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Charge Risk and 3-D Visualization of Petroleum Systems in the San Joaquin Basin, California

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A calibrated model using PetroMod software depicts the 3D evolution and geometry of petroleum systems in the San Joaquin Basin, California. The modeling and geochemical evidence indicate that maximum burial occurred in latest Pliocene to Pleistocene time. Except on the west flank of the basin, where steep dips in outcrop and seismic data indicate substantial uplift and erosion, only a minor amount of section has been eroded. Stable carbon isotope and biomarker data identify four principal oil types that correlate to four different source rocks: the Miocene Antelope Shale, the Eocene Kreyenhagen Formation, the Oligocene Tumey Formation, and the Cretaceous Moreno Formation. Together, these petroleum systems generated at least 15 billion barrels of recoverable oil and 19 trillion ft3 of recoverable gas. Most oil migration occurred in distinct stratigraphic intervals during the Late Cenozoic.

PetroRisk was used to assess the relative importance of different input parameters in controlling the predicted volumes and compositions of accumulated petroleum. Tornado diagrams show that the key variables include kerogen kinetics and initial hydrogen index prior to thermal maturation. Lithology was also a key variable controlling petroleum expulsion from the Antelope siliceous shales.