GROUNDWATER MAPPING IN THE IRVINE SUB-BASIN, ORANGE CO., CA, USING STABLE ISOTOPE AND GENERAL MINERAL COMPOSITIONS

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The coupled analysis of oxygen isotope composition with other geochemical parameters can be used to map geochemically distinct groundwater bodies, possibly leading to the identification of recharge areas, assessment of water-rock interactions, and delineation of subsurface flow paths. Although southern California's Orange County basin possesses one of the most comprehensive, three-dimensionally dense groundwater monitoring systems in the world, only a small section of the basin has been isotopically characterized (Clemens-Knott et al., 1999). Geochemical and isotopic analyses of ≈50 groundwater samples collected from 12 multiport wells within the Irvine Sub-basin and precipitation samples from a rain gauge network surrounding the sub-basin will be used to assess groundwater sources, map three-dimensional flow paths between 4 and 428 m below ground surface, and to model possible mixing and water-rock interactions. Oxygen isotopic values vary from -1.6 to -10.4‰ for local precipitation and from -5.8 to -9.4‰ for sub-basin groundwater. Compared to the 698 km² main Orange County basin, this appended 78 km² basin is shallower and more chemically diverse, with elevated TDS zones suggestive of water-rock interaction during incidental recharge from the Tustin Hills bounding the southwestern Santa Ana Mountains. Additionally, groundwater in the Irvine sub-basin has a history of anthropogenic influences, including irrigation recharge of geochemically distinct Colorado River water. Results from this research will provide constraints on the possible hydrologic interactions between the sub-basin and the main basin as development in the Tustin-Irvine area increases and improve our general understanding of groundwater flow and chemical evolution in alluvial basins.