



**CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY**

Name(s) Megan T. Tang	Project Number S0321
Project Title Using Dropsonde Descending Speed to Determine Vertical Air Velocity in a Hurricane	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project is to derive the vertical air currents in hurricanes using a physics-based model to describe the dropsonde fall speed in still air.</p> <p>Methods/Materials Assumed dropsonde fall velocity in still air follows its terminal velocity and deviation in descending speed in real atmosphere is a result of atmospheric vertical motion. The drag coefficient for calculating terminal velocity was determined empirically by searching for the best fit fall speed in an altitude range that can be approximated as still air. Wrote MATLAB codes for model calculation, data analyses, and graphics.</p> <p>Results A total of 291 complete dropsonde measurements of Hurricane Joaquin were analyzed. The terminal velocity model fit 260 of them, or about 89%. The resultant drag coefficients from each sounding were used to derive the vertical air velocity from each sounding.</p> <p>Conclusions/Discussion Two factors affecting the accuracy of the derived vertical velocity were examined. One is related to the range of altitudes used to optimize the drag coefficient to simulate the drop speed in still air. The other is associated with the tilting and tumbling of the dropsonde that change the vertical cross-section area. It was found that any large errors may be associated with cases with extreme winds in the hurricane, while the majority of the cases show consistent drag coefficients throughout the measurement depth. Soundings in close proximity to each other also show consistent features of updraft and downdraft, indicating that the derived vertical velocity is physically consistent.</p>	
Summary Statement I derived a method to obtain the vertical air velocity, an important physical parameter in hurricane development, from dropsonde measurements.	
Help Received I derived the drop speed model and the method to obtain drag coefficients. The dropsonde data was provided by my mentor.	