Abstract View

Volume 15, Issue 12 (December 1985)

Journal of Physical Oceanography
Article: pp. 1711–1720 | Abstract | PDF (628K)

A Three-Dimensional Simulation of the Hudson–Raritan Estuary. Part III: Salt Flux Analyses

Lie-Yauw Oey and George L. Mellor

Geophysical Fluid Dynamics Program, James Forrestal Campus, Princeton University Princeton NJ 08542

Richard I. Hires

Department of Civil and Ocean Engineering, Stevens Institute of Technology, Hoboken, NJ 07030

(Manuscript received December 12, 1984, in final form May 31, 1985)

DOI: 10.1175/1520-0485(1985)015<1711:ATDSOT>2.0.CO;2

ABSTRACT

Salt fluxes and volume transports in an estuary vary considerably over subtidal time scales of a few days to weeks in response to wind and neap–spring tidal forcings. Results from a numerical simulation of the Hudson–Raritan estuary are used to study subtidal variations of salt fluxes and the physical mechanisms for salt balance in the estuary. Simulated salt fluxes are compared with available observations. Observations support the model's finding that analysis of volume and salt fluxes based on short-length data records (<30 days) can lead to misleading conclusions.

"Tidal trapping" effects due to coastline irregularities contribute most to the salt balance at the Sandy Hook–Rockaway Point transect and at the Narrows. A two-week observational record is analyzed to support this finding. Simulated subtidal variation of the tidal trapping term at the Sandy Hook–Rockaway Point transect compares well with that observed. In Raritan Bay, where tidal currents are weak and effects of winds are significant, contributions to salt balance from vertical velocity and salinity gradients are comparable to transverse contributions. This occurs despite the fact that surface-to-bottom salinity differences during the simulation period—a period of low freshwater flow-never exceed 0.5‰ throughout most regions of the bay. A two-dimensional, depth-integrated *xy–t* model, in which the horizontal dispersion coefficients are modeled empirically, may not perform well in this case.

top

Headquarters: 45 Beacon Street Boston, MA 02108-3693
DC Office: 1120 G Street, NW, Suite 800 Washington DC, 20005-3826
amsinfo@ametsoc.org Phone: 617-227-2425 Fax: 617-742-8718
Allen Press, Inc. assists in the online publication of *AMS* journals.