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The High Reynolds Number Limit of Nonlinear Equilibrium States in Couette Flow KENGO DEGUCHI, PHILIP HALL, Imperial College London — In recent years there has been much interest in the nonlinear equilibrium states, which Couette flow can support. Computational interest in this problem began with Nagata in the early 1990's and since then there have been numerous investigations of shear flows. Beginning in the late 1980's Hall and Smith laid down an asymptotic framework, referred to as vortex-wave interaction theory, for nonlinear equilibrium states generated by the interaction of TS or inviscid wave systems in a variety of shear flows. In 2010 Hall and Sherwin showed conclusively that the asymptotic theory described what were referred to in the CFD community as self sustained processes. Subsequently Deguchi, Hall and Walton (2013) showed that the asymptotic states at small wavenumbers took on a new structure capable of describing spot formation. The asymptotic theory was however unable to predict the so-called upper branch self-sustained process found numerically and the theory predicted a critical wavenumber beyond which asymptotic states could not be found. Here the upper branch structure is given in the high Reynolds number limit and the development of asymptotic modes beyond the critical wavenumber is given thereby completing the description of equilibrium states at high Reynolds numbers.

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