**Effects of Seismic Noise on Imaging and FWI**

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# Abstract

Within the seismic processing workflow, a fundamental step is the attenuation of existing noise in the data in order to achieve the best final image. However, the parametrization of the filters applied for this noise removal consists of a labor-intensive step where we may come to a situation where we need to choose between complete noise attenuation with signal loss or accepting some contamination by noise in the data while maintaining the integrity of the signal.

In this study, we analyze the effects of swell noise contamination on imaging and compare these effects to the effects of an aggressive noise filtering method which also attenuates the signal. The data in question is obtained by modeling a streamer acquisition on a known model (Marmousi2). The swell noise is extracted from real data and added to synthetic seismic records. The version with aggressive noise attenuation is obtained by applying a neural network for noise attenuation, which exhibits the behavior of attenuating all noise but interferes with the amplitudes of the data.

We analyzed the effects of noise presence and signal attenuation on Reverse Time Migration (RTM), assuming that we already have a good velocity model. We also examined the effects on Full Waveform Inversion (FWI) for obtaining the correct velocity model starting from a simple model. Finally, we analyzed the effects on the entire imaging workflow, combining FWI followed by RTM. We will investigate the effects of different FWI objective functions on the final image, both using noise-contaminated data and attenuated data.