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Restricted Euler moments in a pre-turbulent state ROBERT M. KERR, ANDREW N. FERGUSON, University of Warwick, MIGUEL D. BUSTAMANTE, University College Dublin — The evolution of the velocity stress moments of the 'restricted Euler' equations with an isotropic pressure Hessian are compared with their evolution under the three-dimensional Hessian of the full nonlinear terms for a flow with changing structures. Past analysis of numerical data in a fully developed flows has shown that the second and third invariants, Q and R are distributed in the manner predicted by this model. In this work, we ask how these distributions depend upon whether the underlying vortex structures are sheets or tubes. Distributions will also be used to compare the time-derivatives of the individual terms, as predicted by the restricted Euler model, with their values when the full Hessian is applied. Both types of distributions are time-dependent, that is dependent on the underlying vortical structures. When vortex tubes dominate and the turbulence is becoming fully-developed, the predictions of the restricted Euler model are approximately obtained. However, when vortex sheets are dominant, another paradigm is needed. At a minimum, these results suggest that while the restricted Euler model might be a good representation of turbulence once it is fully developed, during the period when the turbulence is still developing, modifications to the usual picture will be needed.

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