Spatial Characteristics of Multi-year Droughts and Pluvials over Southwestern U.S. using MODE

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Studies of extreme events, such as droughts and pluvials, are at the heart of many research programs because of their profound impacts on water supplies. In addition, studies of these events have gained widespread attention because their frequency, duration, magnitude and impacts are expected to increase in the coming decades as a consequence of climate change. Droughts and pluvials are two opposing events that have had significant economic impact on various sectors including agriculture and water resources management, which makes them events of interest to a major water utility in our region of study, Denver Water.

Several indices, based on their sensitivity to drought development at different time scales, data availability and drought types, have been developed for detecting and monitoring drought and pluvial severity. This study uses 36-month standardized precipitation index (SPI36), and standardized precipitation evapotranspiration index (SPEI36) to analyze drought and pluvial episodes over the southwestern U.S., with a focus on the region that supplies water for Denver Water.

We use the Method for Object-based Diagnostic Evaluation technique (MODE) to develop physical insights on the strengths and weaknesses of the modeling of predicted extremes. We compare the spatial distributions of observed SPEI36 fields and SPI36 fields. Also, we use MODE to evaluate the performance ability of the Community Earth System Model (CESM) Large Ensemble datasets to simulate the observed drought and pluvial objects over the region of study.