## Exploration Data Integration, an effective Data Reengineering Process for New Petroleum Plays in Gulf Offshore Basins

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In recent years, data integration and statistical modeling play significant roles in the oil and gas exploration industry. Data integration provides an immense value to exploration industry, when it is associated with appropriate data mining tools. Statistical modeling is one of the data mining tools that often utilize different types of data from different sources. Authors attempt to use statistical modeling concepts for simulating depositional features of offshore oil field provinces, where heterogeneous data are integrated more effectively from different sources.

Materialized data views are extracted from integrated exploration data. Data properties and their attribute strengths, such as porosities from well data and their predictions from seismic volumes, have been analyzed, where more active petroleum geological plays reported. Statistical methods of data exploration tools prove to be very effective. Volume extractions are used to mine channel events from reengineering process approach to visualize and even track channels. These tools can measure the strength and magnitude of properties of data-attributes. Present study infers possible definition of geological facies and their framework for assessing the petroleum potential. Porosity estimation using seismic attributes as well as borehole data provides a knowledge solution on reservoir properties and their areal extents in the producing gulf provinces.

## Artificial Neural Networks based Seismic Facies Classification and Reservoir Property Mapping for Prospect Generation and Development: Lower Indus Basin South Pakistan

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Since the recent past, artificial neural network (ANN) has been widely used to solve the various complex problems in quest for oil where ambiguity is involved. Mostly, ANN has been constructively used in reservoir characterization based on seismic facies classifications and log predictions. Quality results in such analyses are confined to the intelligent and optimal selection of fundamental inputs and parameters for tuning the neural network.

In present work, ANN is applied for pattern recognition of seismic facies and description of petrophysical properties of reservoir to identify drilling targets and prognosis with reduced uncertainty as a role model supported by seismic and well data. Surface and volume based seismic attributes are used as the fundamental input to ANN algorithms of supervised and unsupervised classification of seismic facies reflecting the lithological variations. To complement the results of seismic facies identified through use of ANN, reservoir properties have been mapped using the combination of borehole data and seismic attributes. Results of mapped reservoir properties are based on the number of iterations involving linear and non-linear (ANN) calibration techniques followed by the geostatistical algorithms from CoKrigging and Geostatistical mapping.

The ANN based procedure applied is successful in field trials for exploration and exploitation of Lower Indus basin, South Pakistan. This has significantly reduced the risks associated in drilling wells in the LowerGoru Formation in terms of reduced exploitation costs, increased reserves discovered and increased production with additional drilling locations

## 3D Analogue Experiment and Its Synthetic Seismic Profiles of An Accretionary Prism

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Scaled physical experiments using analogue materials (analogue models) are an excellent technique to model development processes of geologic structures and examine their complex geometry, thus they have been widely used as templates to interpret seismic profiles in petroleum exploration industry. Since the structural geometry on a particular profile of such an experiment is sometimes complex, we have to understand its seismic expression. This can be achieved with a seismic modeling technique.

In this study, we combine the analogue and seismic modeling techniques to acquire the seismic responses of a complex geological structure at a subduction margin. First of all, a sand-box-type experiment is conducted to produce subsurface deformation geometry, then the model is sequentially sliced to record the deformation geometry on each profile. Its 3D geophysical model including reflection boundaries and velocity structure is then constructed from the serial model sections. The seismic modeling technique is applied to this geophysical model to obtain the pseudo-3D staked data finally. This becomes the key data-set to produce 2D migration profiles and their depth images.

The model results show typical structural features of an accretionary prism. These features are of exclusively simplified accretionary prism and do not include any variety due to heterogeneity of local geology. Thus their difference from seismic profiles of natural geological structures can be interpreted as the characteristic feature of the real structure. For instance, the Nankai prism shows that the decollement horizon has an extraordinary physical property and the deformation behaviour of the sedimentary sequences is less brittle.