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INTRODUCTION

Storm surge is a sea level rise driven by intense atmospheric pressure and temperature gradients, generally associated to low pressure centers in the surface of the atmosphere (RESIO and WESTERINK, 2008).

Due to the increase in mean sea level, as well the increase of the frequency and intensity of these extreme events, it is evident the need of comprehension of oceanographic processes at coastal regions through scientific research, in order to provide technical and scientific background for the best solution of problems related to coastal management (CHURCH et al., 2013).

For a better understanding and representation of the local hydrodynamic processes, computational modeling constitutes an excellent methodology (NPH, 2017).

The objective of this study is to characterize and simulate storm surge events in the Estuary of Santos-São Vicente-Bertioga, in order to provide better results of hydrodynamic forecast in this estuary.

MODEL DOMAIN

The Estuary of Santos-São Vicente-Bertioga is located in the Metropolitan Region of Baixada Santista, on the coast of the State of São Paulo (Figure 1). This metropolitan region is formed by nine municipalities: Santos, São Vicente, Praia Grande, Mongaguá, Guarujá, Peruíbe, Itanhaém, Cubatão; and Bertioga. The region of Baixada Santista presents high demographic density, due to its geographic location and socioeconomic factors. The hydrographic system of the region under study can be subdivided into three estuaries and one bay: Estuary of Bertioga Channel; Estuary of Santos Port Channel; and Estuary of São Vicente, the last two with their mouth in Santos Bay.

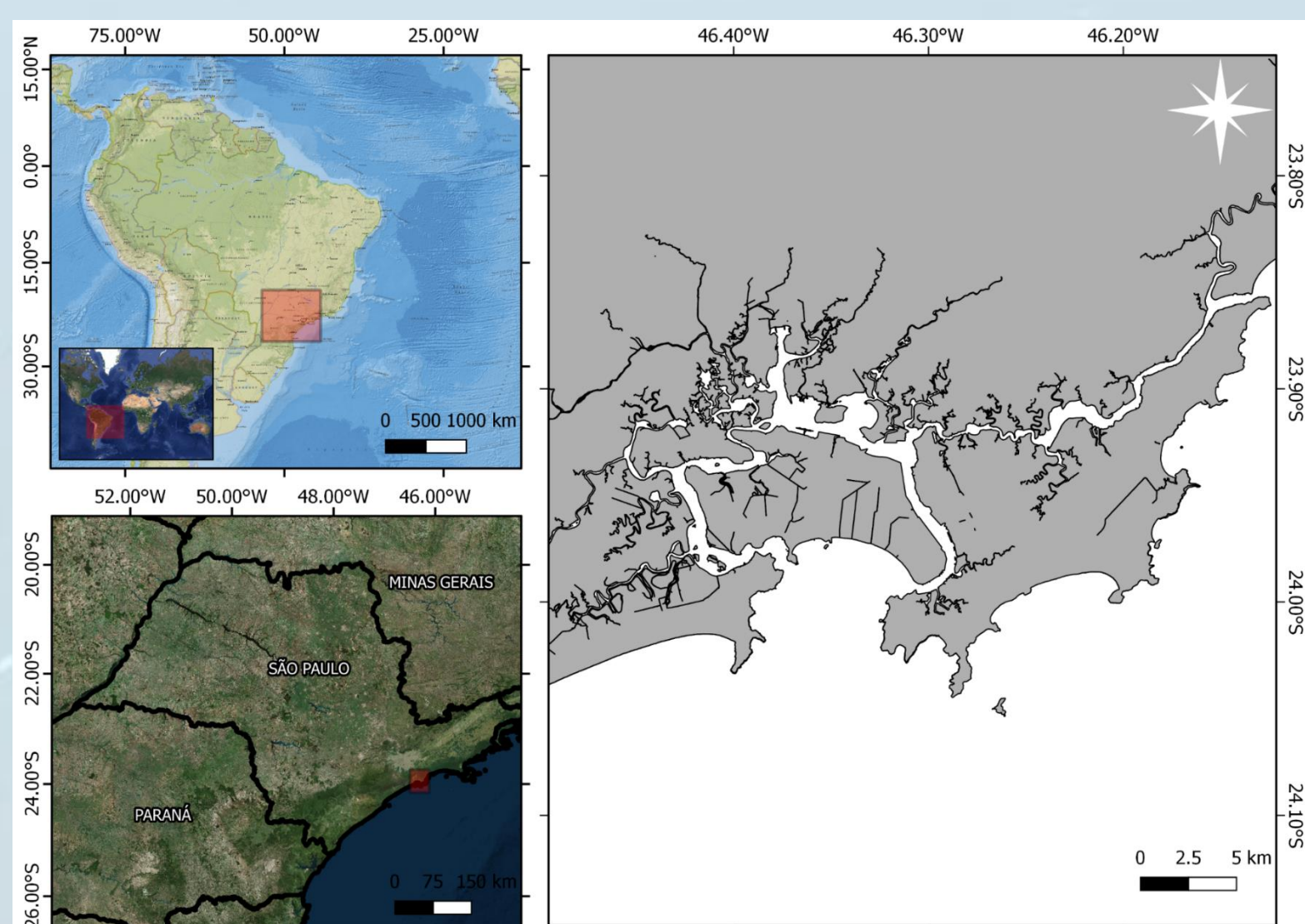


Figure 1 – Geographic location of the Estuary of Santos-São Vicente-Bertioga

The mean tidal amplitudes in the Santos Port Channel are 1.23m and 0.24m, respectively in spring and neap tides. The tide of the estuarine channels is irregular, of mixed and semidiurnal character, with main period of 12h42min. The cold fronts are frequent in the region - mainly in the winter - and produce changes in the mean sea level, which can exceed 0.5m (HARARI et al., 1999). According to Camargo and Harari (1998), there is convergence and divergence of the flood and ebb currents of São Vicente and Bertioga Channels, where tidal waves meet, propagating from their extremities.

