Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Fluid Dynamics of Speech and Cough Aerosols in the Context of COVID-19 Transmission ZU PUAYEN TAN, Auburn University / National Chiao Tung University, LOKESH SILWAL, Auburn University, SURYA P. BHATT, University of Alabama at Birmingham, VRISHANK RAGHAV, Auburn University — Production and dispersion of disease-carrying human aerosols from coughing and sneezing have been widely studied. However, an alternative origin of transmission (aerosol from speaking) have largely remained unexplored. The latter is especially important for COVID-19 where peak virus shedding is reached in the pre-symptomatic phase. Recent studies by Asadi et al. showed that speaking generates as much aerosol over time as coughing/sneezing, while vowels such as /i/ and consonants such as plosives and nasals have the highest production rates. Subsequent dispersion of these aerosols remained unstudied. Our investigation completes the knowledge gap by employing high-speed particle image velocimetry to quantify the dispersion of speech aerosols produced by a human subject at different intensities of vocalization. Our results indicate that phonetics with the most aerosol production did not always correlate with the furthest aerosol penetration. Certain vowel-consonant combinations such as "ti" ("tee") can produce penetration comparable to coughing. Furthermore, the ejected aerosol clouds were observed to fluid dynamically resemble a puff jet, where vortex roll-up along the plume-front concentrated the ejected aerosols and prevented immediate dilution. We propose that assessment of risk burden from COVID-19 exposure during speech must take production, penetration, and vortex structure all into account.

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Date submitted: 10 Aug 2020 Electronic form version 1.4