

Petroleum Geochemical Criteria for Mapping the Petroleum Systems in the San Joaquin Basin, California

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New oil analyses combined with published data for more than 230 oil samples were used to characterize and map the distribution of oil types and to correlate the oil types to their respective source rocks. These correlations provide the criteria to define and map the petroleum systems in the San Joaquin Basin. Geochemical parameters most useful for correlation are stable carbon isotope ratios and biomarker composition including pristane, phytane, and sterane and terpane distributions. The results show that there are four petroleum systems from the following sources: Cretaceous and Paleocene Moreno Formation, Eocene Kreyenhagen Formation, Eocene Tumey shale (industry usage), and the Miocene Antelope Shale Member of the Monterey Formation. Most of the oil from the basin has low to moderate sulfur content (<0.6 weight percent [wt%] S), although some Miocene oils have as much as 1.2 wt% sulfur. Mapping the distribution of the oil types shows that the Miocene oil type is restricted to Kern County in the southern third of the basin. The composition of Miocene oils along the southern and eastern margins of the basin reflects the increased contribution of terrigenous organic matter to the marine basin near the Miocene paleoshoreline. Kreyenhagen oils are widely distributed along the western half of the basin, and Tumey oils are present in the central basin. The Moreno oil type has only been found in the Coalinga area, southwestern Fresno County, and the Griswold Canyon area of Vallecitos field, San Benito County. These oil type maps provide the basis for petroleum system maps that incorporate source rock distribution and burial history, migration pathways, and geologic framework. These petroleum system maps are used for the U.S. Geological Survey resource assessments of the basin.