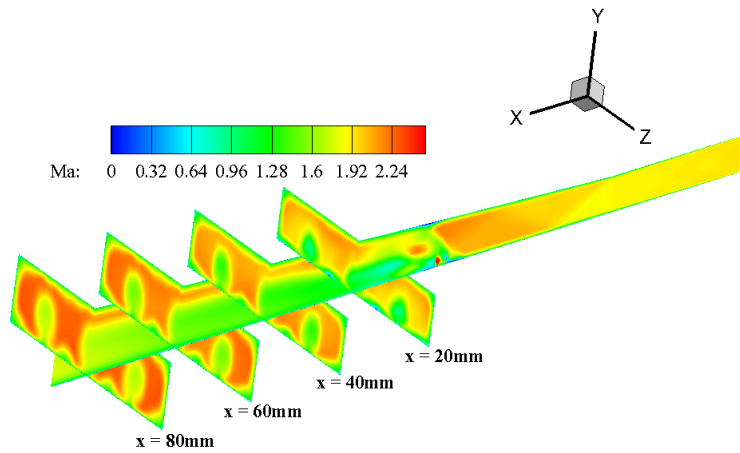


**Journal of Zhejiang University – Science A  
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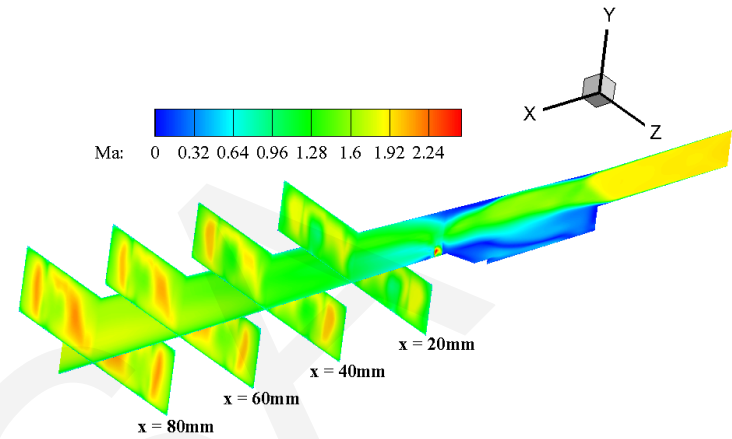
# **Supersonic mixing augmentation mechanism induced by a wall-mounted cavity configuration**

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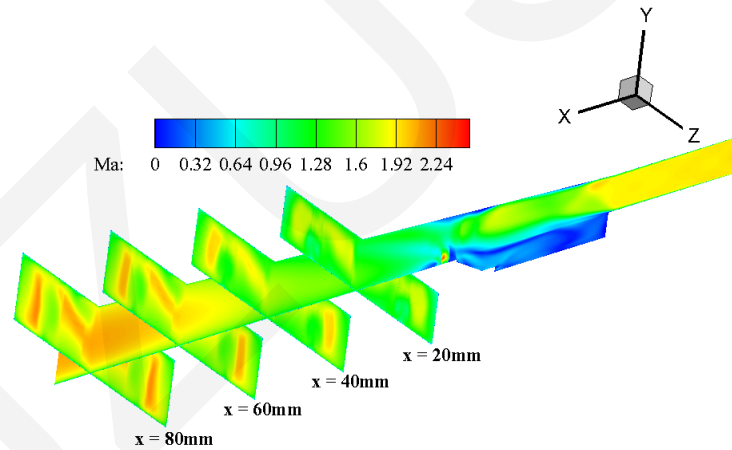
Cite this as: Wei Huang, Ming-hui Li, Feng Ding, Jun Liu, 2016. Supersonic mixing augmentation mechanism induced by a wall-mounted cavity configuration. *Journal of Zhejiang University-SCIENCE A (Applied Physics & Engineering)*, 17(1):45-53. [doi:10.1631/jzus.A1500244]



