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Streamwise vortices in shear flows: harbingers of transition and the skeleton of coherent structures SPENCER SHERWIN, PHIL HALL, Imperial College London — The relationship between asymptotic descriptions of vortex-wave interactions and more recent work on "exact coherent structures" is investigated. We have recently shown that the so-called "lower branch" state, which has been identified as playing a crucial role in these self-sustained processes, is a finite Reynolds number analogue of a Rayleigh *vortex-wave interaction* with scales appropriately modified from those for external flows to Couette flow the flow of interest here. Remarkable agreement between the asymptotic theory and numerical solutions of the Navier Stokes equations is found even down to relatively small Reynolds numbers thereby suggesting the possible importance of vortex-wave interaction theory in turbulent shear flows. In this paper we will outline the motivation behind the asymptotic analysis and computational modelling which demonstrate the linkage between wave vortex interaction and self sustaining processes. The minimum drag configuration associated with a fixed spanwise wavenumber is also determined as a function of the downstream wavelength and this points to the crucial importance of long waves evolving on the spatial scale appropriate to the roll/streak flow.

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