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Effect of fuel stratification on detonation wave propagation DAMIEN MASSELOT[1], ROMAIN FIEVET[2], VENKAT RAMAN[3], University of Michigan - Ann Arbor — Rotating detonation engines (RDEs) form a class of pressure-gain combustion systems of higher efficiency compared to conventional gas turbine engines. One of the key features of the design is the injection system, as reactants need to be continuously provided to the detonation wave to sustain its propagation speed. As inhomogeneities in the reactant mixture can perturb the detonation wave front, premixed fuel jet injectors might seem like the most stable solution. However, this introduces the risk of the detonation wave propagating through the injector, causing catastrophic failure. On the other hand, non-premixed fuel injection will tend to quench the detonation wave near the injectors, reducing the likelihood of such failure. Still, the effects of such non-premixing and flow inhomogeneities ahead of a detonation wave have yet to be fully understood and are the object of this study. A 3D channel filled with O_2 diluted in an inert gas with circular H_2 injectors is simulated as a detonation wave propagates through the system. The impact of key parameters such as injector spacing, injector size, mixture composition and time variations will be discussed.

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