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Flow and Mixing Characteristics of Double-concentric Jets Pulsed at Annular Flow 脈衝雙環噴流的流場與混合特性

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研究概述 Research Abstract

Objective: This study investigated the effects of annulus pulsation on the flow characteristics and mixing properties of double-concentric jets experimentally. The annular flow pulsation was generated by employing a solenoid valve.

Experimental methods: Laser-light sheet assisted flow visualization, Binary edge-detection technique, Hot-wire anemometer, Topological flow patterns, Particle Image Velocimetry and Tracer gas concentration detection technique.

Results: When the annular flow was pulsed with high amplitudes, the mixing capability between the jets enhanced up to 80% in the flow fields.

研究成果 Research Results

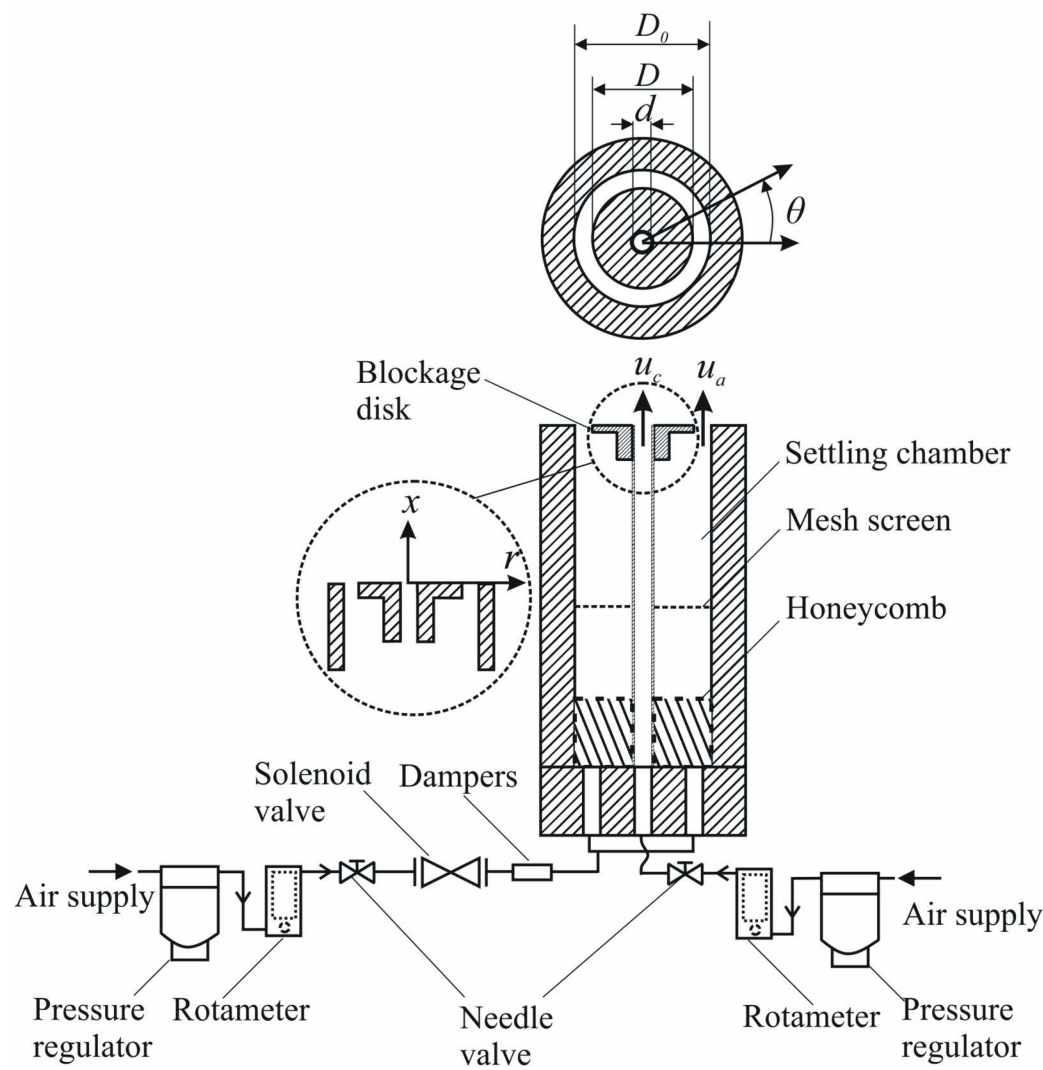


Fig. 1 Experimental setup

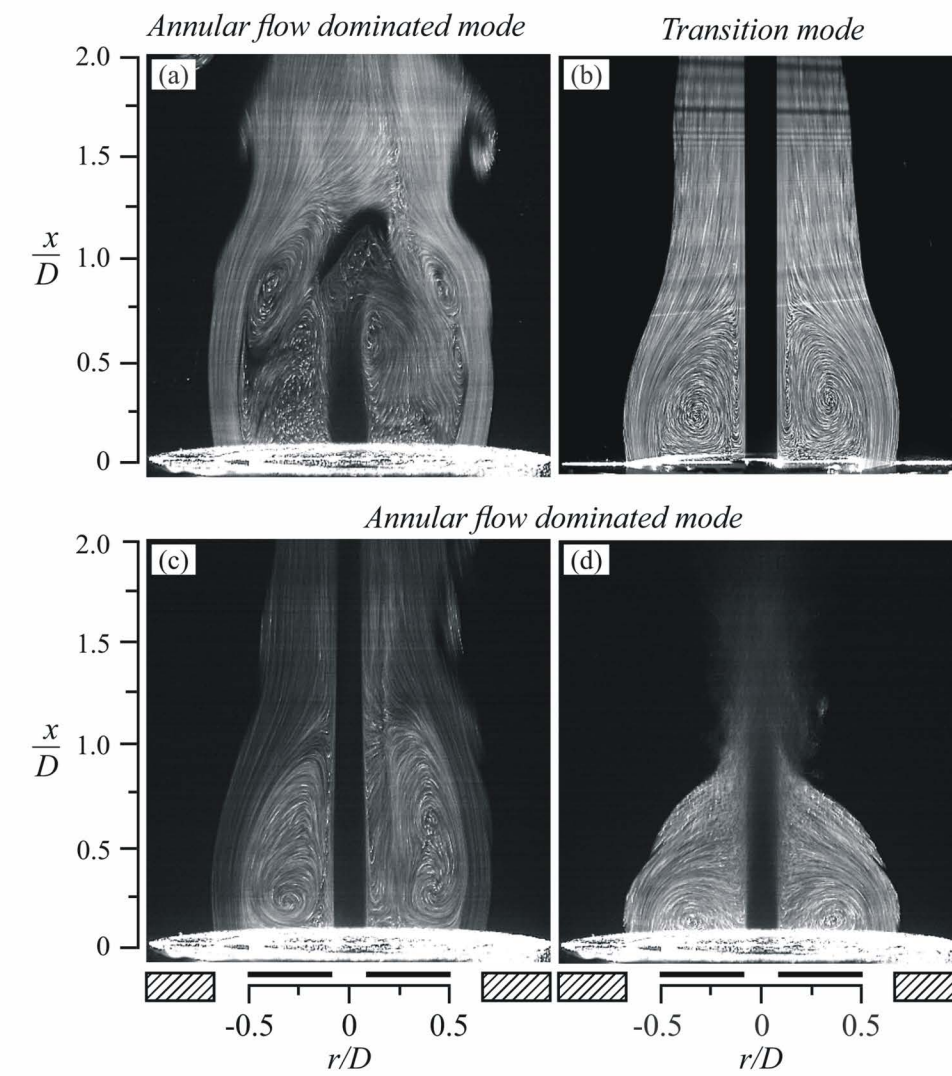


Fig. 2 Flow patterns of different modes of double-concentric jets.

