

Effect of Train Underbody Meandering Flow on Fluctuating Aerodynamic Force of a Tail Car

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This study employs large-eddy simulation (LES) to examine the relationship between meandering flow beneath the underbody of a six-car train model and the fluctuating lateral aerodynamic forces acting on the tail car. While previous studies have identified large-scale meandering flow structures and clarified their role in flow-induced vibrations of car body within tunnel, their influence on the aerodynamic forces of a tail car in open-air conditions remains unclear. The present results demonstrate that fluctuating aerodynamic forces on the tail car intensify in synchronization with the meandering flow. Mode decomposition further reveals that the dominant fluctuating flow structure is an antisymmetric mode, with a frequency close to that of the meandering flow. This mode generates significant fluctuating aerodynamic force near the tail region.