



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Samantha L. Stott	Project Number 31907
Project Title Where Does California's Rain Come From?	
Objectives/Goals This study investigated how La Nina in the tropical Pacific influences sources of rainwater over California. The ratio of heavy to light oxygen isotopes in storm water was used to identify the sources of California's rainwater. Abstract Methods/Materials Rainwater was collected from individual storms in a collection container at 40 Mustang Road, RPV CA. Additional samples were collected by Dr. Nikolaus Buenning of the University of Southern California. Samples from each storm were placed in vials and labeled with time and date. The ratio of heavy to light isotopes of oxygen in the samples was measured using a Picarro Cavity Ring-Down Spectrometer at the University of Southern California. The isotope results of each sample were compiled and the average and standard deviation for samples from each storm was calculated. The results of these analyses were then compared with satellite images from NOAA to evaluate how the isotope ratio changed with northern and southern storms. Results In the winter of 2010/11, 6 of 11 storms had $d^{18}O$ values higher than -5‰ , which is typical of moisture from the Tropics. The results indicate that the majority of storms that reached southern California contained moisture from the Tropics. Among the six Tropical storms several were called "Pineapple Express" because they brought large amounts of rain from the Tropics with high isotope values of -2 to -3‰ . The six Tropical storms had an average $d^{18}O$ value of between 2 and -5‰ . The two lowest isotope values within the data set were from storms that tracked from the North Pacific with average $d^{18}O$ values between -8 and -11‰ . Three storms had isotope values that indicate moisture from both the Tropics and the North Pacific. Conclusions/Discussion In the winter of 2010/11 a La Nina influenced storm tracks in October and November and resulted in more rainwater from the Tropics. However, the La Nina appears to have had less influence on storms in December and January due to a shift to a negative Arctic Oscillation, which caused an increase in the number of storms from the North Pacific. Overall, southern California received most of its precipitation from the Tropics in the winter of 2010/11.	
Summary Statement Oxygen isotope ratios of rainwater can be used to trace the source of California's moisture.	
Help Received Dr. Nikolaus Buenning provided samples and taught me how to measure the oxygen isotope ratio in rain water using the Picarro instrument in the stable isotope laboratory at USC. My dad advised me how isotopes might be used to distinguish sources of moisture. My mom helped design the board layout.	