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**Can the Reservoir Continuity Technique be Applied to a Compositionally Graded Oil Column? Methodological Remarks and Case History Application**

Numerous studies have documented the occurrence of oil columns that contain compositional variation with depth. This can result for several reasons and examples include: gravity segregation, thermal diffusion, inadequate time for equilibrium processes, dynamic flux induced by active aquifer, biodegradation, and various mixing scenarios. These conditions, separate or in combination, can lead to significant variation in fluid composition in both vertical and lateral directions.

A case study of compositional grading is provided by the hydrocarbon resources of the Val D'Agri region within the Southern Apennines Thrust Belt (Italy). The carbonate reservoirs contain thick oil columns (600 to 1000 meters) within karsted vuggy intervals and extensively developed fracture systems. Tectonic and basin modeling indicate substantial uplift and unroofing that led to substantial pressure and temperature decrease within the reservoir interval. The combination of tectonic setting and reservoir character contribute to the development of unstable, compositionally graded oil columns. Specific molecular fractionation trends are identified from volatile, intermediate, and heavy molecular weight fractions (hydrocarbons plus organic sulfur compounds). The results have direct application to devising a successful strategy to identify reservoir compartments.