

Climate Model Projections of Future Changes of Precipitation and Temperature and Associated Driving Mechanisms

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Anthropogenic climate change is broadly projected to bring widespread warming and changes to precipitation over South America. These changes are characterized by considerable regional variability with climate models projecting greater warming in some places compared with others and with regional variability in the sign and magnitude of precipitation change. Furthermore, not all climate models agree on the regional magnitude of change, introducing uncertainty into future projections. Because these changes will be associated with substantial societal and environmental impacts, it is important to constrain this model uncertainty to gain a better understanding of how temperature and precipitation will change across the continent. Towards this goal, we investigate projected changes in several key climate variables, related to temperature and precipitation, in future climate simulations using the CMIP5 suite. These climate variables include quantities related to moisture and thermodynamics as well as large scale circulation. Results show that while most models in general agree on broad patterns, such as an increase in the amount of atmospheric moisture across the seasonal cycle, there is considerable regional and inter-model variability in the magnitude of this change. Evidence shows that regional differences in projected change in temperature and precipitation can often be readily attributed to thermodynamic and dynamic changes. Further investigation into why some models show different patterns and magnitudes of change than others also sheds light on the physical mechanisms behind model projection uncertainty.