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Automated stratified wake classification using Dynamic Mode Decomposition[1] CHAN-YE OHH, GEOFFREY SPEDDING, Univ of Southern California — There has been increasing interest in how and whether early wake information coming from body geometry and thrust ratios or acceleration parameters can persist into the late wake in a stratified fluid, because once formed, these late wakes have long persistence. At moderate values of the controlling parameters Re and Fr, stratified wakes are known to fall into a number of topologically distinct regimes, and these separable categories have been used to develop and test automated pattern detection algorithms, as reported in DFD19. Here, we report on continued work to improve the robustness of the automated wake classification. DMD modes of the flow are classified based on criteria set by the characteristics of each regime. The pattern classifier uses symmetry information about the wake centerline to determine the shape of the dominant mode, which is itself automatically selected according to a ranking by mode energy norm. The 3D wake data can be obtained both from tomographic PIV experiments, and from DNS for Re $\in$ [200, 1000] and Fr $\in$ [0.5, 8]. The identification process is further refined for spatially and temporally limited wake measurements. A collaboration with J. Tu (Carderock, DFD20) investigates an alternative data-driven approach using tools from machine-learning.

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Chan-ye Ohh
Univ of Southern California

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