Removal of Surface and Internal Multiples from Land Data: Experience from North Africa Data

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The appearance of surface-related and internal multiples is a major problem in land seismic data. Over the last decade, the data-driven surface-related and internal multiple prediction and subtraction methods, that have been mainly developed for the marine case, have been cross-fertilized towards the land data problem.

However, whereas the marine case most of the time provides high quality data with deterministic surface multiples, the land data is characterized by poor quality reflection events, disturbance by surface waves and near surface propagation and irregular trace spacing. Therefore, proper preprocessing to enhance and regularize the seismic reflections, which will act as the multiple prediction operator, and removal of noise are key elements for a successful wave equation based multiple suppression.

In this paper a methodology and sequence of data processes is being discussed that improves the signal-to-noise ratio (SNR) of land data recordings prior to any multiple estimation. The method is applied on pre-stack data in the CMP gather domain under the assumption of locally laterally invariance of the earth. The improved SNR and regular offset sampling is obtained by forming CMP super gathers from each group of CMP gathers which allows the possibility of trace mixing, regularization and the signal enhancement in the NMO corrected domain.

Some examples will illustrate the successful application of the method of noise suppression and multiple suppression. After conditioning and attenuating the pre-stack gathers from surface and internal multiples, the velocity picking procedure can be performed with more accuracy which is very crucial for structural interpretation.