HIGHLY-OPTIMIZED TWSM ALGORITHM FOR DIFFRACTION MODELING BELOW SALT OVERHANGS

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Approach. Oil producing companies concern to increase resolution capability of seismic data for complex oil-and-gas bearing deposits connected with salt domes, basalt traps, reefs, lenses, etc. Known methods of seismic wave theory define shape of hydrocarbon accumulation with nonsufficient resolution, since they do not account for multiple diffractions explicitly. Alternative analytical 3D seismic wave theory [1] based on operators of feasible propagation in layers and transmission (reflection/refraction) at curved interfaces accounts for cascade diffraction explicitly. Approximation of this theory is realized in the seismic frequency range as the tip-wave superposition method (TWSM) that has been presented in [2]. TWSM allows evaluating of wavefield in bounded domains/layers with geometrical shadow zones. Here we introduce the so-called shadow function that allows evaluating feasible propagation in shadow and lit zones for arbitrary 3D interface, show realization and storage optimization of this function. The efficiency of the TWSM is illustrated by numerical tests for salt overhang with complex concave-convex boundary of three geometrical shapes.

Tests. We tested the shadow matrix procedure by evaluation physically feasible point-source wavefield bending salt overhang with complex boundary illustrated at Figure 1. Figure 2 shows shadow (black) and lit (gray) elements of shadow matrix for three radiating triangles on boundary. Figure 3 and Figure 4 show the feasible point-source wavefield below overhang at lines 1 and 2.

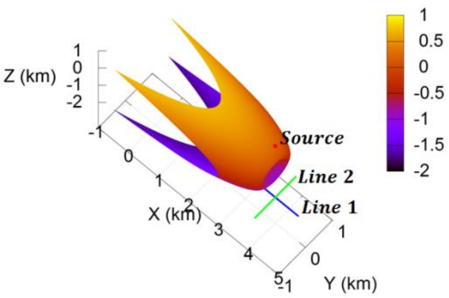

***Figure 1** 3D view of boundary*

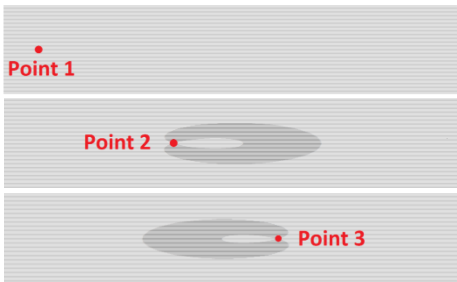

***Figure 2** Shadow and lit zones for boundary*

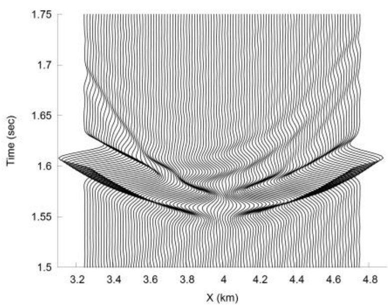

***Figure 3** Wavefield for boundary at line 1*

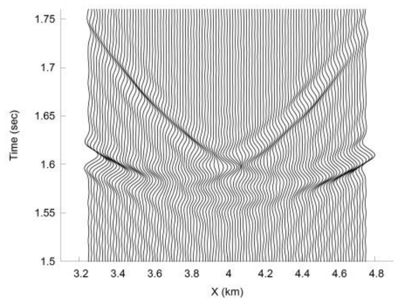

***Figure 4** Wavefield for boundary at line 2*

References:

[1] Aizenberg, A.M. & Ayzenberg A.A., 2015. Feasible fundamental solution of the multiphysics wave equation in inhomogeneous domain of complex shape, Wave Motion, 53, 66-79.

[2] Zyatkov N., Ayzenberg A., Aizenberg A.M., and Romanenko A. Highly-optimized TWSM algorithm for modeling cascade diffraction in terms of propagation-absorption matrices. *Extended Abstracts, 75th Conference and Exhibition, European Association of Geoscientists & Engineers, London, England*, Th-P02-11.