Microclimate of the Chisos Mountains – A Desert Oasis

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The Chisos Mountains are a part of the Big Bend National Park in West Texas. They are surrounded by miles of desert landscape, but the Chisos Mountains are considered by many to be an oasis. The climate of the Chisos Mountains is different from that of the surrounding area due to several reasons: elevation, evapotransporation, and the slope orientation.

The topography is the primary contributor to the micro climate of the Chisos Mountains. The areas with the most vegetation, including forests, are towards the top of some of the mountains. In general, the vegetation increases as mountain elevation increases. However, the orientation of the slopes creates more complex microclimates. The south and west facing slopes are typically warmer and drier due to a more direct sun angle and the north and east facing slopes are cooler and wetter. As a result, more vegetation is present on the cooler slopes contributing to more evapotransporation. The increased vegetation on the cooler slopes allows for more moisture contributing to more clouds and rain which helps to produce a positive feedback loop to keep the temperature cooler. The south and west facing slopes have less vegetation and drier soils, so there is not as much moisture available for evapotransporation. This contributes to less cloud cover and precipitation reinforcing the drier and warmer microclimate. At night, the south facing slopes are able to cool faster than the north facing slopes due to the drier air and more longwave radiation emission. Even though the moisture may vary with regard to slope orientation, the Chisos Mountains as a whole contribute to more showers and thunderstorms developing than the surrounding plains.

There are certain atmospheric conditions that allow the microclimate of the Chisos Mountains to stand out from the surrounding area. A high pressure area to the east that brings easterly winds across the region allows for upslope flow of moist air. Due to orographic lift, this flow will help to create showers and thunderstorms over the mountains while the surrounding plains remain clear. The presence of this microclimate enables forecasters to include higher chances of rain over the mountains given enough moisture and lift is present. It also allows for cooler temperatures to be forecast for the higher elevations and valleys than the surrounding plains. During the day, there is convergence in the basin and over the mountains which starts on the eastward facing slopes in the morning and spreads westward in the afternoon. At night, the air diverges over the mountains as the cool air sinks into the valleys. The Chisos Basin experiences a westerly wind during the day and a northeasterly downslope wind at night. The models generally do a good job with the different weather parameters, but the NAM12 is probably the most accurate since it has the highest resolution.