

Abstract Submitted
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A New Mechanism for Mixing Enhancement in Turbulent Mixing Layer¹ WEI ZHAO, GUIREN WANG, University of South Carolina — It is well known that in shear layer, even under the most effective modes—sub-harmonic modes, the mixing under active forcing is only nearly two times enhanced compared to that without forcing, and saturation will be reached for the further increased forcing amplitude. Hence, the potential of the mixing enhancement is limited for active forcing based on receptivity and instability in mixing layer. Recently we observed that, in a confined mixing layer in a pipe, such saturation could be overcome, so that extremely fast mixing enhancement could be achieved by further increase of the forcing amplitude. However the mechanism behind the high receptivity and fast mixing is still not clear. Preliminary data shows that the optimized forcing frequency does not change with Reynolds number based on bulk flow velocity and pipe diameter in the range of moderate Reynolds number. Therefore we postulate that the phenomenon might be related to the resonance frequency of the pipe flow and the frequency corresponding to the fast mixing augmentation should be scaled with some Strouhal number. The dependence of the optimized frequency on various parameters is investigated.

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