**ABSTRACT**

Estuaries are a subject of increasing interest during the last several years due to the importance socio-economic and environmental issues. On the one hand, estuaries are a complex system with a rich biodiversity; on the other hand, the impact of anthropogenic pressures on their fragile ecosystems has led to endanger their environment. Understanding the estuarine dynamics is fundamental for the ecosystems, especially in the zone of estuarine turbidity maximum (ETM), characterized by large biological productivity and high nutrient loadings (Morris et al., 1978). This important observation being a central paradigm in the present work.

Thus, the physical mechanisms driving estuaries are not fully understood, and it is very challenging to generalize estuarine physics in a single conceptual model (Chatwin 1976, Jay and Musiak 1996, Pritchard 1956, Hansen and Rattray 1965, Geyer et al. 2010, Geyer and MacCready 2013). The objectives in this work are: (1) to provide a general review for improving our understanding of estuarine physical dynamics, (2) to identify the mechanisms that influence sediment changes in the tide-dominated estuaries, and (3) to develop a generalized understanding of dynamics in estuarine systems, based on contrasting numerical models and in situ monitoring networks.