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# Transit time in sand dunes: empirical to polynomial model

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## ABSTRACT

The empirical sand curve has been the initial depth/time model to estimate sand dunes transit times in the Rub' Al-Khali, Saudi Arabia. Where there has been a loss of focusing further, data processing, including surface consistent residual statics have adequately resolved the remaining near-surface static anomalies. A theoretical analysis gives credibility to the empirical definition. There has been no mathematical parametrization describing the sand compaction that could be further developed and changed for other areas. A high density 3D survey is acquired to delineate a low relief structure. This gives more information to perform the analysis to update the near-surface model.

The mathematical sand curve is a combination of a numerical analysis of the shallower transit times coupled to the theoretical model for deeper sand dunes. This mathematical sand curve thus has parameters that can change to match specific areas. The mathematical sand curve approximates to a compaction curve and is more representative than interpolation of the empirical thickness/time definitions.

In the study area, empirical and mathematical sand curves are comparable. In each inline, under-correction of the static corrections under thicker sand dunes is evident. The tomogram of the higher resolution 3D survey yields information to update the empirical sand curve. The additional transit times at thickness of sand is summed with the empirical time definitions, thus producing a new collection of sparsely defined thickness/time pairs. Through those new thickness/times, a polynomial curve is defined. Application of the revised static corrections resolves the under- correction through the thicker sand dunes.

The former approach was to calculate the static corrections from the empirical sand curve and let the later stages of data processing resolve the residual statics. Now the polynomial sand curve method produces static corrections that solve a larger proportion of the near-surface depth/velocity distribution. The polynomial solution for the 3D survey data gives greater confidence in the initial model and processing. This is critical for low relief structures. Improved near- surface model and static corrections reduce the error in velocity analysis and other stages of data processing.