INTRODUCTION

During the last decades, 3D models of subsurface geological heterogeneity have proved to be important tools for the efficient management of hydrocarbon reservoirs. Previous works modelled facies belt distribution in the Sant Llorenç del Munt complex at production scale based on outcrop data (Cabello et al. 2015). In the present work, a new outcrop-based exploration scale 3D facies model including the production scale model area is presented. The total area comprises both Montserrat and Sant Llorenç del Munt fan-delta complexes developed during the Eocene in the South Eastern Iberian basin.

METHOD

1) Horizon framework & fault modelling: Digitization of the key surface traces onto the photovectorial input models, these surfaces are those bounding transgressive and regressive sequence set at scale of composite sequences (Fig. 2b). The derived attributes were used to elaborate contour maps of each key surface. These maps and also the reconstruction of nine vertical faults and two thrusts, were the base for the 3D reconstruction of the 3D reconstruction of the structural framework (Fig. 2).

2) 3D Gridding: The 3D volume delimited by the key stratigraphic horizons and faults was gridded in 7.5 million of cells. Cells dimensions were 100 m x 100 m (100 x 1000 facies oriented following the main palaeocurrent direction (i.e. 30°)), and a proportional layering was selected with a mean cell thickness of 1.75 m (Fig. 2b).

3) Facies modelling: Aimed to reproduce the stratigraphic distribution of the main facies belts which are present in the fan-delta complexes (thrust-related alluvial breccias, proximal alluvial fan, distal alluvial fan, delta front, carbonate platform and prodelta) (Figs. 3c, 5 and 7). Terrigenous facies belts were reproduced using TTG (Truncated of the sum of a deterministic expectation Trend and a Gaussian random field; MacDonald & Asen 1994).

This process was guided by the elaboration of several paleogeographic maps (Fig. 3a). The Gaussian stochastic part of the algorithm was used to reproduce the interfingering between different facies belts showing more detailed scale of geological heterogeneity. The carbonate platforms were assimilated as ellipse-shape geobodies and reconstructed using an object-based algorithm. Its distribution was fixed depending on the nature of the sequence (40% of volume in transgressive and 10% in regressive), and determined to vary vertically. Finally its position was constrained to be within the distal delta front and proximal prodelta.

CONCLUSIONS

• The architecture and distribution of fan-delta front reservoir analogues need to be documented from the model.

• The model reproduces a continuous delta front facies belt connected along the different surfaces (Fig. 7b).

• Fan-delta front facies maps extracted from the model shows maximum potential accumulation zones of about 135 m, preferentially concentrated in the central part of the study area following a trend parallel to paleocurrents (Fig. 4).

Its complex geometry could also capture the existence of potential stratigraphic traps related to the ends of fan-delta front wedges, prodelta and distal alluvial mudstones resulting from the T-R cycles at composite sequence scale (Figs. 5 and 8).

REFERENCES


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