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Depositional History of Recent Sediments from San Pedro Shelf, California: Reconstruction using Elemental Abundance, Isotopic Composition and Molecular Markers

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ABSTRACT

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Sediments deposited near and impacted by a major wastewater outfall system in southern California were examined for their organic content and composition. A combination of (% organic carbon (OC), % organic nitrogen (ON)), stable isotopic ($\delta^{12}C$, $\delta^{15}N$) and molecular analyses were used to reconstruct the depositional history of these Recent sediments. In the immediate vicinity of the outfalls, the variations in the bulk properties (%OC; %ON; $\delta^{12}C$, $\delta^{15}N$) of the sedimentary organic matter were closely correlated and appeared to reflect changing inputs of sewage particulates. This allowed the successful application of a two-source mixing model, whereby the fraction of waste-derived organic matter in the sediments was estimated. With increasing distance from the point of waste discharge, however, the validity of the model became tenuous owing to inputs from other sources, changing depositional environments and other factors. Source-specific molecular markers were used to corroborate predictions based on the mixing model and to establish sediment chronology. Key marker compounds used in this study include: (i) the high molecular weight normal alkanes derived from terrigenous plant debris; (ii) 17α(H), 18α(H), 21β(H)-28,30-bisnorphopane, a pentacyclic triterpene characteristic of California oil seeps and shales; (iii) DDT+ metabolites; (iv) the long-chain alkylbenzenes present in municipal wastes as a result of detergent use.