RECOVERING THE SHEAR WAVE SPEED PARAMETERS IN AN ANISOTROPIC MEDIUM

J McLaughlin[a], **D Renzi**[b],and **JR Yoon**[c]

[a]Department of Mathematics
Rensselaer Polytechnic Institute
Troy, NY 12180
mclauj@rpi.edu

[b]Department of Mathematics
Rensselaer Polytechnic Institute
Troy, NY 12180
renzid@rpi.edu

[c]Department of Mathematics
Clemson University
Clemson, SC 29634
jryoon@clemson.edu

In an isotropic medium, one technique for shear wave speed recovery in transient elastography is level set based inversion of arrival times. Using this technique one first finds the arrival times of a shear wave using a cross-correlation procedure, and then determines the shear wave speed by using level sets of the arrival times to solve the inverse Eikonal equation. In many kinds of tissue, especially tissue with fibers like muscle, the wave speed depends quite heavily on direction. The method described above can only find speed orthogonal to the wave front. We will present results on a related technique that uses multiple transient elastography experiments to determine all the parameters that govern the directionally dependant shear wave speed. In this talk, we will use a nearly incompressible transversely anisotropic model. This medium supports two shear waves, the SH wave and the QS wave. We will consider the following inverse problem: Given arrival times of the QS wave calculate the shear wave parameters governing anisotropy. We first show that using only one set of arrival times, there is no unique solution. We then describe a technique using multiple arrival times to calculate the shear wave speed parameters. Next we will describe how we will use this with supersonic imaging experiments devised by experimenters in the laboratory of Mathias Fink. Last, we will give reconstruction examples using synthetic data in 2 and 3 dimensions.