
Evaluation of the water mixing in a shallow rectified tropical river and its implications for water management

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Abstract

Rectification of coastal rivers allows an easier penetration of the sea water, thereby modifying the structure of the riparian vegetation, a significant environmental impact. In the present work, the modifications in the water mixing processes were evaluated in the estuarine region of the São João River, Cabo Frio, Brazil. The São João River is a rectified river of the Brazilian South East coast, with a watershed of 2,160 km², running some 150 km until the Atlantic Ocean. Extensive surveys with a YSI CastAway CTD that measures salinity, temperature and depth were carried out in the mixing zone of the river during the spring tide of dry and wet seasons. The range of salinities within the study was from full fresh water (salinity 0) to full saltwater (salinity 35). Results show that only in a very restricted region a significant stratification is present (between one and three km away from the ocean). In the remainder of the system, very little stratification could be observed. The absence of a salt water wedge seems to be a natural characteristics of this kind of shallow estuaries, with depths of not more than three meters. On the other hand the penetration of a sort of "mixed water front" was observed to reach some 13 km upstream, which drift forth and back with the tide. During floods, the amount of freshwater contributed to the system is considerably higher and the mixed water front is pulled downstream almost to the ocean outlet. The management implications of the identification of this slowly mixing is that the residence time of the waters in the estuary are much higher than it should be expected from an intense and complete mixing and sewages discarded in the river should remain in the system much longer.

Keywords: Salinity, Estuary, Tide, São João River, Brazil

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