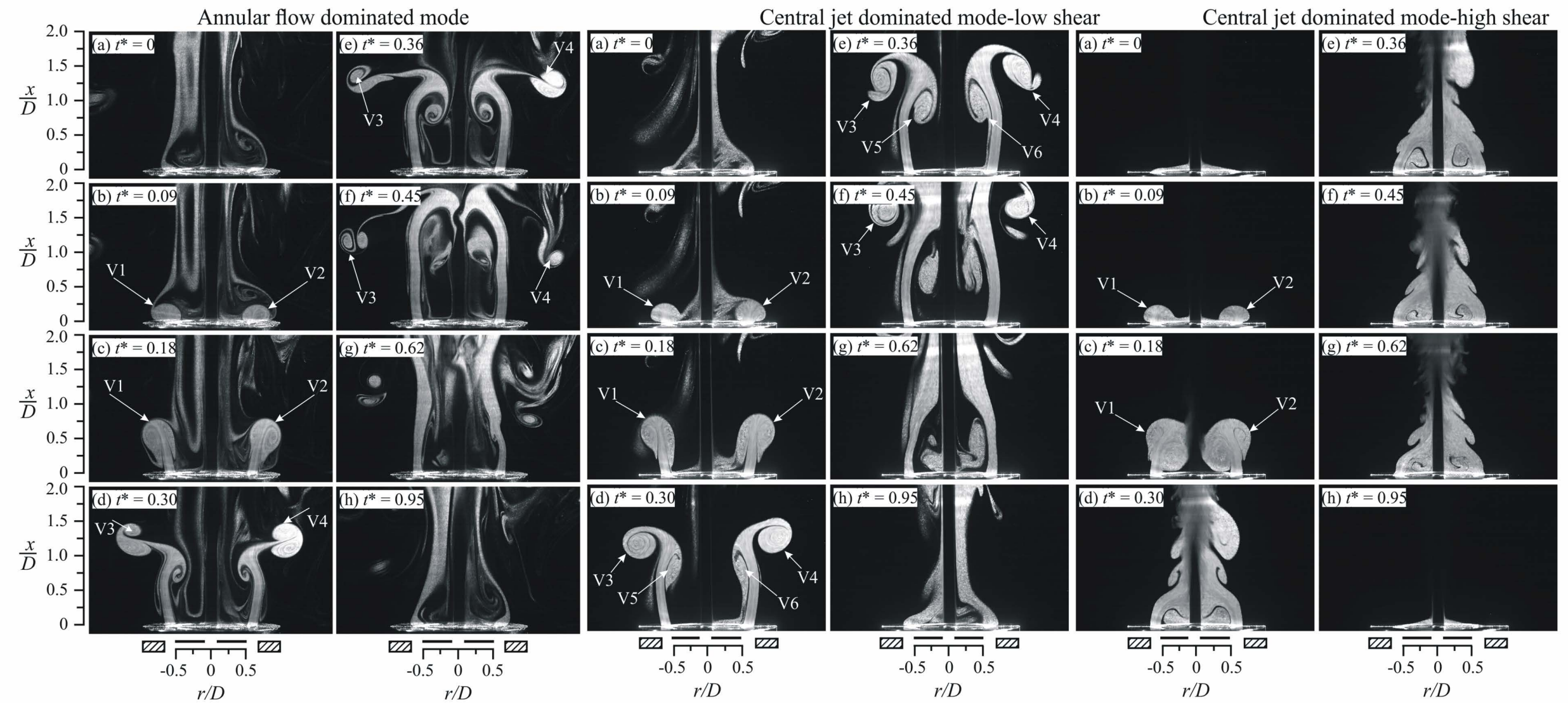


Fig. 3 Flow patterns of different modes of pulsed double-concentric jets.

