3D critical layers in fully-developed turbulent flows[1] THERESA SAXTON-FOX, BEVERLEY MCKEON, Caltech — Recent work has shown that 3D critical layers drive self-sustaining behavior of exact coherent solutions of the Navier-Stokes equations (Wang et al 2007; Hall and Sherwin 2010; Park and Graham 2015). This study investigates the role of 3D critical layers in fully-developed turbulent flows. 3D critical layer effects are identified in instantaneous snapshots of turbulent boundary layers in both experimental and DNS data (Wu et al 2014). Additionally, a 3D critical layer effect is demonstrated to appear using only a few resolvent response modes from the resolvent analysis of McKeon and Sharma 2010, with phase relationships appropriately chosen. Connections are sought to the thin shear layers observed in turbulent boundary layers (Klewicki and Hirschi 2004; Eisma et al 2015) and to amplitude modulation observations (Mathis et al 2009; Duvvuri and McKeon 2014).

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