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Tracing the thermohaline Conveyor Belt circulation; from the Drake Passage to the Pacific Ocean

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This study describes an important pathway of the thermohaline conveyor belt circulation and connects the geographical distribution of water masses with water mass transformation.
In the Southern Ocean, cold and fresh water up-wells to the surface and returns northward, entering the Pacific, Atlantic and Indian Ocean. This reflects an important part of the thermohaline conveyor belt circulation. As the water flows northward, it changes temperature and salinity, and thus density. These changes can be caused either by internal mixing or air-sea interactions.

In this study, Lagrangian trajectories are used to follow the pathway from Drake Passage to the warm Pacific Ocean. Trajectories are started in the Drake Passage, and are ended when they either reach 25°C or return to the Drake Passage. The trajectories entering the Pacific Ocean follow the Antarctic circumpolar current and separate then into two pathways. The first enters the Pacific Ocean close to the South American coast and flows along the coast until it reaches 25°C close to the equator. The second pathway, which corresponds to most of the total volume transport entering the Pacific, are subducted around 40°S. The water then moves westward until it reaches Australia where it turns northward and ultimately joins the equatorial undercurrent.

Along these two pathways, the water changes temperature and salinity, going from cold and fresh to warm and saline. Preliminary results indicate that the water mass transformation for the first pathway are due to air-sea interactions, and internal mixing for the second.