



Impact of mean sea level rise in the Rias Baixas hydrodynamics (NW Iberian Peninsula)

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Mean sea level rise is currently a growing and prominent consequence of climate change. The increase in the mean sea level poses a significant threat to low-lying coastal areas that often present high economic and biological value. Recent studies also show that tidal propagation in estuarine systems will be altered due to climate change, intensifying the threat it poses to these systems. The Rias Baixas located in the NW of the Iberian Peninsula, as well as the rest of the Galician coast, are areas of high primary production susceptible to alterations in their hydrodynamics induced by climate change, negatively impacting the system.

In this context, this study aims to validate a hydrodynamic model of the Rias Baixas and to analyse the effect of mean sea level rise in the local hydrodynamics. The methodology followed comprises the application of a three-dimensional numerical model (Delft3D), with realistic bathymetry and coastline of the NW Iberian Peninsula including the Rias Baixas. The model considers the main physical processes and the main features of circulation. Ambient shelf conditions include TOPEX global tidal solution.

Firstly, the model validation was done through a qualitative and quantitative analysis. The qualitative analysis was done through a visual comparison between model results and observed time series of the water level in several sampling stations, showing good agreement. The quantitative analysis aims to assess the model performance, through the determination of the root mean square error between model results and observations and of the harmonic constituents from both types of data series. After the model validation, the main semidiurnal and diurnal constituents as well as the tidal current magnitude were determined for Ria Baixas for three mean sea level scenarios: present mean sea level and two future scenarios from CMIP6, a more optimistic one (SSP1 - 2.6) and a more pessimistic one (SSP5 - 8.5).

The model results show that the amplitude of the main semidiurnal and diurnal constituents will decrease for future scenarios, whereas the respective phase increases towards the head of the Rias. The results also highlight that tidal current magnitude generally increases with mean sea

level rise for future scenarios, although a slight decrease was found at the upstream areas of the Ria Baixas.

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