

Full Wavefield Simulations in an Anisotropic Media Applied to the Study of the Northern Appalachian Anomaly

¹D. Lopes da Silva, ²W. Menke

¹Lamont-Doherty Earth Observatory of Columbia University, ²Universidade Federal Fluminense

The Northern Appalachian Anomaly (NAA) is an unusual low velocity zone located at the eastern edge of the thick, cool and tectonic stable North American craton. Over the past 20 years, several studies about this anomaly came up with different ideas of what it could be. Besides being located in a tectonic stable area, previous studies could not detect any significant change in the shear wave splitting pattern or in the asthenosphere thickness caused by the NAA. Based on the idea that this thermal anomaly is generated by the presence of mantle upwelling, a simplified anisotropic model of the Earth was built to simulate a shear wave propagating through it. This paper uses a preexisting MATLAB script to simulate full wavefield propagation, allowing the testing of the hypothesis that wave diffraction masks changes in the mantle anisotropy. A post-processing script, also written in MATLAB, was developed to measure the shear wave splitting and the travel time along an array of 80 different at the top of the model. As a result, we were able to compare the measurements after simulations with the ones predicted by the ray theory and understand if the wave diffraction effect is the reason why past studies did not detect changes in shear wave splitting in the area.