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Evolution of a Near-Surface Model in an Area of Complex Topography

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Complex topography has promoted the evolution of near surface modeling concepts and techniques that attempt to adequately resolve datum static corrections. In a study area, *jebels*, *wadis*, and *sabkhas* generate large velocity contrasts. The 2D seismic lines were modeled with a single layer velocity model. This velocity model (Figure 1) was derived from uphole control and was adequate for most prospective areas. However, irregular uphole distribution under-sampled the near-surface velocity field leaving some local anomalies unresolved. The 2D technique of shallow horizon interpolation to solve local anomalies was inappropriate for recently acquired 3D seismic data.

Local anomalies were still evident after building a two-layer model that defined weathered and sub-weathered layers. This two-layer model was enhanced by extra upholes and control points in order to better define the near-surface geology. While this revised model defined the regional trends, local structure confirmation still required model improvements where near-surface anomalies remained.

Source gathers from a sparse 3D survey over the study area contained relatively large near trace offsets. Refraction methods were considered but were not pursued due to insufficient near offset data. Acquisition did include extra near-trace 30 m offset data for selected inlines. 3D source gathers similar to 2D source gathers were extracted from these near offset inlines. The direct arrival and first refractor were interpreted, yielding derived control points which were used to build the final two-layer model (Figure 2).

This approach created a 3D model in which the seismic time horizons on a 3D inline validated a time structure similarly seen in a corresponding 2D line.

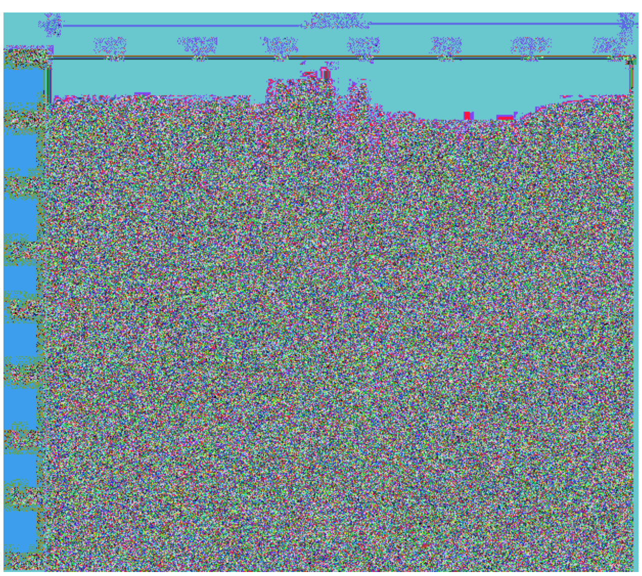

Figure 1: Initial Single-layer velocity model.

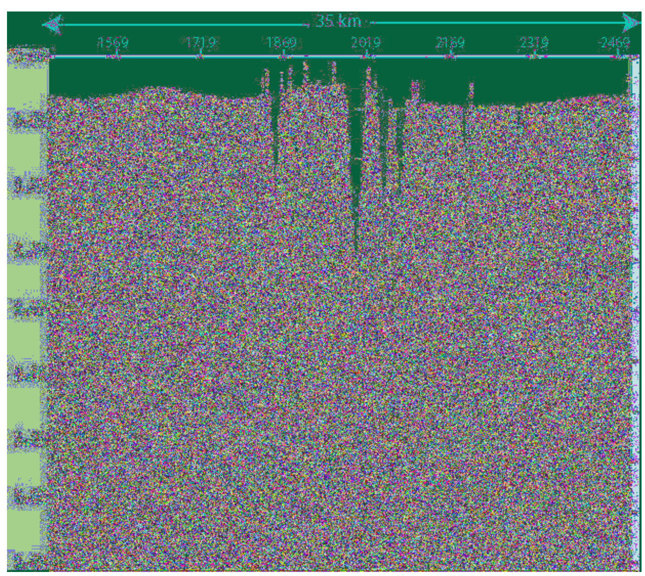

Figure 2: Final two-layer velocity model.