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Dynamic mode decomposition (DMD) applications in spinning and standing waves in rotating detonation combustors MYLES BOHON, ALESSANDRO ORCHINI, Technische Universitat Berlin — Rotating detonation combustors (RDC) are characterized by a supersonic combustion wave spinning around an annular combustion chamber at a characteristic frequency. Dynamic mode decomposition (DMD) should thus be a well-suited low-order tool to investigate the RDC's dynamics. However, other wave patterns are commonly observed, including counter-rotating, standing and clapping waves, which complicate the analysis. In this work, we investigate the applicability of DMD to RDC operating conditions in which multiple waveforms are simultaneously found. By processing high speed video imaging of the natural flame luminosity from the aft-end of the combustor, we (i) identify and separate the wave modes associated with longitudinal, spinning, standing and clapping phenomena and (ii) demonstrate successful reconstruction of the RDC dynamics using a small set of wave modes. We also demonstrate the applicability of DMD and preservation of the identified dynamics when reducing the processed dataset from the original two-dimensional Cartesian image of the annular combustor into 1D luminosity maps, averaged across the radial extension of the annulus. This significantly reduces the computational cost without affecting the DMD ability of isolating the most significant wave modes in an RDC.

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