Red Sea 2D Transition Zone Reprocessing Case Study

Sergey Kishchik [1]

[1]Saudi Aramco

Abstract

In 2010, 69 seismic 2D lines were acquired and processed in a transition zone (TZ) in offshore Saudi Arabia, in the Red Sea. This 2D transition zone reprocessing case study was conducted on two key seismic lines, to investigate the discontinuity of reflectors in the subsalt zones, as well as to verify that optimum processing parameters and procedures were applied to the data.

Matching the different seismic sources and receivers, along with static corrections, noise, and multiples attenuation, comprise four of the main processing concerns with the acquired seismic data. The TZ acquisition environments required different types of sources and receivers. There were five sources, Vibroseis, dynamite, and three air gun array sources. There were six types of receivers, such as geophones for land surveys and marsh phones, OBC hydrophones, OBC geophones, node hydrophones and node geophones for marshes and sea.

The first processing challenge was matching the multisource receiver combinations. This was performed by "matching" filter applications. This procedure was designed to correct for imperfections in the hydrophone and geophone coupling imperfections. Filters provided by the acquisition crew performed matching of the hydrophones and geophones signals.

The second processing challenge was the dynamic and complex nature of the TZ situated between land and marine environments. This caused the linear, random, and coherent noise levels in the seismic data to be particularly high. These different types of noise were suppressed in the seismic data by cascading application of 2D FK filtering, linear strong amplitude noise suppression, dip median filtering and time-frequency domain noise bursts.

The third processing challenge was the static model correction for the land elevations, islands, reefs and deep waters zones. The accurate static solution was achieved by implementing a combination of "single layer refraction statics solution" with "2D wave equation datuming."

The fourth processing challenge was the suppression of the "interbed" and sea bottom multiples. It was successfully achieved by applications of surface related multiples attenuation (SRME) and "velocity dependent multiple suppression" methods.

The improvements in the continuity of target events in the subsalt zones was achieved by conducting more detailed testing of seismic data, applications of new processing flow, programs, and different parameters.