

Building Accurate Depth-Velocity Models in Shallow Water Marine Environment by Joint Reflection/Refraction Velocity Inversion*

Sergey Birdus¹

¹CGG

*Adapted from extended abstract prepared to accompany poster presentation

Abstract

Standard depth-velocity modelling, which uses reflections, can be challenging for the upper part of the section in shallow water marine environment (water depth up to few hundred meters, which is typical for Myanmar offshore exploration areas). Problems are caused by the limited number of offsets that are available for analysis and the widespread presence of strong multiples. Seismic acquisition is designed for an optimal illumination of much deeper target intervals. Very often, it does not allow accurate velocity estimations in the shallow part of the section. However all deeper target reflections travel through the upper part of the model, so having an accurate velocity model right from the seafloor is important. In this environment, refracted and diving waves can provide additional information for velocity modelling.

This paper discusses how Refraction Tomography (also called first arrival travel time tomography) and Full Waveform Inversion (FWI, which mostly depends on diving waves) help to produce more accurate and detailed depth velocity models below a shallow seafloor. We do not use refractions and diving waves by themselves to build a complete shallow velocity model. In our workflow, Refraction Tomography and FWI complement standard Reflection Tomography and the priority remains with the reflections to guarantee stability of the solution and to avoid uncertainties associated with refracted or diving waves in complex media.