Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Is 3D Measurement Necessary for Quantifying Fluid Mechanics in a Left Ventricle? ZHENGLUN WEI, KESHAV KOHLI, YINGNAN ZHANG, VAHID SADRI, IKECHUKWU OKAFOR, AJIT YOGANATHAN, Georgia Institute of Technology — Left ventricle (LV) fluid mechanics has been broadly investigated *in vivo*, *in vitro*, and *in silico* over the past few decades. Previous studies have successfully demonstrated clinical relevance for hemodynamic metrics of the LV, e.g., energy dissipation, washout time, and vortex formation time, etc. A majority of these studies extracted conclusions based on 2D measurements. Additionally, 2D phase-contrast magnetic resonance imaging (PC-MRI) and echocardiography are the most common measurement tools in clinical practice since current 3D tools have technical challenges or have significantly higher demand. Unfortunately, previous literature marginally discussed the validity of reducing the order of LV hemodynamic metrics (from 3D to 2D). In this study, an *in silico* LV model is developed and firstly validated against 4D PC-MRI in an *in vitro*, patient-specific, 3D LV phantom. Then, the settings of the *in silico* model are adjusted to mimic diseased states. The centerplane of the 3D phantom is extracted to represent a 2D measurement plane. The necessity of 3D measurement is elucidated based on the comparison between the LV hemodynamic metrics obtained from 3D and 2D measurements.

Zhenglun Wei
Georgia Institute of Technology

Date submitted: 31 Jul 2019 Electronic form version 1.4