

Abstract Submitted  
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**On the destabilizing influence of surface tension in planar wakes**

EYAL HEIFETZ, Tel Aviv University, LUCA BIANCOFIORE, Imperial College London, FRANÇOIS GALLAIRE, EPFL — A counterintuitive destabilizing effect of the surface tension in planar immiscible wakes was observed by means of a linear global analysis (Tammisola et al., PoF, 2011) and Direct Numerical Simulations (Biancofiore et al., FDR, 2014), respectively. This destabilization can be interpreted by the presence of two different temporal unstable modes found when analyzing the local stability of an extracted velocity profile from the base flow. We approximate the wake velocity profile through a piecewise broken-line profile. We then explain the presence of these two temporal unstable modes using the Rossby wave (RW) perspective, which associates to each vorticity discontinuity an individual RW. The introduction of a finite amount of surface tension at the interface creates two capillary waves (CW) which travel with the same relative velocity but in opposite directions. The interaction of these four waves originates in two temporal unstable modes for both sinuous and varicose symmetries. Furthermore, we have captured the spatio temporal evolution of the interacting four-waves system by means of an impulse response analysis. The spreading of the wavepacket is significantly influenced by the coupling of the Rossby waves with the capillary waves, and is seen to favor absolute instability.

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