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Stormwater runoff plumes observed by SeaWiFS radiometer in the Southern California Bight

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ABSTRACT

Understanding the factors that influence the incidence and dispersal patterns of freshwater runoff plumes in southern California is important for management of coastal water quality. Significant river discharge is associated with episodic winter rainstorms, leading to turbid pollutant and pathogen laden stormwater plumes that are clearly visible near shore in the Southern California Bight (SCB). We analyzed 1.1-km spatial resolution sea-spectral reflectance data acquired from 1997 to 2003 by the Sea-viewing Wide Field-of-view Sensor (SeaWiFS), focusing on four regions with distinctive adjacent watershed properties: Ventura, Santa Monica Bay, San Pedro Shelf, and Orange County/San Diego. The area of each plume was detected by the backscattering characteristics of surface waters, i.e., normalized water-leaving radiation of green-yellow wavelength 555 nm (nLw555). Plume area size was correlated with rainstorm magnitude, which was estimated from atmospheric precipitation averaged over the total area of the watersheds connected to the seashore. The time lag between rainstorm and maximum plume was one day in San Pedro Shelf region and two days in the other three regions. Assessing maximum correlation between precipitated rainwater and plume size, we estimated the optimal nLw555 values best characterizing plume boundaries in each of the four study regions. Another quantitative characteristic derived from this correlation between rainwater and plume size was defined as the coefficient of persistence, a relationship between the speed of freshwater discharge and the time of plume water dissipation; this coefficient varied according to watershed. The primary factors regulating the relationship between rainstorm and plume area were watershed land-use characteristics, size, and elevation.

Full Text

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