

Preliminary Plio-Pleistocene Stable-isotope and Paleosol Data from the Fish Creek-Vallecito Basin, Southern California: Implications for Timing of Uplift of the Peninsular Ranges

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In this study we use detailed measurements and isotopic analyses of Plio- Pleistocene paleosols in the Fish Creek-Vallecito basin to test for the onset of a rain shadow created by the uplift of the Peninsular Ranges. In the basin, abundant paleosols are exposed in a thick, tilted stratigraphic section that accumulated in the hanging wall of the West Salton detachment fault. New high-resolution magnetostratigraphic dating allows high precision age determination of paleosols. Carbonate nodules from 23 paleosols ranging in age from 3.7 to 1.0 Ma were analyzed for oxygen and carbon isotopic compositions. The data reveal an increase in carbonate $d^{18}O$ values at about 2.5-3.0 Ma, from -10.5 ± 1.5 permil to -9.2 ± 1.8 permil. Carbon isotope values in pedogenic carbonate vary between -10.4 permil and -3.8 permil with no apparent trend. A total of forty-nine paleosols were described in the study interval. Most paleosols have shallow carbonate horizons and thin, indistinct A horizons. Our finding of an increase in $d^{18}O$ is opposite of the change that would be produced by the onset of a rain shadow in the study area. These data therefore indicate that Peninsular Ranges uplift occurred before 3.7 Ma or after 1 Ma. The increase in $d^{18}O$ at 2.5-3.0 Ma coincides with a global climate change caused by the onset of northern hemisphere glaciation, and may reflect an increase in enriched Pacific Ocean-derived storms and decrease in the isotopically depleted monsoonal storms, or an increase in soil water evaporation driven by local aridification.