

## How to Extract S-Waves in the Marine Environment Offshore the UAE

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### Abstract

In the Arabian Gulf, Ocean Bottom Cable (OBC) acquisition has been used extensively to collect three-dimensional seismic data (3D). Typically it has been done with 2-component recording (hydrophone and vertical geophone). In other parts of the World we have seen that 4-component recording (4C), hydrophone and 3-component geophones has given useful extra information. The most common wave-mode used has been P-wave down to the reflector and S-wave up (P-S) reflections). In the Arabian Gulf region, there are, however, very few examples of useful information extracted from S-type events.

While P-waves react to the whole structure, rock matrix and the fluid within, the S-waves basically react only to the rock matrix. This implies that if one could extract both wave modes one might estimate important additional reservoir details.

Typical for the region is shallow water (say 10 meter) environment with hard bottom of alternating high-velocity layers. This dictates the existence of strong surface waves and multiples, which of course makes the wave-field complicated. In previous work (Sun et al, 2009, Berteussen and Sun, 2010) we have, however, demonstrated that we should expect to find S-waves offshore UAE, this because of the special local geology. These events (S-down and S-up, see Figure 1) have a fairly simple ray-path, much like the P-waves, but they have a much more complicated PVO (phase versus offset) structure with typically several phase changes within normal offset ranges, say 5000 meter. This implies that the processing will have to be interactive, a combination of modeling and processing.

In this work we illustrate how these waves, S-down and S-up, can be extracted and give one example of their possible use.