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Factors controlling the subtidal distribution of suspended Mesozooplankton carcasses in a mid-latitude estuary

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Abstract

The southern zone of Chile —from the province of Arauco to Seno de Reloncaví— has a relevant number of estuaries. Together with their wetlands, these estuaries make up an ecosystem rich in multiple plants and animal species. One of the most outstanding estuaries corresponds to the Valdivia River. This river is relevant in the economic dynamics of Valdivia city.

This research implemented an idealized 2D-vertical subtidal model to understand the transport mechanisms and spatial distribution of floating and suspended MesoZooplankton Carcasses (MZC) of sizes around 500µm in the Valdivia River Estuary (ERV). Mesozooplankton, particularly Copepods, are the most abundant metazoans in aquatic ecosystems and represent an essential link between primary producers and higher trophic levels.

The idealized model assumes stationary conditions of the characteristic regimes of the VRE to estimate the horizontal and vertical circulation along the estuary. For the calibration of the model, subtidal current profiles were used to determine the eddy viscosity coefficient A_v and the records of MZC concentrations for the three different depths obtained from the 2014 and 2015 exploratory VRE campaigns obtain the vertical eddy diffusivity coefficient K_d.

The general purpose is to explain how circulation patterns (circulation drivers, such as river discharge, wind, and longitudinal salinity gradients) affect the distribution of copepod detritus in estuaries. Thus, the forcing conditions that induce the entrainment distribution of MZC towards the estuary mouth in the southern hemisphere summer. During the autumn, the intrusion of MZC at the estuary bottom near the head of the estuary, were identified.

This study highlights the importance of estuarine circulation with the identification of potential biomass hotspots along the VRE channel.

Keywords

Valdivia River Estuary, idealized model, mesozooplankton, exchange flow