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Zonal Flow Velocimetry in Spherical Couette Flow using Acoustic Modes MATTHEW M. ADAMS, ANTHONY R. MAUTINO, DOUGLAS R. STONE, University of Maryland, College Park, SANTIAGO A. TRIANA, Institute of Astronomy, KU Leuven, VEDRAN LEKIC, DANIEL P. LATHROP, University of Maryland, College Park — We present studies of spherical Couette flows using the technique of acoustic mode Doppler velocimetry. This technique uses rotational splittings of acoustic modes to infer the azimuthal velocity profile of a rotating flow, and is of special interest in experiments where direct flow visualization is impractical. The primary experimental system consists of a 60 cm diameter outer spherical shell concentric with a 20 cm diameter sphere, with air or nitrogen gas serving as the working fluid. The geometry of the system approximates that of the Earth's core, making these studies geophysically relevant. A turbulent shear flow is established in the system by rotating the inner sphere and outer shell at different rates. Acoustic modes of the fluid volume are excited using a speaker and measured via microphones, allowingdetermination of rotational splittings. Preliminary results comparing observed splittings with those predicted by theory are presented. While the majority of these studies were performed in the 60 cm diameter device using nitrogen gas, some work has also been done looking at acoustic modes in the 3 m diameter liquid sodium spherical Couette experiment. Prospects for measuring zonal velocity profiles in a wide variety of experiments are discussed.

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