METHODOLOGY AND EXPECTED RESULTS

This project will be divided in two steps: Analysis of current and sea level data; and numerical modeling.

Data of sea level, velocity and direction of the currents were obtained from São Paulo Pilots local stations (Figure 2), and provided to NPH-UNISANTA. In addition, data from Companhia Docas do Estado de São Paulo (CODESP) will be used. There is also the possibility of adding data from other sources, in order to characterize the local physical processes and increase the representativeness of the hydrodynamic model, with emphasis on storm surge events.

Data analysis will be carried out through MATLAB® software; propagation times and differences in tidal amplitudes in the channels and estuary will be relevant variables to consider in this study.

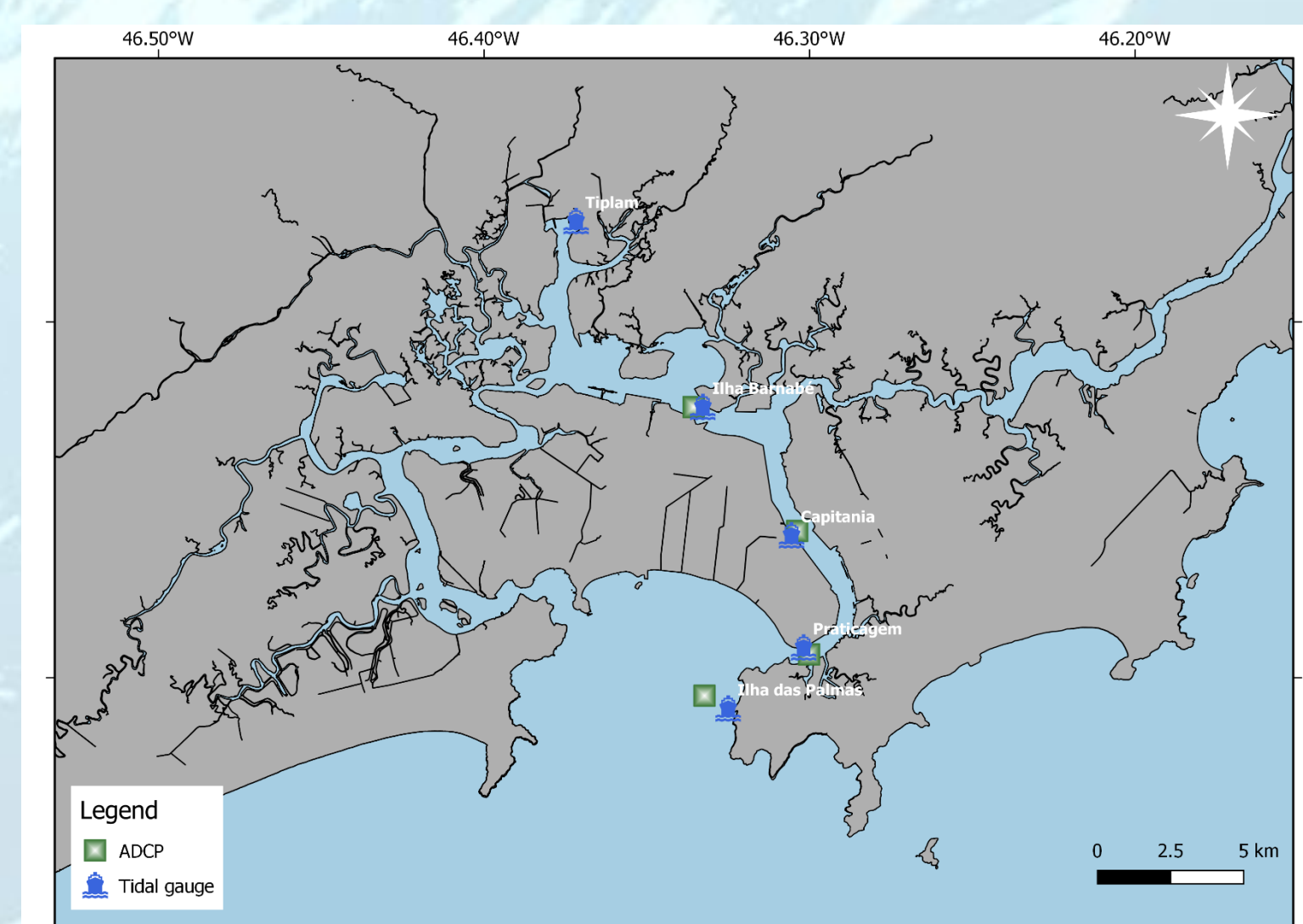


Figure 2 – Geographic location of the São Paulo Pilots local stations

After data analysis, a set of hydrodynamic numerical models will be implemented, in order to simulate the local hydrodynamic storm surges, through a technique named downscaling, which consists of information transfer from the large scale grid to a local scale grid. The chosen model for this project is MOHID, as this model runs operationally through the NPH and Hidromod partnership. Nonetheless, model grids and meteorological forcing are not yet defined.

The results after the implementation, calibration and validation of the hydrodynamic model are expected to be of good quality, allowing understanding the behavior of the coastal area, with good statistical indices in the Santos-São Vicente-Bertioga Estuarine System, with emphasis in the simulation of storm surge events.

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