

Near Surface Velocity Modeling Using Surface Wave Analysis Modeling and Inversion (SWAMI): An Application for Noise Attenuation from 3D Seismic Data

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Abstract

The complexity of the near-surface geology is a key challenge for onshore oil and gas exploration, where the variations in thicknesses and velocities in the near-surface layers can cause significant issues in imaging deep seismic reflections. Therefore, the quality of the seismic data is strongly affected by the near-surface characteristics. The near-surface layer plays an important role in the characterization of ground motion. Thus, the surface waves are instrumental in understanding the complexity of the near-surface. In this case study, we design a workflow to characterize the near-surface layers using one of the advanced approaches in near-surface model building known as Surface Wave Analysis, Modeling and Inversion (SWAMI), which we used for both velocity model building and noise attenuation in the area of interest. The SWAMI method provided a quite reasonable estimation of the near-surface velocity model for the shallow subsurface by analyzing, modeling, and inverting the surface waves, which succeeded in removing ground roll and backscattered noise. We have successfully applied a set of workflows that included SWAMI application for ground roll noise attenuation, and high-resolution velocity model building, and that have brought significant improvement over the legacy results.