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USE OF ORBITAL CYCLICITY AS A HIGH-RESOLUTION DATING AND CORRELATION TOOL IN THE MONTEREY AND SISQUOC FORMATIONS OF THE SANTA MARIA BASIN AND OFFSHORE EQUIVALENTS, CENTRAL CALIFORNIA MARGIN

Can Milankovitch climatic cycles can be used to provide a high-resolution chronostratigraphic and correlation tool for the late Miocene-early Pliocene California Margin? The late Neogene sediments of the upper Monterey and Sisquoc Formations and their offshore equivalents form a thick and important component of the onshore and offshore Santa Maria Basin. But these rapidly accumulated sediments are difficult to date because they were deposited in only a few diatom zones and contain relatively few calcareous microfossils.

Milankovitch cycles may help solve this problem. Changes in the global distribution of solar radiation due to past orbital cyclicity (413 to 19 kyr periods) have strongly influenced atmospheric/oceanic circulation and climate. These changes are recorded in hemipelagic sediments by modulation of rates of coastal upwelling and terrigenous runoff. The Santa Maria Basin was sensitive to such climatic variation via changes in the strength of the California Current that controlled upwelling, sea-surface temperature, and water-column oxygenation. Therefore, rhythmic bedding, observed in outcrop or detected by well logs, may reflect changes in global climatic conditions and have chronostratigraphic, not just lithostratigraphic, significance.

We have demonstrated orbital cyclicity (using gamma ray logs) down to at least ~100,000-year cycles in a well-dated Ocean Drilling Program core (ODP Site 1016) ~100 km offshore of Point Conception and are correlating cycles from this site to more proximal offshore petroleum wells. We intend to extend these correlations to onshore wells and outcrops across the Santa Maria Basin. Astrochronology is a promising tool that could help improve dating of biostratigraphic zonations, documentation of diachronous formational and facies changes, and measurement of accumulation rates of important sedimentary components. To the best of our knowledge, this is the first use of cyclostratigraphy and well logs to refine chronostratigraphy in a Californian petroliferous basin.