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Analytical theory of the PDFs of momentum transport and the formation of shear flow in plasmas JOHAN ANDERSON, EUN-JIN KIM, Sheffield University — There has been overwhelming evidence that coherent structures play a critical role in determining the overall transport in a variety of systems. A crucial question in momentum transport theory is thus the prediction of the PDFs of the momentum transport due to these structures and of the formation of shear flow. Here, we report on a first analytical result on these two closely related problems by using a novel non-perturbative method. We first compute the PDF tails of global momentum flux in the ion-temperature-gradient turbulence, by assuming that a short-lived modon is a coherent structure responsible for bursty and intermittent events, contributing to the PDF tails. The tail of PDF of global momentum flux $R = \langle v_x v_y \rangle$ is shown to be exponential with the form $\exp\{-cR^{3/2}\}$, which is broader than a Gaussian, similarly to what was found in the previous local studies [1-2]. The non-Gaussian tail is a manifestation of intermittency due to rare events. The overall amplitude of the PDFs crucially depends on the temperature and density scale lengths through the constant c. We then present a consistent theory of the PDFs of the formation of a shear flow by incorporating its generation via the computed momentum flux. Implications for momentum transport in astrophysical plasmas will be addressed. 1 E. Kim and P. H. Diamond, Phys. Rev. Lett. 88 225002 (2002) 2 E. Kim et al, Nucl. Fusion 43 961 (2003)

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