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Dynamic Mode Decomposition of a Numeric Simulation of a Jet in Crossflow WILLIAM KROLICK, MARK OWKES, Montana State University Bozeman - Fluids and Computations Laboratory — Numerical methods have advanced to the point that many groups can perform detailed numerical simulations of atomizing liquid jets and replicate experimental measurements. However, the simulation results have not lead to a substantial advancement to our understanding of these flows due to the massive amount of data produced. In this work, we develop a tool to extract the physics that destabilize the jets liquid core by leveraging dynamic mode decomposition (DMD). DMD takes ideas from the Arnoldi method as well as the Koopman method to evaluate a non-linear system with a low rank linear operator. The method is beneficial to us in that it reduces the order of the simulation results from all the original data through time to a few key pieces of information. Most important of these are the dynamic modes, their time dynamics, and the DMD spectra. In this case, DMD is applied to the jets liquid core outer radius, which is computed at streamwise and azimuthal locations, i.e., $R(x, \theta)$. With the DMD data, we obtain the dominant spatial and temporal modes of the system and their stabilities. The dominant modes provide a useful way to collapse the large dataset produced by the simulation into a length and timescale that can be used to initiate reduced-order models.

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