LadHyX Seminar – April 16th, 2pm

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Lateral vibrations of low-side-ratio rectangular cylinders in an airflow

Slender bluff bodies immersed in a high Reynolds-number airflow are often prone to vortex-induced vibrations. Nevertheless, several noncircular geometries, such as low-side-ratio rectangular cylinders, can also get dynamically unstable, giving rise to large-amplitude lateral vibrations diverging with the flow speed known as "galloping". For light and low-damping cylinders, the two excitation mechanisms inevitably interact leading to a peculiar type of dynamic instability, which has been extensively studied in the wind tunnel. The phenomenon can be successfully modeled coupling a nonlinear body oscillator with a nonlinear wake oscillator, which also helps understand the physical mechanism of interaction between vortex-induced vibration and galloping. However, experiments clearly reveal that the picture remarkably changes if the oncoming flow is significantly turbulent. The adaptation of the mathematical model to these flow conditions allows understanding and explaining the vibrations observed in the wind tunnel.