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The dynamics of three-dimensional slung prisms under very low and high turbulence SHENG JI, YAQING JIN, HONGYI ZHOU, LEONARDO P. CHAMORRO, University of Illinois at Urbana Champaign — The distinctive oscillation and pitching patterns of cubic and rectangular slung prisms were characterized at various Reynolds numbers under two free-stream turbulence levels. Laboratory experiments were performed using high-resolution telemetry and hotwire anemometry to quantify the dynamics of the prisms and wake fluctuation. Results show that the dynamics of the prisms depends on the prism shape, and can be categorized by two distinctive regions. Specifically, in the case of cubic prism, the regions are characterized by the growth rate of the pitching amplitude; whereas the dynamics of the rectangular prisms is more sensitive to the angle of attack. When the large side initially faces the flow, the regions are defined by the synchronization between the vortex shedding and pure oscillations under very low turbulence. However, this synchronization can be disturbed under high background turbulence. When the smaller side initially faces the flow, the regions are defined by the equilibrium pitching position. Regardless of the geometry of the prism and flow condition the dominant oscillation frequency resulted as being close to the natural frequency of the small-amplitude pendulum-like oscillation.

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