(a) Conventional physical model

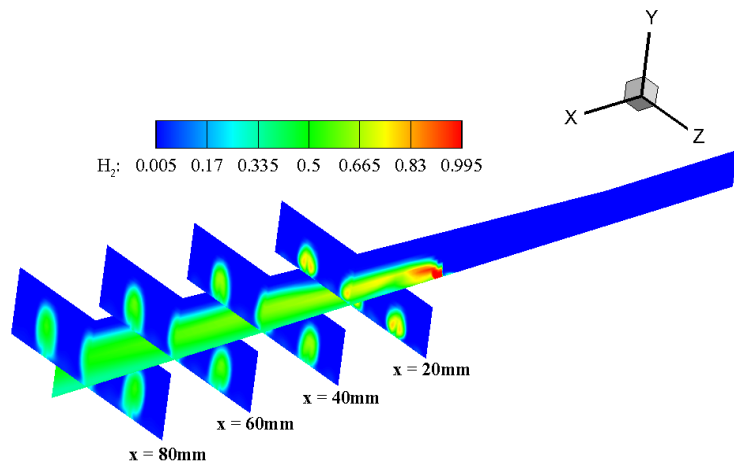


(b) Novel Physical model I

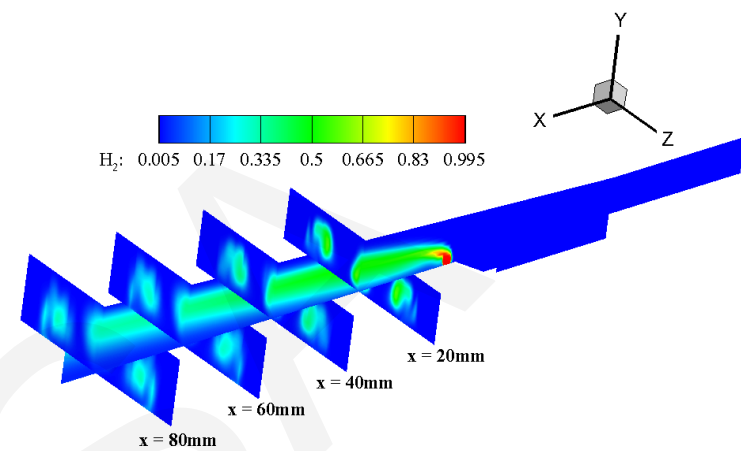


(c) Novel Physical model II

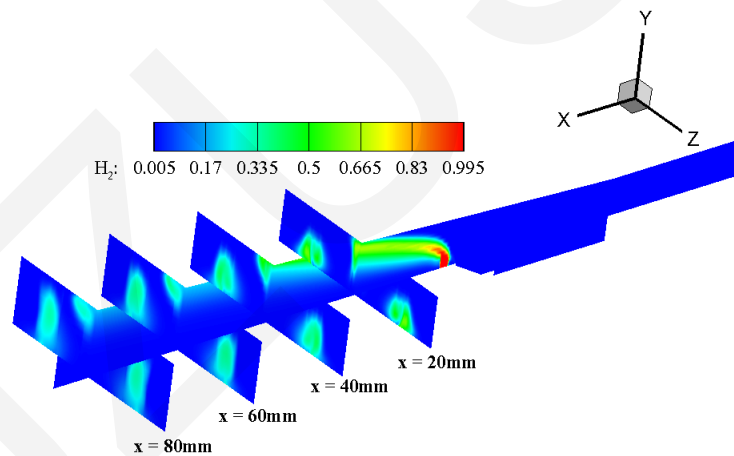
**Comparison of Mach number contours on the symmetric and four cross-sectional planes for three physical models with a moderate grid scale**



