

Abstract Submitted  
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**Effects of non-premixed injection schemes on the detonation structure in rotating detonation engines**<sup>1</sup> TAKUMA SATO, VENKAT RAMAN, University of Michigan — Recently, RDEs has been getting more attention as the pressure gain combustor. Because it uses the detonation in the combustion process, the reactant mixture can get additional compression due to the shock wave. Although a series of simulations have been conducted in the community, most of them are limited in the canonical problems and the premixed assumption in a 2D geometry. In the real RDEs system, the non-premixed injection system creates a complex detonation structure due to the incomplete mixing and the stratification of the fuel and oxidizer. However, the measurement of the detailed flame structure is hard to obtain in the experiment due to the harsh environment of the system. With this mind, the goal of this study is to understand the detailed 3D detonation structure by simulating the full system RDEs system. Because the flow-field is highly unsteady in time and space, the 3D averaged flow-field will be extracted from the simulation. The heat release distribution in the space will be extracted to understand the combustion process in the detonation chamber. The mixing process of the non-premixed injection system will be discussed by varying the mass flow rate. Finally, the comparison between the Euler and Navier-Stokes equations will be discussed.

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