

Abstract Submitted
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The Orr mechanism in transition of parallel shear flow YUXIN JIAO, YONGYUN HWANG, SERGEI CHERNYSHENKO, Imperial College London — The precise role of the Orr mechanism in transition of parallel shear flow is studied using the linear optimal perturbation for spanwise velocity. We find that the spanwise velocity of a small-amplitude perturbation can be mostly amplified via a lift-up effect induced by the Orr mechanism at the streamwise wavelength comparable to the given spanwise wavelength. The optimal perturbation for spanwise velocity is subsequently introduced into the plane Couette flow together with the optimal perturbation for all velocity components, and two transition scenarios are found via varying the amplitudes of the two optimal perturbations. The first scenario is the oblique transition, where the optimal spanwise velocity perturbation amplified in the very early stage of transition via the linear growth process mediates both streak amplification and breakdown. However, the role of the Orr mechanism is limited to the streak breakdown in the second transition scenario, streak transition. The oblique transition is more energetically efficient than the streak transition. Many similarities can be observed between the oblique transition and the transition triggered by the minimal seed ¹.

¹R. Kerswell, **Annual Review of Fluid Mechanics** **50**, 319, 2018

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