Mantle Degassing—A Possible Hydrocarbon Source in Regions of Anomalous Uplift

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Recent speculations on the production and loss of the high-density batholithic root of the southern Sierra Nevada of California interpret some regions of anomalous subsidence in the southern Sierran arc and adjacent San Joaquin Valley forearc basin to represent convective removal of mantle lithosphere during arc magmatism. Other workers have postulated that some hydrocarbons are primordial (i.e., inorganic) in origin and related to mantle-derived basement, in marked contrast to popular kinetic models that attribute most of the world's petroleum reserves to maturation of organic material. Possibly, the generation and subsequent removal of upward-rising masses of high-density mantle material (so-called mantle "drip" structures) may be accompanied by concurrent convective removal of primordial hydrocarbons entrained in the mantle. Given the dramatically different densities of eclogitic mantle material and carbon-based compounds, different paths of crustal migration are likely, with mantle drips initially under-plating batholithic terranes adjacent to regions of anomalous subsidence, and primordial hydrocarbons migrating in the opposite direction to give rise to regions of adjacent anomalous uplift, as buoyant primordial hydrocarbons rise through the crust and push on overlying strata. One example may be the Palmdale bulge. If so, inflation of this bulge by mantle degassing may prove to be a previously overlooked gas source, leading to speculation that mantle flatulence could be responsible for some of the isolated dry gas accumulations of the Bakersfield Arch.