Deepwater turbidite system analysis : From outcrops studies to basin scale depositional elements. Key learnings for reservoir occurence and characterisation.

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Decisions on exploration and production in the deepwater domain rely mostly on seismic data (2D or 3D) with limited amount of well geological data. This limited information has to be supplemented by models derived from analogues at different scales, in order to derisk the reservoir presence and infer the reservoir architecture within a larger stratigraphic framework from shelf to deep basin.

The fundamental outcrop analysis carried in the 70's and the 80's contributed to identify and characterize the main deep water depositional elements. Outcrop observations are the best way to appraise the architectural and faciological complexity of the subsurface depositional systems within their stratigraphic framework. The lessons learned in the Earth surface provide the key to the subsurface data understanding: core analysis, well-logs correlations and detailed 3D seismic interpretations. Subsurface data is in turn bringing key insights on large scale depositional system; 3D geometry and sediment nature of the depositional elements and processes. Research derived from 3D seismic subsurface data interpretations with tentative continuity between shelf to basin improved the understanding of shelf to deep basin sediment transfer mechanisms. In particular, it has been accompanied by a renewal of interest in the processes associated with hyperpycnal flows in the various deepwater settings. Outcrop and Subsurface integration appears as a powerful tool to characterize and predict reservoir occurence.

A seismic based approach on the recognition of depositional elements defined at different scales honoring the stratigraphical architecture of turbidites deposits is systematically applied in our evaluations at a similar scale than the elementary depositional sequences recognized by Mutti (1994).

Despite common depositional processes, a large diversity of systems and geobodies will be illustrated from regional scale to reservoir scale from a worldwide portfolio of assets in turbidite deposits, deposited in various tectonic /structural settings and various types of depositional settings

Reservoir monitoring data such as 4D seismic dataset and long-term production data in different turbiditic facies is bringing new insights and new challenges in deepwater turbidite system analysis at an even smaller scale than anticipated.

The increasing operating costs force to reduce as much as possible the uncertainties and to improve the geological predictivity. The key challenge is to generate a predictive framework defining a genetic link between depositional elements/reservoir units. A good approach could be starting from the seminal predictive facies model of Mutti, 1992. His process based approach is probably showing the path to follow.