

Water Renewal Time in Santa Catarina Island Bay, Brazil

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Hydrodynamics has direct consequences for many human activities and also determines how human presence can affect the aquatic environment, especially in highly populated estuaries. One such case is the Bay of Santa Catarina Island (BoSCI) located between the mainland and Santa Catarina Island. Studies using hydrodynamic modelling to elucidate water renewal dynamics are commonly carried out in estuarine environments with only one ocean boundary, while investigations in environments with more than one ocean boundary are relatively rare. Santa Catarina Island Bay (SCIB), located in southern Brazil, presents a unique geomorphology in that it is elongated, two-mouthed and subdivided in its central portion by a strait. This article describes a vertically integrated hydrodynamic model for SCIB. An evaluation of the model's performance based on data registered *in loco* was used. A description of the water renewal dynamics of BoSCI according to this model was obtained. This model is a good representation of bay hydrodynamics based on statistical indexes which accurately show water level and current velocity. It provides reasonable to excellent representation of the v (north-south) component of current velocity, but more limited representation of the u (east-west) component was obtained. Given the shape of SCIB and its two open boundaries, a noteworthy hydrodynamics was observed. Specifically, the water runs northwards through SCIB, resulting in $199 \text{ m}^3 \cdot \text{s}^{-1}$ of water entering at the southern mouth, but $236 \text{ m}^3 \cdot \text{s}^{-1}$ exiting at the northern mouth. Tidal streams are asymmetrical, with the incoming tide from the northern mouth flowing across the North Bay and passing the strait between the bays, whereas flows entering the southern mouth are more restricted to the southern portion of South Bay. The time required for water renewal by oceanic or riverine waters within the bay increases in a northerly direction, with a typical renewal time of, approximately, 40 days.