1106-86-2049 **Yanhua O. Yuan*** (yanhuay@princeton.edu), 308A Guyot Hall, Princeton, NJ 08544, and **Frederik J Simons** and **Ebru Bozdağ**. *Full-waveform adjoint tomography based on wavelet multiscale analysis.*

We present a multiscale scheme for full-waveform adjoint tomography based on a (bi)orthogonal wavelet transform. We show that convergence and stability of the inversions are greatly improved when data and synthetics are progressively presented to the algorithms in a constructive multiscale approximation. Within the industry-standard elastic Marmousi model, we applied the multiscale approach successfully to the body waves generated. In this talk, we also explore the sensitivity of surface waves in waveform-difference tomography. The incorporation of surface waves escalates the cycle-skipping problems compared to inversions considering body waves only. An envelope-based misfit function designed in a multiscale framework is shown to get rid of the numerous local minima present in the waveform-difference misfit surface. The effect of incorrect density information on elastic inversions is also discussed. Based on our analyses and numerical experiments, we ultimately formalize a flexible scheme for full-waveform inversion including body and surface waves, considering density, compressional-wave and shear-wave speed. Ours is a scheme that can be applied to exploration problems, global-scale tomography, as well as to small-scale inversion problems in geoengineering. (Received September 15, 2014)