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Suspended particle dynamics in a southern California urban estuary during the dry season

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ABSTRACT

Sediments in urbanized estuaries often have elevated levels of pollutants and are the subject of cleanup or management actions. Understanding particle dynamics in an estuary can provide insight into possible sediment sources and can inform management decisions. This study deployed a laser scatterometer (LISST-100X, Sequoia Scientific, Inc., Bellevue, WA) in the Ballona Creek Estuary (BCE), in southern California, throughout the summer of 2008 to investigate particle dynamics. The LISST- 100X sampled total suspended material (TSM) in the near-sediment water column analyzed particle size frequency in 32 log-spaced diameters between 2.73 and 462 μm once every 6 minutes. Tidal elevation was measured at the site to estimate the tidal prism throughout the deployment. The bio-fouling observed between instrument servicing was approximated by logistic equation and removed from the raw data. The detrended data matrix on particle size distribution was transformed using Principal Component Analysis (PCA) multivariate statistics. The three leading PCA modes (>92% of total variability) were attributed to different particle size classes: mid-size (71%), small-size (14%), and largesize (7%). Domination of mid-size TSM was associated with high phytoplankton biomass in the coastal waters. This conclusion was based on correlation between the first PCA mode and remotely-sensed satellite (MODIS-Aqua) observations of surface chlorophyll a (CHL) concentrations in Santa Monica Bay. In addition, first PCA mode variability was mostly diurnal rather than semidiurnal (i.e., associated with phytoplankton growth rather than tidal transport). Small- and large-size sediments (second and third PCA modes) were dominated by semi-diurnal variability, indicating the role of tidal circulation in forcing horizontal transport and resuspension. The relationship between tides and small- and large-particle TSM was non-linear, indicating high spatial heterogeneity of these particles. The extremes of both small and large-particle TSM were observed during spring ebb tides when low concentrations of small-size particles and high concentrations of large-size particles were transported down-estuary. The results from this monitoring indicate that greatest pollutant level reductions in the BCE would come from minimizing the pollutant concentrations on sediment input into the system rather than efforts to clean up sediments *in situ*.

Full Text

ftp://ftp.sccwrp.org/pub/download/DOCUMENTS/AnnualReports/2009AnnualReport/AR09_097_108.pdf