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NUMERICAL STUDY OF THE HYDRODYNAMICS OF A MARINE WATER BODY IN WESTERN PATAGONIA

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The Patagonian fjords area (PFA), located in southern Chile, is one of the largest estuarine regions in the world. Every water body of the area displays a particular hydrodynamical behavior in terms of the seasonal variations of its currents, salinity and temperature depending on the interaction between environmental conditions and local topography. This interaction has enormous effects on the biogeochemical cycles of the belonging ecosystems. Currently, due to the lack of knowledge about the industry-ecosystem-community relation, the design of a national environmental regulation for the PFA has become a particularly challenging task for the country. This work focuses on applying advanced computational tools for simulating the hydrodynamics of a typical semi-enclosed water body of the PFA. The obtained results are expected to serve as a base line to study the biogeochemical dynamics of the corresponding marine ecosystem. To this end, we employ the three-dimensional (3D) version of the SLIM3D[1] numerical code to study the seasonal variations in the hydrodynamics of Puyuhapi channel (44°19S,72°33W) when subjected to the action of environmental forcing factors. To this end, a large-scale, parallel unstructured finite element model of the zone of interest [1, 2] is used to conduct numerical studies with the purpose of: i) identifying the main mechanisms involved in the seasonal variations of currents and tides, ii) studying the formation and evolution the a fresh water plume due to the Cisnes river discharges and iii) studying the influence of wind forcing on the water column stratification.

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[1] *Second-generation Louvain-la-neuve Ice-ocean Model*. See `http://sites.uclouvain.be/slim/`.