



California Science Center  
**CALIFORNIA STATE SCIENCE FAIR**  
**2001 PROJECT SUMMARY**

<b>Your Name</b> (List all student names if multiple authors.) <b>Katie A. Dolence</b>	<b>Science Fair Use Only</b>  <span style="font-size: 2em; font-weight: bold;">S0504</span>
<b>Project Title</b> (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9) <b>Induction of Thermal Currents in Earth's Ocean Systems</b>	<b>Division</b> _ Junior (6-8) <u>X</u> Senior (9-12)
<b>Preferred Category</b> (See page 5 for descriptions.) <b>5 - Earth Sciences/ Planetary Sciences/ Physical Environments</b>	
<b>Abstract</b> (Include Objective, Methods, Results, Conclusion. See samples on page 14.) Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.	
<p><b>Objective:</b> The objective of the Induction of Thermal Currents in Earth's Ocean Systems project is to illustrate how complex currents (movement of water) can be generated between two bodies of water of different temperatures. Thermal ocean currents in nature have a profound affect on the weather (such as in El Nino and La Nina).</p> <p><b>Materials and Methods:</b> I utilized our pool and spa to demonstrate the forces driving the induction of thermal currents. Our 36# by 18# (33,000 gal.) swimming pool is connected to a 6# by 6# (750 gal.) spa. The water level was raised to 1 inch above the wall dividing the pool and spa creating an interface. I blocked the connection between the pool and spa using bricks. The pool temperature at the time of this experiment remained a constant 67.4F. I gradually heated the spa and performed the experiment, made observations and recorded the results at three different temperatures (79.7F, 88.3F, 104.1F). To conduct the experiment one brick was removed to create a connection. I used blue algacide as an indicator and observed the connection for evidence of movement of water. I made my observations, measured the current flow and recorded the data.</p> <p><b>Results:</b> I observed that colder water (67.4F = Density .998275 g/cm<sup>3</sup>) from the pool flowed over the shelf and plunged vertically down the inside of the spa. This colder, denser pool water displaced the warmer (79.7F = Density .996653 g/cm<sup>3</sup>, Temperature 88.3F = Density .995257 g/cm<sup>3</sup>, 104.1F = Density .992197 g/cm<sup>3</sup>) spa water causing it to flow over the top of the colder water on the surface of the pool in a plume. This experiment demonstrated that gravity has a profound effect (causes currents) on water of slightly different density (difference in density were .001623 g/cm<sup>3</sup>; .003018 g/cm<sup>3</sup>; .006078 g/cm<sup>3</sup>) caused by moderate temperature differences.</p> <p><b>Discussion:</b> My experiment clearly demonstrated that thermal currents are induced by moderate temperature differences between two standing bodies of water. It also demonstrated that the larger the difference in temperature the larger the difference in density and the stronger the current that was generated. Complex ocean currents are also caused by wind, salinity differences and the Coriolis effect (spinning of the earth).</p>	
<b>Summary Statement</b> (In one sentence, state what your project is about.) My experiment demonstrated that thermal currents are induced by moderate temperature differences between two standing bodies of water.	
<b>Help Received in Doing Project</b> (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4. Father helped with layout, Mother proof read report, Father took pictures	