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Analysis of CMIP5 historical runs for southwest US precipitation

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We examine historical runs from the CMIP5 archive to evaluate model performance against present climate. We focus on mechanisms linked to decadal variations in southwest US precipitation, and the occurrence of long-term drought. Precipitation in the southwest US is dominated by mesoscale convective activity from the south during the summer monsoon season, and storms crossing the central US west coast during winter. Precipitation climatology varies between the CMIP5 models in the summer, due to shifts in the location of the monsoon ridge and the timing of the reversal of the low-level winds. Varied results are also seen in 20th Century Reanalysis V2 and GPCC gauge precipitation data, due to the difficulty in capturing thunderstorm activity during this season. The models and data sets are more consistent in winter, due to their ability to represent the characteristics of large-scale coastal storms. Higher than average precipitation in the southwest US on decadal timescales is associated with low pressure anomalies over northern Pacific Ocean and southern US, and high pressure anomalies over northern North America. These pressure anomalies are in turn associated with warmer than usual equatorial Pacific Ocean SSTs, extending northwards along the west coast of Mexico and the US, and cool north Pacific Ocean SST anomalies. This evidence of an atmospheric bridge between SST anomalies in the Pacific Ocean and southwest US precipitation may be useful in predicting decadal drought in the Great Basin region if the SST anomalies are predictable on long time scales.