Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Sound radiated by a compliant wall in turbulent channel flow[1]
SOHAM PRAJAPATI, SREEVATSA ANANTHARAMU, KRISHNAN MAHESH, University of Minnesota — Structural excitation due to turbulent flow generates sound. We simulate the far-field sound radiated by a compliant wall in a turbulent channel flow using Direct Numerical Simulation (DNS) at $Re_\tau = 180$ and 400. The fluid-structure-acoustic interaction is assumed to be one-way coupled. In the fluid domain, we solve the incompressible Navier-Stokes equations, and in the solid domain, we solve the linear elasticity equations using the time-domain finite element method. To compute the acoustic pressure radiated due to the structural excitation, we use half-space Green's function formulation. We validate the acoustics solver by comparing the sound computed from synthetic structural excitation to analytical results. We will discuss the effect of boundary conditions on the radiated sound and the structural excitation for the two Reynolds numbers. Further, we will study the fluid-structure-acoustic coupling by combining the fluid DNS data with the solid modal decomposition and the acoustic Green's function to identify the dominant wall-normal regions that contribute to the far-field sound as a function of frequency.

[1]Supported by Office of Naval Research

Soham Prajapati
University of Minnesota

Date submitted: 31 Jul 2020 Electronic form version 1.4