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Jet dynamics in a scaled up vocal fold model with incomplete glottal closure[1] ABIGAIL HAWORTH, UNL, NATHANIEL WEI, CalTech, HUNTER RINGENBERG, DYLAN ROGERS, UNL, MICHAEL KRANE, Penn State ARL, TIMOTHY WEI, Northwestern — PThe focus of this study is on phonation in the physiological condition where the two oscillating vocal folds do not fully close. This occurs in breathy voice or whispering and may be problematic to individuals who can only speak like this. Prior experiments with fully closing vocal folds revealed a variety of fascinating dynamics including cycle-to-cycle variations set up by weak recirculation cells in the supraglottal region when the folds were closed. When the folds do not fully close, there is a non-zero mean flow downstream of the glottis which significantly alters the dynamics. The objective of this study was to examine differences between the fully and partially closed cases as well as examine frequency and Reynolds number effects. Experiments were conducted using a 10x scaled-up model in a free surface water tunnel. 2-D vocal fold models with semi-circular ends were computer driven inside a square duct with constant opening and closing speeds. DPIV and time resolved pressure measurements along the duct centerline were made for Reynolds numbers from 3650 to 8100 and equivalent life frequencies from 52.5 Hz to 105 Hz. Phase-averaged and cycle-to-cycle analysis of key contributors to sound production were examined and compared to the fully closed case.

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