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What determines the Atlantic-Pacific Ocean salinity contrast?

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In the present thermohaline circulation deep water formation takes place mainly in the North Atlantic Ocean, while the North Pacific Ocean is too fresh for deep water formation to occur. In this presentation, we hypothesize that the global thermohaline circulation is itself responsible for this salinity contrast. In a perfectly symmetric situation of two ocean basins that are connected at southern high latitudes and driven by zonally symmetric temperature and freshwater forcing, simulations within an ocean general circulation model show that four different equilibria of the thermohaline circulation exist which all result in different surface salinity distributions. One of these equilibria mimics the present ocean circulation, associated with high salinities in the North Atlantic and low salinities in the North Pacific Ocean. We address the physical mechanisms that lead to a preference for this solution by systematically studying the effect of asymmetries, e.g., continental geometry or asymmetric air-sea interaction, in the system.