An objective regionalization of precipitation applied to the Western U.S.

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We use a principal component analysis on nine datasets to "regionalize" the precipitation climate of the western United States. Five unique precipitation climates are identified within that region, which have centers and boundaries that are physically reasonable and that highlight the relationship between the precipitation climatology and local topography. Using the congruence coefficient as the measure of similarity between principal component solutions, the method is found to be generally stable across datasets. The loading pattern differences among datasets are shown to be primarily a result of data differences in the representation of (i) precipitation over the Rocky Mountains, (ii) the eastward wet-to-dry precipitation gradient that occurs during the cold season, (iii) the magnitude and spatial extent of the North American monsoon signal, and (iv) precipitation in the desert southwest during spring and summer. The results suggest that alternate data products can be used in regionalization studies, which has applications for rain gauge installation and planning, climate research, and numerical modeling experiments.