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Coupled Aero-Structural Dynamics in the Human Larynx During Phonation HAOXIANG LUO, Vanderbilt University, XUDONG ZHENG, RAJAT MITTAL, STEVEN BIELAMOWICZ, George Washington University — We simulate the nonlinear flow–structure interaction during the phonation process in the human larynx by coupling an incompressible flow solver and a linear viscoelasticity solver. In both solvers, computations are done efficiently on Cartesian grids, and boundary conditions for both flow and solid are treated using the immersed-boundary methods. The airflow is driven by the constant subglottal pressure, and the vocal folds are modeled by a simplified three-layer structure. A pair of false vocal folds are included to better approximate the geometry. In addition, we have incorporated a simple contact model to deal with the vocal fold collision. Several salient features of phonation are captured, and the statistical quantities of the glottal waveform are consistent with the clinical data. Supported by NIDCD Grant R01 DC007125-01A1.

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