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Investigating the effects of river flow on Apalachicola Bay by frequency analysis and hydrodynamic modeling

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Evaluating the effects of changing river flow on the ecology in downstream estuaries is an important issue. In this paper, a case study in Florida of USA is presented. Apalachicola Bay is located in the panhandle of Florida, which receives freshwater from Apalachicola River in the south end of the Apalachicola-Chacttahoochee-Flint (ACF) basin. The bay is a highly productive barrier-island estuary, which in general produces 90 percent of the state's commercial oyster harvest, and the third largest shrimp catch. Preservation of the ecology in Apalachicola Bay has been recognized as of state, federal, and international importance. The bay has been designated as a National Estuarine Research Reserve, Outstanding Florida Water, State Aquatic Preserve, and International Biosphere Reserve. During the past several decades, the freshwater resources in the ACF basin have been developed to meet various demands for municipal and industrial water supply, flood control, hydropower, navigation, agriculture water supply, and fish and wild life conservation. There are hundreds of reservoirs in the basin, which can be used to regulate freshwater to meet certain water demands, which would modify the natural freshwater flow in Apalachicola Bay. If upstream water demands increase, freshwater inflow to Apalachicola Bay would alter and reduced. Since 1950, considerable growth has occurred in the Atlanta-metropolitan area. The population in this area increases from less 0.5 million in 1950 to almost 3 million in 1993. This has resulted in a considerable increase of demand for freshwater resources. Changing reservoir operation and water demand has resulted in the changes of freshwater inputs to the bay. As a result, it will affect predator-induced oyster mortality and growth. In the case study, a 3D hydrodynamic model was applied to examine the responses of estuarine salinity to the freshwater inflow. Frequency analysis has been conducted to identify the most frequently occurred river flow, and the frequency density of salinity in the oyster beds. The integration of hydrodynamic modeling and frequency analysis will support decision making in estuarine and water resources managements.

Composition and sources of non-aromatic hydrocarbons in surface sediments of Daya Bay, China

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Reports related to lipid in Daya Bay, northern South China Sea, are very scarce. The present work represents the first study on the composition, origin and distribution of non-aromatic hydrocarbons (NAH) in solvent extractable organic matter (EOM) from Daya Bay surface sediments, and provides a background estimation of the contamination of Daya Bay surface sediments with petroleum related hydrocarbons. TOC and EOM contents show distinct spatial differences. TOC accounts for 0.861.60% of the dry sediment. EOM varies in a large range of 881637 μg g^{1} dry sediment and accounts for 0.8311.53% of the TOC contents. The contents of non-aromatic hydrocarbons vary from 32276 μg g^{1} dry sediment and account for 5.864.1% of the EOM. *n*-Alkanes with carbon number ranging from 1535 are identified to be derived from both biogenic and petrogenic sources in different proportions. The contribution of marine autogenic input to the sedimentary *n*-alkanes is lower than the allochthonous input based on the average $n\text{-}C_{31}/n\text{-}C_{19}$ alkane ratio. 25.646.5% of the *n*-alkanes, with a mean of 35.6%, are contributed by vascular plant wax. Results of unresolved complex mixture, isoprenoid hydrocarbons, hopanes and steranes also suggest possible petroleum contamination. There is strong evidence of a common petroleum contamination source in the Daya Bay.

Is the Three Gorges Dam changing the biogeochemistry of Yangtze River?

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