



CALIFORNIA SCIENCE & ENGINEERING FAIR

2019 PROJECT SUMMARY

Name(s) Jason Wang	Project Number J0925
Project Title Big Data Analysis of Climate Change: Extreme Temperature, Rain, Snow, and Ice Trends	
Objectives Overall measurements of global warming average over areas that have both gotten hotter or colder, masking the severity of climate change. This project measures the extremes of climate change, and identifies geographic areas where: -Temperatures have gotten Hotter or Colder -Rainfall has Increased or Decreased -Snowfall has Increased or Decreased -Ice coverage change has affected climate	Abstract Public weather datasets with 2+ billion global records are analyzed with Google BigQuery, Tableau, and least squares linear regression to quantify regional climate trends over five decades. Weather measurements are very sensitive, however, to the numbers and locations of stations included in the analysis. To make measurements consistent and comparable, this analysis follows carefully selected groups of weather stations that existed every year from 1973 to 2018.
Methods The Arctic is warming 3 times faster than the global average, while portions of the Upper Midwest of the United States have gotten colder due to the polar vortex. The Southeast and Western States have received less rain, while New England and the Upper Midwest have received more rain, due to a weaker, meandering jetstream. Most of the United States has gotten less snow, while New England and the Great Lakes region has gotten more snow. This research discovered dramatically increased snowfall in the Great Lakes region, specifically a 40 percent increase in February snowfall over the last 5 decades. Decreasing and delayed lake ice coverage contribute to more lake effect snow, but there are many other factors, e.g., air temperature, lake evaporation, water temperature, and jetstream humidity.	Results Different geographic regions show more severe effects of climate change than global averages. Extreme climate change trends appear to have started over 45 years ago, much earlier than recent public awareness. The discovery of dramatically increased February snowfall in the Great Lakes region over 5 decades shows the complexity of climate change.
Conclusions This project measures the extremes of climate change, and identifies geographic areas where temperatures have gotten hotter or colder, and rainfall, snowfall, and ice have increased or decreased.	
Summary Statement This project measures the extremes of climate change, and identifies geographic areas where temperatures have gotten hotter or colder, and rainfall, snowfall, and ice have increased or decreased.	
Help Received My father taught me SQL and Tableau, which I used to analyze and visualize my data.	