

## **COMPARISON OF SEISMIC SOURCES FOR MASW INVESTIGATIONS, APPALACHIAN PIEDMONT PROVINCE IN PENNSYLVANIA, USA**

*William Seaton, ARM Group Inc.; Jeffrey Leberfinger, Terranear PMC LLC*

Three commercially-available portable accelerated weight drop (AWD) seismic sources are compared for use in shallow (0-50 meters depth range) multichannel analysis of surface waves (MASW) seismic surveys. Tested AWD sources (with hammer weights) include the R.T. Clarke PEG-40 (36 kg ), GISCO ESS-Mini (23 kg ), and GISCO ESS-500 (230 kg). Testing included an array of 24 geophones (4.5 Hz) with a geophone separation distance of 1.5 meters connected to a 24-channel seismograph.

MASW survey data was collected at a site in the Piedmont Province of the Appalachian Basin, north eastern USA. The site is underlain by 5-10 meters of unconsolidated overburden composed of clay-rich soil and weathered bedrock overlying variably weathered carbonate bedrock consisting of dolomite and limestone. The site is typical of many areas in the Appalachian Piedmont with carbonate bedrock.

Analyses of seismic shot gathers provides a comparison of frequency content vs amplitude, amplitude decay vs travel time, and amplitude vs offset distance for each source. MASW dispersion curves are illustrated for each source with representative 1-D velocity-depth earth models. Fundamental and higher-mode information from each source is presented.

The two sources with smaller hammer weights (PEG-40 and ESS-Mini) produce MASW dispersion curves with useable data between 15 and 70 hertz and 1-D velocity models with useful information down to approximately 20 meters. The larger source (ESS-500) produced 1-D velocity models with dispersion curve data between 10 and 80 hertz and subsurface information down to approximately 40 meters.