Least Square Migration in Image domain (LSMi) along with Better Velocity Modeling Improves Subsalt Imaging, Offshore Mediterranean, Case Study

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ABSTRACT

In this paper we will demonstrate how the application of the high resolution tomography along with Least Square Migration in the image domain improves the image in the structurally complex areas (subsalt). Prospect is located in the Mediterranean sea, offshore Egypt acquired with broadband narrow azimuth approach. Zone of the interest is subsalt. In general, in Mediterranean Sea, several targets are below the complex salt and they are suffering from the inaccurate velocity models, inadequate acquisition, and imprint of complex over burden and bandwidth limitation. In order to improve the velocity model we have used iterative geologically constrained tomography. High resolution tomography paired with Kirchhoff Pre stack Depth Migration has yielded stable results in the target area. Even with the most accurate velocity model and superior imaging algorithm, illumination effects can still have imprint on the amplitudes at the target level making them less reliable for the inversion work. Those effects are generally caused by complex overburden, inadequate acquisition (under-sampling) and limited recording aperture. Least Square Migration, either in image or data domain could potentially lessen some of the above-mentioned effects, giving more reliable seismic amplitude and phase for further inversion to elastic properties. Further in this paper we will demonstrate how Implementation of the Least Square Migration in Image domain (LSMi) has managed to reduce some of the dip dependent illumination issues in the target area while improving the continuity of the data. The key of the LSMi is the introduction of the modeling-imaging response known as Point Spread Function (PSFs). They are estimated using the Green's function and as such they represent important tool for survey design and illumination studies. PSFs are supposed to capture the illumination related effect of the wave propagation in the earth that are not accounted for in signal processing or migration. LSMi uses PSFs in order to remove the dip dependent illumination effects from the image giving more reliable amplitudes.