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Convection Cells: The Saline Effect

This project is an experiment on the effects of salinity on velocities of convection cells. The original idea was to create a model that reproduced deep-ocean currents. However, to be more practical, the experiment ended up being a representation to illustrate the effects of salinity on velocities of deep ocean currents using a tank of water with heating and cooling devices. The velocity was determined by using Potassium Permanganate attached to a wire and inserted into the water at three locations, which dissolved into the currents. Time-lapse photography captured the motion. The time to take each photo and the distance traveled between frames were used to calculate the velocity (cm/s). Using this technique, the average velocities for the rising current were: 1) 0.5% salinity - 0.95 2) 2.0% salinity - 0.69 3) 3.8% salinity - 0.55 The average velocities for the horizontal current were: 1) 0.5% salinity - 0.41 2) 2.0% salinity - 0.42 3) 3.8% salinity - 0.42 The average velocities for the falling current were: 1) 0.5% salinity - 0.25 2) 2.0% salinity - 0.33 3) 3.8% salinity - 0.45 As the salinity increased, the velocity of the rising current decreases, the velocity of the horizontal current stays the same, and the velocity of the falling current increases. As the icebergs melt in the ocean, the velocity of currents could be affected as demonstrated. The results of this experiment follow standard physics principles, and illustrate the effects of salinity on the velocity of convection cells.