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H Zhao and **Y Zhong*** (yiminz@uci.edu). *A hybrid adaptive phase space method for reflection travelttime tomography.*

We present a hybrid imaging method for a challenging travel time tomography problem which includes both unknown medium and unknown scatterers in a bounded domain. The goal is to recover both the medium and the boundary of the scatterers from the scattering relation data on the domain boundary. Our method is composed of three steps: 1) preprocess the data to classify them into three different categories of measurements corresponding to non-broken rays, broken-once rays, and others, respectively, 2) use the the non-broken ray data and an effective data-driven layer stripping strategy—an optimization based iterative imaging method—to recover the medium velocity outside the convex hull of the scatterers, and 3) use selected broken-once ray data to recover the boundary of the scatterers—a direct imaging method. By numerical tests, we show that our hybrid method can recover both the unknown medium and the not-too-concave scatterers efficiently and robustly. (Received July 20, 2018)