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SmartResQ, Instant Reservoir Quality Estimator

N.G. Roy & Ishue Tandon

Summary

This paper presents an extension/plugin for the Schlumberger software Petrel that enables user to facilitate generating zone-wise reservoir pay summaries based on user-defined cut-offs on log curves and calculate thickness and average properties in each zone. Apart from average properties this plug-in also enables user to create spatial variance map of well log data/reservoir properties for desired zone/interval. This module is an essential kit for a Petrel* user to get a feel of reservoir properties distribution prior detail modeling.*

Keywords: Ocean, Petrel, Petrophysics, Variogram

Introduction

Petrel is a Seismic to Simulation software product of Schlumberger. The Petrel architecture allows the common users to develop extension using its platform Ocean. The current paper presents such an extension/Plugin that has three different components petrophysical average calculator, spatial analysis of petrophysical/well log data.

Data analysis process is a critical part of reservoir modeling in Petrel. Data analysis process in the property modeling workflow in Petrel helps to analyse data during the process of modeling. The SmartResQ calculator provides petrophysical summary of individual reservoir zones and their spatial relations, trends etc. in static reservoir modeling project before creation any model. Basic reservoir properties such as NTG, Porosity, Saturation, Net pay, HCPC (hydrocarbon pore column) etc. are assessed through well log data. SmartResQ can compute the important average properties from well log data and show the spatial distribution of them; which are really helpful for the geologist, geophysicists and even reservoir engineers to understand the reservoir petrophysical quality and its distribution. In Petrel, 2D map-based Hydrocarbon reserves are estimated using average reservoir property data from petrophysical source. Unless the petrel is provided with any tool to use

well logs to estimate average property that are normally generated and processed from software like “TechLog” and reservoir summation and average property maps like porosity, water saturation on a regional scale based on modeling exercise in Petrel. Though the data analysis can be done with wells which are not in the model, but it is a tedious process. In the input pane only one well and one surface can be used at a time. This simple User Interface of SmartResQ provides pay zone summary and their spatial relation as per the choice of interval by the user.

Method

As mentioned before that SmartResQ consists of two modules. The first Module is calculator which calculates netpay and other petrophysical average properties in multi-well and in multi zone scenario of the reservoir. The computation of these net pay reservoir properties involves cut-off applied for porosity, Vshale & water saturation. There are three cut-off levels namely Vshale/rock, porosity/net reservoir and saturation/net pay are used. In this application use of multi well and multi zone approach was done, providing user to vary cutoff and get the pay summary on multiple zone simultaneously. Pay summary, where key petrophysical parameters are calculated by “sum & average” method, and zonal average value is calculated by weighted average method, weighing to well thickness. A facility is

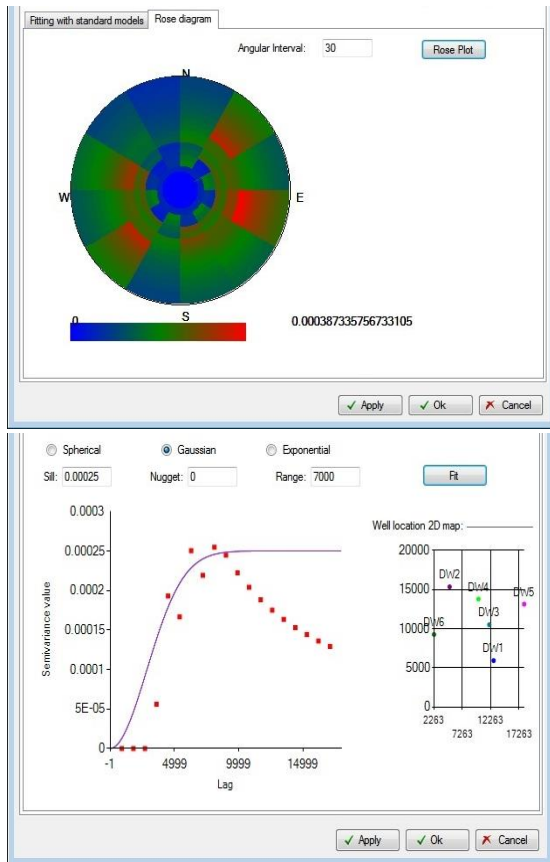


Figure 3: a) Rose Variogram b) Experimental variogram & variogram-fit

Conclusion

SmartResQ is an important module for Petrel* user for an initial investigation about the reservoir quality in subsurface. This module generates a quick output of the reservoir parameters and helps user to compare various reservoir zones at any desired stratigraphic interval. The module is architecturally well built and all the algorithms used for reservoir parameter estimation are standard formulae. The plug-in provides estimation of key petrophysical parameters as well as other “payzone” related parameters in Table which provides Pay Summary of all the reservoir zones (in case of multiple zone reservoir) at one place. Depth range and Averaging scheme provide different choice of petrophysical parameters estimation. The plug-in effectively handles the variogram modeling and variogram mapping using rose diagram. The rose diagram helps better in geological anisotropy analysis before actual modeling.

Reference

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