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Seismic Meeting the Exploration and Development Challenges in North Africa

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Great successes were achieved in the early days of exploration for hydrocarbons using geological mapping based on surface outcrop and gravity data. 3D seismic is now providing the images that allow us to discover more of the remaining oil and gas. In AAPG Explorer (1995) Algeria was ranked number one for exploration success with several large fields discovered in the Sahara. Whilst there is still exploration to do the emphasis has shifted to the development and optimization of these fields.

The early exploration challenges related to the vast remote arid environment that we had to work in. Huge sand dunes and steep cliffs put to the test static corrections and array design. The evaporites that blanket the area lead to multiples that obscure the primary seismic image. Many of the reservoirs are ancient rocks with poor acoustic contrast due to their relatively low porosity and crystalline fabrics. Tackling these problems one by one lead to an incremental progress by the industry.

With the focus on field development there is the need to provide a solution to imaging the reservoir with an improvement in every one of the challenge areas. At WesternGeco we directed our research effort towards providing a seismic solution that would lead to a step change in quality by addressing all of the issues in one coordinated effort. The resulting Q land solution is the integration of the acquisition, processing, inversion and interpretation innovations.

During the latter part of 2002 we tested this Q Land solution over part of the Hassi Messaoud field to assess our ability to characterize the reservoir in a very complex setting. Past experience tells us that Hassi Messaoud provides a considerable challenge to the seismic method. Previous 2D and 3D tests had not provided the answers required to optimize the development of the field.

The test combined both surface seismic and borehole technology. From the comparison of images between legacy and Q data it is clear that we now image the reservoir layers and can identify the lateral heterogeneity due to the fluvial sedimentary system and its subsequent partial erosion by the Hercynian unconformity. The andesite volcanic rocks are a further level of complexity that we now can address with the Q Land data.

The pilot test results exceeded our expectations and demonstrated the ability of the seismic method to deliver a reservoir solution.

Today we see our industry taking an evolutionary stride to meet the seismic challenges in North African exploration and development.