UAB
Universitat Autònoma de Barcelona

Universitat de Barcelona

Final Master Project by Bello, G.

3D characterisation of sedimentary heterogeneity and its impact on reservoir properties in amalgamated fluvial sheet-sandstones: Montllobar Formation (Ypresian, Tremp-Graus Basin, Spain)

Supervisors: Poyatos, M. Cabello, P. and Oms, O.

MSc Reservoir Geology and Geophysics (2022-2023)

Submission Date: June 2023

0. Abstract

A detailed study has been conducted in the Montllobar region of the piggy-back Tremp-Graus basin, focusing on the implications for CO2 storage modelling. The study combines sedimentology and geostatistical models to assess the impact of sedimentary heterogeneities on reservoir qualities. After mapping, vertical logging, paleocurrents measurements, and interpretation of fluvial architecture, eight modelling facies groups are defined for a 34m thick succession in three stratigraphic zones. First zone contains paleosol floodplain (alternating sequences of nodular breccia and floodplain muds). Second zone is characterized by channel sandstones (including fine- to medium-grained and coarse-grained facies, along with gravel horizons, mudstone lenses, and proximal alluvial fan facies). Third zone encompasses floodplain channel mudstones (comprises interbedded heterolytic beds within a muddy floodplain background).

The studied system is classified as a braided meandering river, deposited during a low accommodation period and separated by two high accommodation phases, characterized by muddy plains with isolated channels. Outcrop bar dimensions confirms the existence of braided fluvial systems, predominantly found within alluvial fan plains. Interestingly, the W/T ratio indicates an overlap between channels on megafans, braided low-sinuosity and meandering rivers.

3D genetic models characterize internal facies variability, porosity, vertical and horizontal permeability. Facies' porosity and permeability contrasts further highlight the heterogeneity of the reservoir. The presence of poorly connected permeability barriers affects the upward movement of injected CO_2, reducing the overall capacity. However, distinct petrophysical properties in reservoir facies facilitate better connectivity for CO_2 migration. The studied case shows a potential for CO_2 storage despite 5% of the reservoir is characterized by seepage barriers.