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The Triple Layer Structure of a Transitional Wall-Jet SAM RABEN, WING NG, PAVLOS VLACHOS, Virginia Tech — Wall-jets are commonly found in heating and cooling applications such as gas turbine blade cooling as well as flow control [i]. The structure of wall-jets can be described by three distinct regimes: near wall boundary layer, mixing layer, and outer shear layer [ii]. Previously, wall-jet studies have focused on the self-similar fully developed length scale regime. This study examines the transitional regime using Time Resolved Digital Particle Image Velocimetry over a range of Reynolds numbers between 200-10,000. Analyses of the data, using previously developed scaling laws [ii], support the notion of incomplete similarity, and demonstrate that a transition point exists past which this similarity can be applied. However, although before this transition point the incomplete similarity can be used to describe the outer shear layer, yet it fails to scale the inner near wall layer and mixing layer. The present work provides the first investigation of the triple layer structure of a wall-jet within the regime of transitional lengths and across a wide range of Reynolds numbers with high spatio-temporal resolution. i. Launder BE, and Rodi W (1983) *The Turbulent Wall Jet – Measurements and Modeling*, Ann Rev Fluid Mech **15**:429-459 ii. Barenblatt GI, et al, (2005) *The Turbulent Wall Jet: A Triple-Layered Structure and Incomplete Similarity.* Proc. of the Nat. Academy of Sciences, **102** (25)

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