(a) Conventional physical model

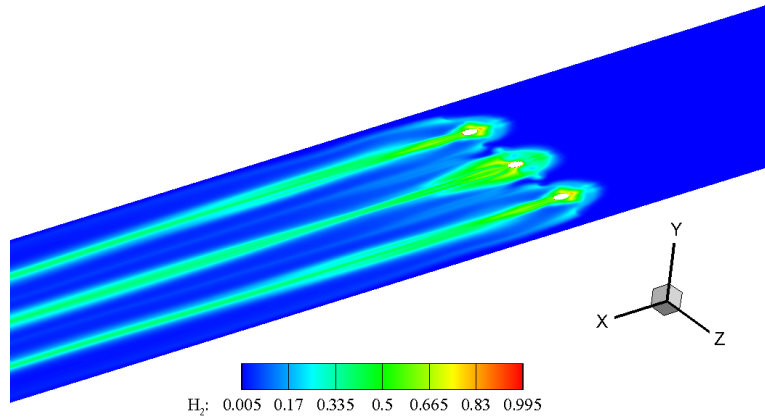


(b) Novel Physical model I

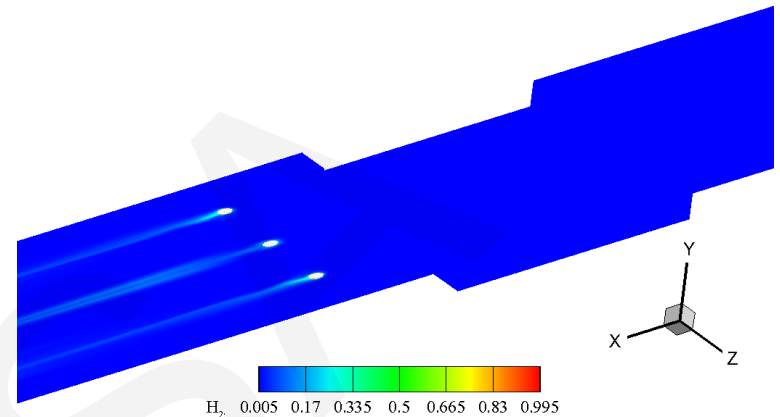


(c) Novel Physical model II

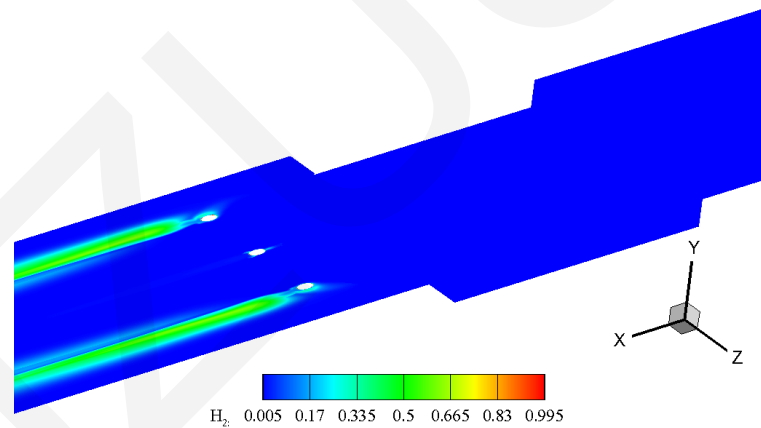
**Comparison of hydrogen mole fraction contours on the symmetric and four cross-sectional planes for three physical models with a moderate grid scale**



(a) Conventional physical model

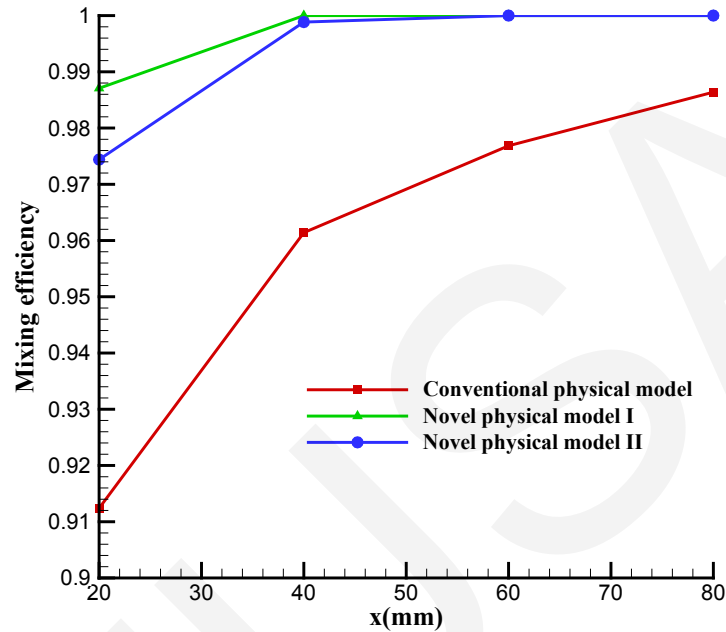


(b) Novel Physical model I



(c) Novel Physical model II

**Comparison of hydrogen mole fraction contours on the lower wall for three physical models with a moderate grid scale**



**A comparison of the mixing efficiency of the physical models employed in the current study**

- 1. In the case with only the transverse injection ports, the vortex was broken up by the strong interaction between the shear layer over the cavity and the jet.**
- 2. Hydrogen penetrated deeper in the case with the cavity mounted upstream of the transverse injection ports, especially for novel physical model II.**
- 3. Novel physical model I had the highest mixing efficiency. The strong interaction between the shear layer over the cavity and the jet has a large impact on the mixing enhancement in supersonic flows.**

## Related research papers

1. Huang W., 2014. Design exploration of three-dimensional transverse jet in a supersonic crossflow based on data mining and multi-objective design optimization approaches. *International Journal of Hydrogen Energy*, 39: 3914-3925
2. Huang W., 2015. Effect of jet-to-crossflow pressure ratio arrangement on turbulent mixing in a flowpath with square staged injectors. *Fuel*, 144: 164-170
3. Huang W., Jin L., Yan L., Tan J. G., 2014. Influence of jet-to-crossflow pressure ratio on nonreacting and reacting processes in a scramjet combustor with backward-facing steps. *International Journal of Hydrogen Energy*, 39: 21242-21250
4. Huang W., Li S. B., Yan L., Wang Z. G., 2013. Performance evaluation and parametric analysis on cantilevered ramp injector in supersonic flows. *Acta Astronautica*, 84: 141-152
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7. Huang W., Yan L., 2013. Progress in research on mixing techniques for transverse injection flow fields in supersonic crossflows. *Journal of Zhejiang University – Science A (Applied Physics & Engineering)*, 14(8): 554-564
8. Huang W., Tan J. G., Liu J., Yan L., 2015. Mixing augmentation induced by the interaction between the oblique shock wave and a sonic hydrogen jet in supersonic flows. *Acta Astronautica*, 117: 142-152