

Marchenko redatuming for multiple prediction and removal in situations with a complex overburden

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S24A-03: Marchenko redatuming for multiple prediction and removal in situations with a complex overburden

Tuesday, 11 December 2018

16:30 - 16:45

📍 *Marriott Marquis - Marquis A-C*

Internal multiples can create severe artefacts in seismic imaging, especially when our zone of interest is overlain by a complex overburden. These artefacts can mask structures, which has a strong effect on the interpretation of the image. Therefore, multiple prediction and removal is of significant importance for correct imaging and interpretation in settings with a complex overburden.

We propose an adaptive double-focusing method to predict and subtract the internal multiples that were generated in the overburden. This method is a form of the Marchenko method, that can retrieve the directionally-decomposed Green's functions between virtual sources and virtual receivers anywhere inside the subsurface. The retrieved Green's functions contain all orders of multiple scattering. The method only requires the single-sided reflection response and a smooth velocity model as input. Instead of conventional imaging methods, that assume that the wavefield only consists of single-scattered waves (and thus create imaging artefacts when multiple scattering is present), we now use the multiple-scattered Marchenko wavefields for correct redatuming and imaging.

We apply our method to 2D and 3D field data that were recorded in settings where imaging and interpretation is hindered by a complex overburden. First, we create virtual sources and virtual receivers directly above our zone of interest. Next, we use the retrieved Marchenko wavefields to predict and subtract the internal multiples that were generated in the overburden. Masked structures become visible after multiple removal, which significantly improves the geological interpretability. Therefore, we conclude that the adaptive double-focusing method (Marchenko redatuming) is capable of correctly predicting and removing internal multiples generated in the overburden.

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