Victor de la Pena, Yochanan Kushnir & Upmanu Lall, *Space-Time Dynamical System with Application to Climate Change*

The major goal of our project was to develop statistical and probabilistic tools appropriate for analyzing dynamical systems to detect changes in their spatio-temporal behavior. The results of the project are fourfold: (1) We tested a method of deriving information on gradual changes in variables related to climate projections. This was accomplished by analyzing projected drying trends in the US West and the Mediterranean. (2) In performing cluster analysis of Atlantic hurricane tracks, we tested a novel track clustering procedure based on defining moments of each track by mass and the variance of track points around this center. Identifying each historical Atlantic hurricane track by these two moments, we find an optimum of six clusters with differing genesis locations, track shapes, intensities, life spans, landfalls, seasonality, and trends. (3) In analyzing the sea surface temperature gradient along the equator to assess changes in the climate of the Indian Ocean under global warming, our recently graduated PhD candidate, Dr. Chie Ihara, identified a statistically significant weakening of the temperature gradient and the associated atmospheric features through studying the cumulative distribution function of model projected seasonal averages. (4) We are looking to adopt statistical techniques from other disciplines to approach the topic of dynamic detection of climate extremes from the perspective of decision makers looking to detect change in extreme events in a timely manner.