

# Pressure signal processing

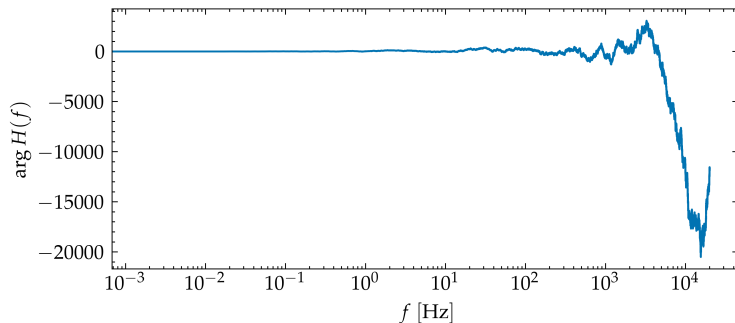
JMO Massey<sup>†</sup>, F Cabrera-Booman, J Klewicki, BJ McKeon

Center for Turbulence Research  
Stanford University

April 4, 2025

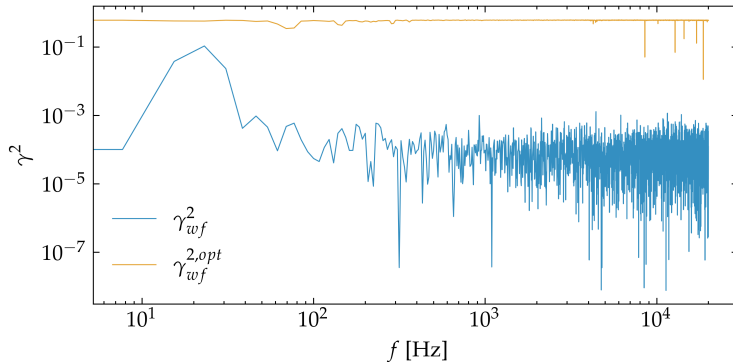
Thanks to DARPA for funding this work.

# Match mics by finding the complex transfer function



- ▶ The microphones aren't phase matched
- ▶ We need to match the phase response of the microphones by finding the complex transfer function

# Phase matching dramatically increases the coherence

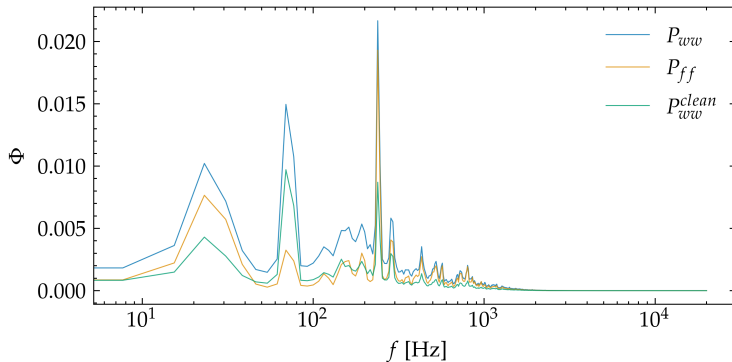


- ▶ Without the complex transfer function, the coherence is very low
  - ▶ There's still a missing piece regarding the magnitude response
- ▶ Fitting in the same way would cause the wiener filter to force the cleaned signal to be zero

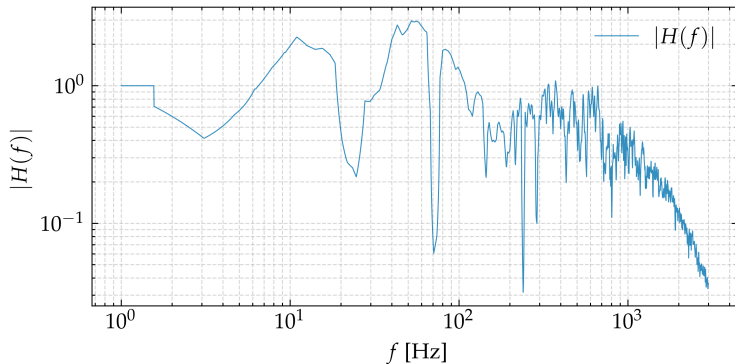
# Phase matched CSD

The Wiener filter has equation

$$H(f) = \frac{P_{fw}(f)}{S_{ww}(f)} \quad (1)$$

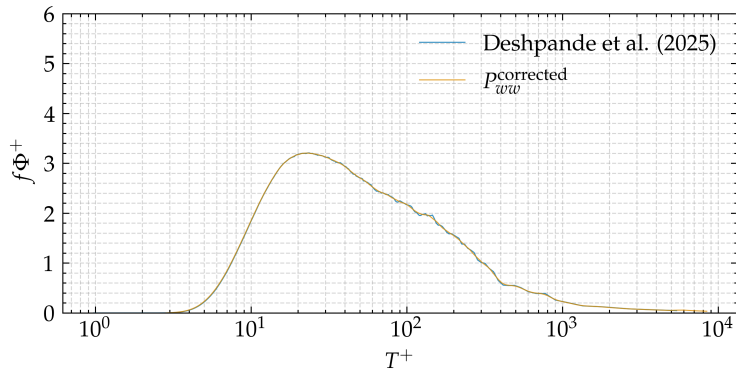


## Transfer function between reference spectra and measurements



- ▶ Transfer function between reference spectrum (Deshpande *et al.*, 2025) and current measurements

# Corrected signals



► Corrected wall pressure signal spectrum

DESHPANDE, RAHUL, VINUESA, RICARDO, KLEWICKI, JOSEPH & MARUSIC, IVAN 2025  
Active and inactive contributions to the wall pressure and wall-shear stress in turbulent  
boundary layers. *J. Fluid Mech.* **1003**, A24.