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Laboratory simulations of the surface circulation patterns in the Bransfield Strait (Antarctica).

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The Bransfield Strait is located in the middle of the Antarctic dynamics. From interdisciplinary mesoscale surveys, as CIEMAR and BREDDIES, we are checked that its circulation patterns is a inflow of two water masses, the Transitional Zonal Water with Bellingshausen influence (TBW), relatively warm and fresh, and the Transitional Zonal Water with Weddell Sea influence (TWW), relatively cold and salty water. In our surveys we are obtained that these water masses are separated by a hydrographic front, in this way, the first 300 meters of the water column in the northwest half of the strait are occupied by TBW, whereas the TWW occupies almost the entire volume of the Bransfield Strait. From in situ data and knowing the different fronts located in the Strait, it is possible to conclude that the Bransfield Strait surface circulation pattern can be viewed as a gravity current system. In this work, we simulate this surface circulation in a rotating tank scaling the experiments to the Bransfield Strait conditions and study the influence of density in the gravity current velocity simulated.

In our simulations the densest water (TWW) flow towards the Southwest occupied almost the entire of the tank, whereas the least dense water (TBW) flow superficially towards the North-East, forming the Bransfield Current. Although in the sensibility analysis done so far, the relationship between increases of density in our prototype isn't very clear, these laboratory experiments reproduce quite well the mains patterns of the observed surface circulation at the Bransfield Strait, the velocities expected agree with observations and our experiments predict current extension values in the same order that in situ data.