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Dye dispersion in the surf zone: Measurements and simple models

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ABSTRACT

To examine the spatial and temporal effect of low-volume land-based runoff on beach contamination, discrete batches of dye were released at the shoreline at three beaches in Santa Monica Bay in 2000 (Malibu Creek, Santa Monica Canyon and Pico–Kenter drain). Dye concentration was measured at the shoreline 25, 50 and 100m alongshore from the dye release point for up to 40 min after dye release. The shoreline concentration time series are characterized either by approximately exponential decay in concentration after passage of the dye patch maximum concentration or by persistent low concentration up to 30 min after passage of the initial dye patch front. In the absence of detailed measurements of physical conditions, several simple advection–diffusion models are used to simulate shoreline concentration time series for an idealized surf zone in order to probe the roles of alongshore current shear and rip currents in producing the observed characteristics in dye concentration time series. Favorable qualitative and quantitative comparison of measured and simulated time series suggest alongshore current shear and rip currents play key roles in generating the observed characteristics of nearshore dye patch dispersion. The models demonstrate the potential effects of these flow features on the extent and duration of beach contamination owing to a continuous contamination source.