

Data Mining and Exploratory Statistics to Visualize Fractures and Migration Paths in the WCBS

Jean-Yves Chatellier*

Tecto Sedi Integrated Inc., Calgary, Alberta, Canada

jchatellier@shaw.ca

and

Michael Chatellier

Consultant, Calgary, Alberta, Canada

Abstract

Data mining and exploratory statistics have many applications that make maximum use of various types of data, find trends previously missed and solve problems by analogy. Dealing with very large amount of data reduces the level of uncertainty, a common feature of geological interpretation. Three-dimensional visualization gives the opportunity to identify with clarity 3-D geological features crossing stratigraphy and not recognized before. Data mining is most powerful when interactive and linked displays of crossplots, histograms, boxplots, are associated with 3-D views, graphic cluster analyses and other ANOVA.

Various aspects and methods of data mining are demonstrated with a series of examples using different types of data. Major extensive west-east faults and fractures are shown as planar alignments of high pressure problems in wells. Two examples of cross-formational faults and fractures are shown: the first one visualizes in 3-D, abnormally high values of H₂S or CO₂ (with respect to formation specific depth trends), the second one deals with thickness of porous intervals in every formation after statistic normalization and visualization of the top 3% of the thickest porous intervals. Visualizing and assessing the relative timing of fault activity and fluid flow is demonstrated using cuttings data from Canstrat in the Peace River Area. The reliability of the findings is shown by demonstrating that trend repeatability is not source dependent (e.g. geologist).

Data mining is ideally suited for the Western Canadian Sedimentary Basin because of the incredible amount of data available; its successful use should dramatically increase in years to come.