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Tectonic Inversion Along the Algerian and Ligurian Margins: On the Insight Provided By Latest Seismic Processing Techniques Applied to Recent and Vintage 2D Offshore Multichannel Seismic Data

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Recent studies on the Algerian and the North-Ligurian margins in the Western Mediterranean have evidenced inversion-related superficial structures, such as folds and asymmetric sedimentary perched basins whose geometry hints at deep compressive structures dipping towards the continent. Deep seismic imaging of these margins is difficult due to steep slope and superficial multiples, and, in the Mediterranean context, to the highly diffractive Messinian evaporitic series in the basin. During the Algerian–French SPIRAL survey (2009, R/V Atalante), 2D marine multi-channel seismic (MCS) reflection data were collected along the Algerian Margin using a 4.5 km, 360 channel digital streamer and a 3040 cu. in. air-gun array. An advanced processing workflow has been laid out using Geocluster CGG software, which includes noise attenuation, 2D SRME multiple attenuation, surface consistent deconvolution, Kirchhoff pre-stack time migration. This processing produces satisfactory seismic images of the whole sedimentary cover, and of southward dipping reflectors in the acoustic basement along the central part of the margin offshore Great Kabylia, that are interpreted as inversion-related blind thrusts as part of flat-ramp systems. We applied this successful processing workflow to old 2D marine MCS data acquired on the North-Ligurian Margin (Malis survey, 1995, R/V Le Nadir), using a 2.5 km, 96 channel streamer and a 1140 cu. in. air-gun array. Particular attention was paid to multiple attenuation in adapting our workflow. The resulting reprocessed seismic images, interpreted with a coincident velocity model obtained by wide-angle data tomography, provide (1) enhanced imaging of the sedimentary cover down to the top of the acoustic basement, including the base of the Messinian evaporites and the sub-salt Miocene series, which appear to be tectonized as far as in the mid-basin, and (2) new evidence of deep crustal structures in the margin which the initial processing had failed to reveal.

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