Will Lee-Side Cyclones Become More Intense in a Warming Climate?

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Will Lee-Side Cyclones Become More Intense in a Warming Climate?

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The generation of lee-side low pressure systems, or lee-side cyclogenesis, commonly occurs in areas downwind of mountain ranges, such as eastern Colorado. Cyclones that form east of the Rockies tend to evolve into larger storm systems that travel eastward into the Great Plains region. Previous studies have found that diabatic heating, such as heat radiating away from Earth’s surface, has the ability to affect developing cyclones. The International Panel on Climate Change (IPCC) has reported that future climate scenarios all indicate an increase in surface temperature, which could prove to impact lee-side cyclogenesis. The purpose of my research is to determine if increased temperatures on the plains east of the Colorado Rockies could bring about a change in the cyclones that develop there. In order to test this, I will be utilizing a meteorological model, the Weather Research and Forecasting model (WRF), to simulate recent lee-side cyclone cases. The first set of simulations will be control runs of each lee-side cyclogenesis case. The second set will use the same weather conditions, with one key difference: the soil moisture east of the Rockies will be diminished in order to reflect a severe drought scenario. This scenario will produce higher surface temperatures east of the Rockies, which will affect the cyclones developing there. Temperatures, mean sea level pressure, and other meteorological parameters will be compared in control and experimental simulations for each case to assess the strength of the cyclone. I expect to see an increase in cyclone intensity given an increase in surface temperature in each of the cases.