

# **Compositional Grading: Its Causes and Use in Subsurface Characterization**

James, Bruce R., Trey Meckel, Andrew Murray, and Bob Davis, Woodside Petroleum, Perth, Australia

Compositional grading in reservoirs is a common phenomenon. Grading refers to changes in hydrocarbon properties, such as bulk properties or chemical components, within a reservoir with distance or elevation.

The magnitude in grading of a parameter can vary greatly, depending on the geological/geochemical environment or history. Where grading is significant, it is a powerful tool for subsurface characterization, particularly in deepwater oil and gas development where uncertainty is large and appraisal costs are high.

However, grading is often a misunderstood phenomenon and is under utilized as a tool. For example, in the past significant grading was often not recognized or not enough samples were taken to be able to understand it or utilize it as a tool for subsurface characterization. This misunderstanding is partly due to a communication gap between the geochemical and reservoir engineering communities.

The purpose of this paper is to use field examples to demonstrate a) some of the geological/geochemical aspects controlling grading to give greater understanding of where and where not grading is significant and b) how grading can be used to improve subsurface characterization, such as predicting fluid properties away from well bores and compartmentalization.