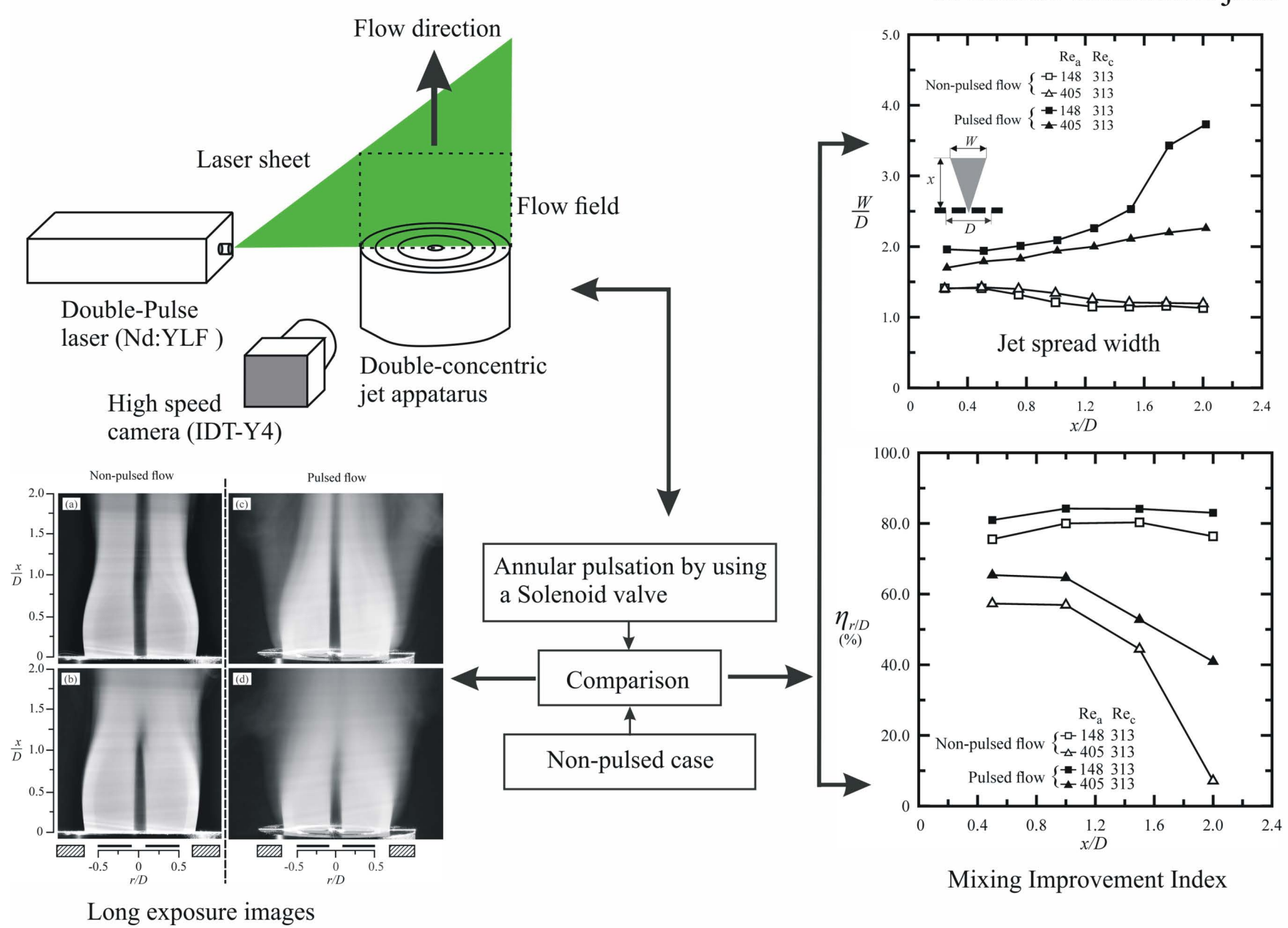


Fig. 4 Effect of annular pulsation on flow and mixing characteristics of double-concentric jets.

Summary:

◆ The mixing between the jets was enhanced by the two major factors:

a) The deflection of the central jet to the recirculation region by the stagnation points that were formed on the central line.

b) The annular pulsation transformed the axial momentum into radial momentum, which increases the turbulence fluctuations on the flow field drastically. Therefore, the larger turbulence fluctuations were created in the Annular flow dominated mode of the pulsed double-concentric jets.

◆ When the annular flow was pulsed, the dispersion of the central jet improved significantly along the central axis. The radial dispersion improvement index showed that mass exchange between the annular flow and the central jet improved drastically by up to 80% when the annulus flow was pulsed.

研究經歷 Research Experience

My research experience began as a graduate student at Anna university to investigate a constant volume combustion chamber in 2011. I worked in various research topics as an assistant professor at Srec, Anna university. I continued my research on the thermal and fluids in Taiwan from 2016. My main research work comprised of investigating the properties of the co-axial jets on various applications. I have published 7 international journals and have delivered invited speech at international conferences.

Recent Publications:

- ▲ Murugan, S., Huang, R.F. and Hsu, C.M., 2020. Exp. Therm. Fluid Sci., 114, p.110039. JIF:3.44
- ▲ Murugan, S., Huang, R.F. and Hsu, C.M., 2020. Int. J. Mech. Sci., 186, p.105907. JIF:4.63
- ▲ Murugan, S., Huang, R.F. and Hsu, C.M., 2020. Int. J. Heat Fluid Fl., 86, p.108707. JIF:2.07



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