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Removing Near Surface problems from seismic data

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Objectives:

During the processing of a 3D vibroseis survey over high sand dunes and sabkha, the static solution had to be adapted to the complexity of the area and to the acquired data. Automatic first break picking is very good when receivers or shots are on sabkha. On dunes, far offset traces display good picks; near offset traces do not show any visible FB to pick. In these locations, the refraction statics algorithm failed to provide a proper static solution.

Additionally, dune imprints are visible on many amplitude maps, introducing greater uncertainty to its interpretation. The objective is to improve the amplitude reliability below dunes by increasing the signal to noise ratio for amplitude correction computation.

Procedures:

After trials with different picking techniques and FB inversion, the conclusion was that near offset FB picking on high dunes is not possible due to low near offset fold and very poor FB quality. The full static solution is obtained by a combination of 4 cascaded static computations, derived with a dedicated processing flow:

- Primary static: based on a geological model generated from uphole survey.
- 1st pass residual reflection static
- Supplemental horizon based static corrections

- 2^{nd} pass of residual reflection static

On the top of the usual AVO term, a dedicated dune residual AVO correction largely improves the dune imprint. Surface consistent amplitude corrections computed on non-noisy data gives better spatial amplitude balancing, mainly located on dunes. A 2^{nd} iteration of surface amplitude corrections also computed on non-noisy data show small but non-negligible improvement on the remaining dune anomalies.

Results and Conclusions:

Pre-stack de-noising, in combination with a horizon based statics solution, showed that efficient attenuation of surface acquisition impact is possible, and helps in improving the amplitude reliability.

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