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COMPRESSIONAL STRUCTURES AND HYDROCARBON POTENTIAL

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ABSTRACT

Compressional structures around the world contain extensive proved petroleum reserves, but even more accumulations remain undiscovered and many existing fields are insufficiently exploited. The typical complexity of compressional structures and inadequate seismic resolution inhibit accurate interpretations and prospects.

COMPRESSIONAL METHODS

In a 30-second world-wind tour from the North American Rockies to the South American Andes and into the deepwater fold and thrust belts (i.e. Perdido) hydrocarbons abound. From the Middle East (Zagros) to North Africa and into Eastern Europe and the Caspian Sea area, significant potential still remains in compressional structures. And then there is the Southeast Asia Pacific region with New Zealand, Brunei, Papua New Guinea and other areas where compressional structures hold billions of barrels of potential hydrocarbons.

Is there a magical answer to unravelling the complexity of such areas in order to reap the harvest of hydrocarbon reserves? Critical to the best possible analysis of the data is an interpreter?s knowledge of compressional structural geology, and the application of techniques and methods that lead to geologically accurate and three-dimensionally valid subsurface structural interpretations and prospects.

Have you ever wondered what makes the difference between a great, successful oil and gas prospector and one who is mediocre or below average? Have you ever wondered why

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one geoscience team has a much greater success rate than others working within the same area? We have learned through research, observations and analysis that success is a direct result of an individual?s educational background and experience, coupled with a philosophy and methods employed in the quest to find hydrocarbons.

In regard to interpreting geological structures and in particular, compressional structures, an interpreter should have a fundamental, classic education in geology and a strong background in structural geology (Tearpock and Bischke 1991, 2002). When an interpretation is made in a particular tectonic setting like compressional area, experience shows that an interpreter needs to know as much as possible about the structural geology of the area. This places the requirement on an interpreting geoscientist initially to have a fundamental, classic education in geoscience. Without knowledge and understanding of geology, the applications of geophysics, petrophysics, workstation interpretation and computer mapping will be questionable, and potentially inconsistent with geologic principles. We must always remember that skilled people, not computers or workstations, find oil and gas.

One of the most impotant of the compressional-structural geologic techniques is structural balancing. The ultimate goals of balancing are to restore complexly deformed rock to its original state and to determine the geologic sequence of events. Perhaps the major advantage of balancing is to allow the interpreter to check for proper correlations in areas where data are poor and bed dips are steep. Such information provides a better understanding of the geometry of a structure, the migration pathways for hydrocarbons and the

When you place your investment dollars into exploration or development prospects or in the purchase of a producing field, you expect the highest probability for success. This can best be achieved through well-trained, experienced interpreters using proven methods and techniques for the tectonic setting (i.e. compressional) being studied, coupled with advanced integrated interpretation software and project workflows.

In petroleum exploration and production, nothing can take the place of the experience and skills of a good interpreter. It is well-trained people who find oil and gas, not computers or workstations.

REFERENCES

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A QUICK STRUCTURAL CHALLENGE

Review the simplified compressional fold shown here. The interpreted fold is based on surface dip and seismic data. Applying general principles of structural geology regarding bed thickness, axial surface analysis and fold geometry, what can you potential trap mechanism, resulting in lower risk wells through better and more accurate prospects and reservoir maps, as well as the understanding of geologic trends such as sand patterns.

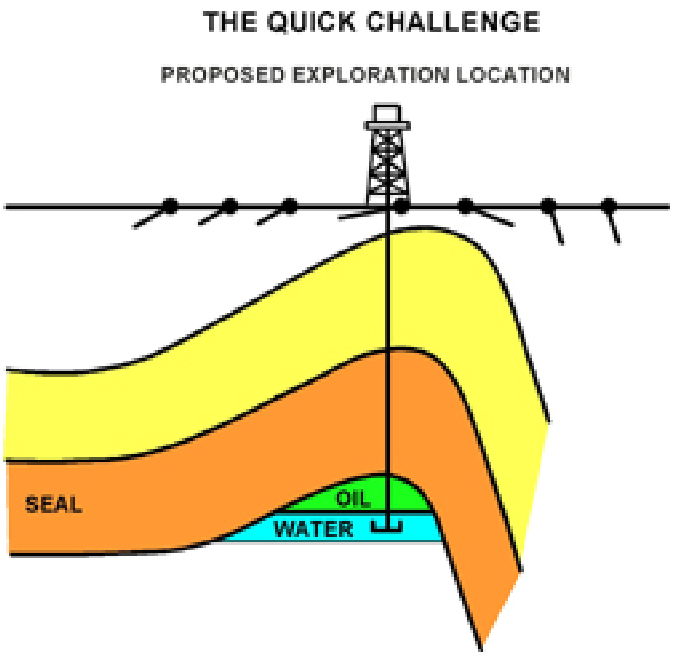
The basic principle behind all balancing techniques is that nature, and not an interpreter, can create or destroy mass. The interpreter must account for all of the present or pre-existing volume. This is often referred to as volume conservation (or mass balance.) From an economic standpoint an interpretation that does not conserve volume, but instead introduces mass overlaps or gaps, can result in unrealistc prospects that end up as costly dry holes (Bischke 1994.)

The benefits of balancing are fundamental to correct geologic interpretation. The earth?s subsurface contains no holes or mass overlaps; thus a cross section or depth corrected seismic section that does not balance cannot be geologically reasonable on simple geometric grounds. Unfortunately, a balanced cross section, although physically reasonable, need not necessarily result in a viable geologic interpretation.

Balancing is not unique, and two geoscientists can produce two balanced sections that are not alike. Again, the more complete the data set, the better the educational background and expertise of the interpreter with the application of valid interpretation techniques and methods, the more likely that the structurally balanced section will reflect reality, leading to lower risk viable exploration prospects.

say about the proposed drilling location and the probability of success?

Hint: Notice the high back limb and front limb dips. How will these limb dips image on seismic data?



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