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Streamwise vortices in shear flows: Stability of the lower branch states in Couette flow PHIL HALL, SPENCER SHERWIN, 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 talk we will discuss the stability of the lower branch states for Couette flow where we will show that there is a single unstable mode with growth rate proportional to the Reynolds number raised to the power $-1/2$. The instability is concentrated in a layer which surrounds the critical layer and destroys the wave leaving the roll/streak flow to decay on a $1/R$ timescale.

Hall, P. & Sherwin, S.J. 2010, Streamwise vortices in shear flows: harbingers of transition and the skeleton of coherent structures, *J. Fluid Mech.* **in press**.

Spencer Sherwin
imperial college london

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