Molecular records of northern California vegetation change

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During the late Pliocene and early Pleistocene, the northern California margin experienced major tectonic and climatic changes. A detailed record of these changes is preserved in two marginal marine sedimentary sequences tectonically uplifted and exposed along the California margin: the slope to outer shelf Rio Dell Formation, near Cape Mendocino, and the shelf to non-marine Merced Formation, near San Francisco. Portions of these two formations were analyzed at ~5000 year resolution through several apparent glacial-interglacial cycles for a diverse array of molecular fossils derived from terrestrial ecosystems: steroids, sesquiterpenoids, diterpenoids, triterpenoids, *n*-alkanes, and polycyclic aromatic hydrocarbons (PAH).

Context for this terrestrial marker data is provided by complimentary analyses of: sedimentary structure and texture, macrofossils, non-plant related molecular fossils, benthic foraminiferal assemblage, the stable isotopic composition of benthic foraminiferal carbonate, and palynology.

The combined analysis of these terrestrial molecular fossils allows the identification of distinctive and climatically sensitive elements of ancient California flora. For example, salt marsh floras -- abundant during marine transgressions -- are marked by systematic changes in the isotopic composition and relative abundance of different odd carbon number long-chain *n*-alkanes in sediment extracts, and *Cupressaceae* dominated floras are marked by a high relative abundance of tetracyclic diterpanes and isotopically light C_{33} and C_{35} *n*-alkanes. Glacial-interglacial cycles in PAH abundance and composition reflect dramatic changes in seasonal rainfall distribution, vegetation communities, and the frequency, magnitude, and nature of wildfires.

This multi-proxy study allows the interpretation of competing source and diagenetic effects upon the distribution of terrestrially-derived molecular fossils in the marine record. Observed diagenetic alterations are sometimes considerable and have implications for the use of terpenoid molecular fossils in other studies.