**Introduction**
A statistical clustering technique was used to analyze output from the Parallel Climate Model (PCM) (Washington, et al.). Five 100-year “business as usual” (BAU) simulations were performed in combination into 32 groups or climate regimes. Three PCM output fields were considered for this initial work: surface temperature, precipitation, and soil moisture (root zone soil water). Only land cells were considered in the analysis. The clustered climate regimes can be thought of as climate states in an N-dimensional phase or state space. These states provide a context for understanding the behavior of the climate system. This technique also makes it easy to see the long-term climatic trend in the copious output (about 1300 monthly maps per run) that is otherwise masked by the magnitude of the seasonal cycle. The same approach is useful for analyzing observations, like the CRYSTAL-FACE data, to find atmospheric regimes and better understand cloud processes and climate feedbacks.

**Multivariate Spatio-Temporal Clustering**

Multivariate clustering is the division or classification of objects into groups or categories based on the similarities of their properties.

Non-nichiearchical clustering produces a single level of division of objects into some specified number of groups.

Multivariate Geographic Clustering employs non-hierarchical clustering to the classification of geographic areas.

Multivariate Spatio-Temporal Clustering is an application of Multivariate Geographic Clustering across space and through time.

**Climate Regime Definitions & Maps**

The central coordinates of each of the clusters represent the mean values of the three climate variables for all grid cells in the respective cluster. These cluster centroids are the geographic locations of the predicted climate occupancy for that particular climate regime.

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**Climate Regime Definitions & Maps**

Clustered Climate Regimes

**Climate Trajectories**

A single regime history is shown for each climate regime at any point in time. By increasing time, any single geographic location will track out a single trajectory or will remain relatively constant in area throughout all climate regimes. These single regimes or clusters show how large area changes in each run are plotted.

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**Climate Trajectories**

A single case study was selected as an example to plot climate regimes in at least one common climate state space. The resulting maps and regime histograms show where regime change has occurred. The difference maps show the location of the predicted change.