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TRANSPORT PHENOMENA & FLUID MECHANICS

加角被动控制自由扇射流多尺度涡结构的实验研究

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摘要 Turbulent flow field of the free jet with circular nozzle and wedged nozzles is measured using hot wire anemometry with resolution higher than the smallest turbulence time scale. Wavelet analysis is employed to perform multi-scale decomposition of instantaneous turbulence fluctuating velocity signals, and the energy distribution of the turbulent multi-scale eddy structures over scales is studied using wavelet coefficients. Investigation of the multi-scale eddy structures of circular jet and various wedged jets reveals the transport of the energy of these wedged jets in the space from the axis to the side of the jet, as compared with the circular jet. Furthermore, not only the eddy structures at the wedge times in the near field are crashed, but also the interactions such as eddy structure union and entrainment take place at different longitudinal and normal locations along with the development of the jets because of the existence of wedges.

关键词 多尺度结构 自由射流 扇流 过渡速度 加角被动控制

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Passive Control of Turbulent Jet Flow with Wedged Nozzle

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Abstract Turbulent flow field of the free jet with circular nozzle and wedged nozzles is measured using hot wire anemometry with resolution higher than the smallest turbulence time scale. Wavelet analysis is employed to perform multi-scale decomposition of instantaneous turbulence fluctuating velocity signals, and the energy distribution of the turbulent multi-scale eddy structures over scales is studied using wavelet coefficients. Investigation of the multi-scale eddy structures of circular jet and various wedged jets reveals the transport of the energy of these wedged jets in the space from the axis to the side of the jet, as compared with the circular jet. Furthermore, not only the eddy structures at the wedge times in the near field are crashed, but also the interactions such as eddy structure union and entrainment take place at different longitudinal and normal locations along with the development of the jets because of the existence of wedges.

Key words jet with wedged nozzle; passive control; multi-scale; wavelet analysis;

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