

Middle Miocene Organic Carbon Accumulation Rates in the Monterey Formation in the Santa Barbara and Santa Maria Basins, California

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Abstract

Middle Miocene post-compaction sedimentation rates in the Monterey Formation vary rapidly both laterally and vertically due to tectonically induced changes in depositional setting and changes in phytoplankton productivity rates, detrital input, and sediment redistribution by bottom currents. Extremely condensed intervals in the Lower Mohnian Stage (10-13 Ma) are found in the stratigraphic sections exposed along the Santa Barbara coastline between Naples Beach and Gaviota Beach, where sedimentation rates average 4 to 9 m/my over this 3-my interval. In contrast, expanded intervals are found in the middle Miocene basin center in the Santa Barbara-Santa Maria basin where sedimentation rates up to 100 m/my are found. The condensed sections in the coastal outcrops west of Santa Barbara are comprised of phosphatic marls with average TOC values of 10-12.5% in the Lower Mohnian. These condensed sections were deposited in a bank top environment where diatomaceous sediments were swept by currents into the adjacent basin, resulting in silica-poor intervals. The Lower Mohnian Stage in the adjacent depocenter is silica-rich with average TOC values in the range of 2-4%. Calculated organic carbon accumulation rates (OCAR) are only 0.1 mg/cm²/yr for the bank top deposits, but up to four times higher in the centers of the adjacent basins. In the underlying Luisian Stage (13-15.5 Ma) the sedimentation rates are as low as 25 m/my in coastal exposures west of Santa Barbara, but two to four times higher in the adjacent basin, where the OCAR averages as much as 1.0 mg/cm²/yr.

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