Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Outer streaming within a two-dimensional channel[1] KYLE PIETRZYK, ILENIA BATTIATO, Stanford University — Acoustic streaming is the net time-averaged flow that results from nonlinearities in an oscillating flow. Extensive research has sought to identify different physical mechanisms and regimes of acoustic streaming in systems of various geometries. While streaming in a channel maintains a simple geometry, it requires an appropriate set of scales to capture the multiple regimes of streaming that can occur. This study aims to define a set of scales and dimensionless numbers for general outer acoustic streaming within a channel. The chosen scales are validated through the recovery of slow streaming equations describing Rayleigh streaming in a channel and Eckart streaming for the case of infinitely far away channel walls. Using the scales and the time-averaged momentum equations, fast streaming is then analyzed and nonlinear Reynolds numbers, which indicate whether the streaming is nonlinear or linear, are found. With this analysis, a brief procedure for identifying regimes of acoustic streaming within a channel is provided for future analyses involving streaming in complex multi-scale systems.

[1]Stanford Graduate Fellowship in Science and Engineering

Kyle Pietrzyk
Stanford University

Date submitted: 19 Jul 2019 Electronic form version 1.4