The Eocene Morillo Turbidite System (South-Central Pyrenees, Spain): Helping to Reduce Uncertainty of Sub-Surface Data Interpretation in a Deep Marine Growth Basin

Moody, Jeremiah D.[1]; Pyles, David [1]; Bouroullec, Renaud [2]; Clark, Julian [3]; Hoffman, Matthew [1]; Setiawan, Prianto [4] (1) Geology and Geological Engineering (Chevron Center of Research Excellence), Colorado School of Mines, Golden, CO. (2) Geology and Geological Engineering, Colorado School of Mines, Golden, CO. (3) Chevron, Chevron Energy Technology Company, San Ramone, CA. (4) Chevron, Chevron IndoAsia Business Unit, Jakarta, Indonesia.

Several deep water mini-basins around the world such as the Gulf of Mexico, deep-water Brunei or deep water Nigeria contain reservoirs that consist of submarine channels that converge onto a growing compressional structure. Due to the limited amount of outcrop data for these types of basins it can be challenging for the oil and gas industry to build and constrain reservoir models in such settings. For this reason, the Eocene Morillo turbidite system in the Ainsa Basin southern Spanish Pyrenees, is an important outcrop analogue for these reservoirs as it provides an opportunity to reduce uncertainty in the interpretation of subsurface data (i.e. seismic and well log data). This study is based on a detailed analysis of facies, facies distribution and stratigraphic architecture of submarine slope channels of the Morillo 1 sub-system that are divergent in the up-dip part of the basin, weakly confined in the central part of the basin, and convergent in the down-dip confined part of the basin.

Stratigraphic columns, interpreted photopanels, and paleocurrent data are used to produce several detailed maps and cross-sections illustrating the variability of stratigraphic geometry and architecture of individual channels, channel complexes and channel complex sets. From these data several key lessons are learned. First, reservoir quality is higher in the weakly confined part of the basin than the confined part in terms of reservoir size, connectivity, and compartmentalization. Second, the volume of MTC deposits increases with confinement and proximity to the down-dip bounding growth structure. Third, stratigraphic architecture and facies distribution within channels vary depending on the degree of structural confinement of the channels. Finally, in the up-dip part of the basin, stratigraphic architecture, channel connectivity and facies distribution show lateral changes between the system’s margins and the system’s axis at both channel complex and individual channel element scales.

The lessons learned from this study can help reduce uncertainty in the interpretation of subsurface data by providing new opportunities to better characterize deep water channelized reservoirs in mini-basins controlled by bounding compressional growing structures and by illustrating stratigraphic variability of channelized sandy systems in relation to the degree of structural confinement in deep-water settings.