Investigation of coherent structures in a superheated jet using decomposition methods[1] AVICK SINHA, SHIVASUBRAMANIAN GOPALAKRISHNAN, SRIDHAR BALASUBRAMANIAN, Indian Institute of Technology Bombay — A superheated turbulent jet, commonly encountered in many engineering flows, is complex two phase mixture of liquid and vapor. The superposition of temporally and spatially evolving coherent vortical motions, known as coherent structures(CS), govern the dynamics of such a jet. Both POD and DMD are employed to analyze such vortical motions. PIV data is used in conjunction with the decomposition methods to analyze the CS in the flow. The experiments were conducted using water emanating into a tank containing homogeneous fluid at ambient condition. Three inlet pressure were employed in the study, all at a fixed inlet temperature. 90% of the total kinetic energy in the mean flow is contained within the first five modes. The scatterplot for any two POD coefficients predominantly showed a circular distribution, representing a strong connection between the two modes. We speculate that the velocity and vorticity contours of spatial POD basis functions show presence of K-H instability in the flow. From DMD, eigenvalues away from the origin is observed for all the cases indicating the presence of a non-oscillatory structure. Spatial structures are also obtained from DMD.

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