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3-D Interpretation Using Borehole Image Derived Dip Data

For the last decade 3-D seismic interpretation has become the main geoscience tool for exploration and reservoir development. During the same time, structural dipmeter analysis has become less practiced and only rarely finds its way into the 3-D world of today's reservoir modeling techniques. New software has been developed that creates surfaces from a single-well structural dipmeter analysis that can be easily imported into any 3-D reservoir modeling chain. These surfaces can be used to refine the structural interpretation based on seismic, particularly in reservoirs with highly dipping layers as well as in areas of high structural curvature like growth faults. The technique presented puts borehole structural dip analysis back into the "cube".

Using image-derived dip data, a wellbore structural interpretation based on stereonet analysis is conducted interactively. Then, having generated a series of formation markers, multiple x, y, z scatter sets are built. Formation marker scatter sets in the near-well area provide an enhanced, higher resolution understanding of the geology. Traditional gridding technique is then employed on each of the marker scatter sets including fault planes, upper fault blocks and lower fault blocks.

This paper/session will present examples of borehole image derived dip data that are projected into a 3-D volume for comparison and contrast to traditional seismic. The examples demonstrated include:

Growth Faulting Normal Faulting Reverse Faulting

Combining the expansive character of seismic with higher resolution image dip scatter arrays generates a joint seismic to wellbore interpretation. This synthesis "pins" multiple yet discrete well bore data into the seismic volume, evolving a more complete geological interpretation.