University of Southern California, DANIELE CARATI, BOGDAN TEACA, Universite Libre Bruxelles — The locality functions introduced by Kraichnan give the fraction of the energy flux across a given cutoff wavenumber $k_c$ that is due to nonlinear interactions with wavenumbers $k$ smaller than the cutoff (the infrared locality function) or greater than the cutoff (the ultraviolet locality function). The theory predicts that in the limit of the infinite inertial range the locality functions scale as $(k/k_c)^n$, where n=4/3 and -4/3 for the infrared and the ultraviolet limit, respectively. We have computed the locality functions using several DNS databases. At lower Reynolds numbers, despite of only short inertial range, the data points for computed infrared function are still aligned with the 4/3 slope. However, they always lie above the asymptotic theoretical line, i.e., the nonlinear interactions are more infrared nonlocal than the asymptotic result. The data points for the ultraviolet function show more significant departure from the theoretical scaling and are always below the asymptotic line, i.e., the nonlinear interactions are less ultraviolet nonlocal than the asymptotic result. The analysis was repeated for data obtained in DNS that enforce the inertial range spectrum over an extended range of wavenumbers. The qualitative features of the locality functions remain unchanged but differences between computed values and the theory are reduced.

Julian Domaradzki
University of Southern California

Date submitted: 02 Aug 2008 Electronic form version 1.4