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Experimental Studies of Acoustics in a Spherical Couette Flow SAVANNAH GOWEN, University of Maryland College Park and Mount Holyoke College, MATTHEW ADAMS, DOUGLAS STONE, DANIEL LATHROP, University of Maryland College Park — The Earth, like many other astrophysical bodies, contains turbulent flows of conducting fluid which are able to sustain magnetic field. To investigate the hydromagnetic flow in the Earth's outer core, we have created an experiment which generates flows in liquid sodium. However, measuring these flows remains a challenge because liquid sodium is opaque. One possible solution is the use of acoustic waves. Our group has previously used acoustic wave measurements in air to infer azimuthal velocity profiles, but measurements attempted in liquid sodium remain challenging. In the current experiments we measure acoustic modes and their mode splittings in both air and water in a spherical Couette device. The device is comprised of a hollow 30-cm outer sphere which contains a smaller 10-cm rotating inner sphere to drive flow in the fluid in between. We use water because it has material properties that are similar to those of sodium, but is more convenient and less hazardous. Modes are excited and measured using a speaker and microphones. Measured acoustic modes and their mode splittings correspond well with the predicted frequencies in air. However, water modes are more challenging. Further investigation is needed to understand acoustic measurements in the higher density media.

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