Abstract Submitted
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Irregular vocal fold dynamics incited by asymmetric fluid loading in a model of recurrent laryngeal nerve paralysis DAVID SOMMER, University of Waterloo, BYRON D. ERATH, The George Washington University, MATIAS ZANARTU, Universidad Tecnica Federico Santa Maria, SEAN D. PETERSON, University of Waterloo — Voiced speech is produced by dynamic fluid-structure interactions in the larynx. Traditionally, reduced order models of speech have relied upon simplified inviscid flow solvers to prescribe the fluid loadings that drive vocal fold motion, neglecting viscous flow effects that occur naturally in voiced speech. Viscous phenomena, such as skewing of the intraglottal jet, have the most pronounced effect on voiced speech in cases of vocal fold paralysis where one vocal fold loses some, or all, muscular control. The impact of asymmetric intraglottal flow in pathological speech is captured in a reduced order two-mass model of speech by coupling a boundary-layer estimation of the asymmetric pressures with asymmetric tissue parameters that are representative of recurrent laryngeal nerve paralysis. Nonlinear analysis identifies the emergence of irregular and chaotic vocal fold dynamics at values representative of pathological speech conditions.

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