Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Experimental Investigation of Expiratory Flows During Consonant Production: Application to the Transport of Virus-Laden Droplets.[1]
BYRON ERATH, TANVIR AHMED, AMIR MOFAKHAM, BRIAN HELENBROOK, ANDREA FERRO, Clarkson University, DEBORAH BROWN, Trudeau Institute, GOODARZ AHMADI, Clarkson University — Airborne transport of the SARS-CoV-2 virus has been recognized as an efficient transmission vector. This is of particular interest when considering airborne spread by asymptomatic individuals who do not produce violent expiratory events (e.g., coughing and sneezing). We show that speech is also an effective modality for transporting virus-laden droplets over relatively large distances. Speech is a highly transient process comprised of unique phones that form the building blocks of communication. Different posturing of the oral cavity, combined with the unique mechanics required to form each sound, produces drastically varying flow conditions at the exit of the mouth. Of greatest interest is the production of fricative consonants that are formed by a narrow occlusion at the mouth that results in a high-velocity blast of air. The fluid mechanics of human speech is investigated using particle image velocimetry (PIV) to acquire the velocity field, and associated flow statistics, at the exit of the mouth during the production of [θ] (an aspirated "th" sound, as produced when saying the word "thaw"), and [f] (an aspirated "f" sound, as produced when saying the word "far"). Results elucidate the fluid mechanics of these utterances, including the magnitude and trajectories at the mouth exit, spatial variations in the jet momentum, and penetration distance into the ambient surroundings.

[1]This research was funded by the NSF, Grant No. CBET-2029548

Byron Erath
Clarkson University

Date submitted: 03 Aug 2020 Electronic form version 1.4