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Characterizing spatial rainfall patterns in Puerto Rico for natural hazard analysis

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Precipitation is one of most significant drivers of hydrological and geomorphic hazards in the Caribbean Region. In order to gain a more complete understanding of the precipitation triggering mechanisms associated with landslide events this study evaluates the primary modes of variation in precipitation patterns on the island of Puerto Rico. Previous studies have outlined various rainfall divisions for Puerto Rico using either generalized analyses or temporally incomplete gauge data. This study builds on the past studies by performing a statistical analysis on precipitation estimates derived from geostationary satellite imagery, which provides hourly precipitation values at a resolution of 0.04ºx0.04º from 2001 to 2006. This record is used to evaluate spatial trends in precipitation through the use of Empirical Orthogonal Functions (EOF) analysis. EOF analysis helps to statistically pinpoint the dominant spatial modes of precipitation variability across the island using a combination of independent basis functions. The results of the analysis indicate that there are dominant spatial trends in rainfall, which are influenced by the impact and directionality of tropical cyclones, orographic rainfall, and other convective disturbances.

The rainfall subdivisions within Puerto Rico derived from EOF analysis are then compared to gauging data from 22 stations operated by the National Data Climate Center (NCDC) as well as other precipitation estimates from global and regional remote sensing imagery. This study compares both the annual and climatological signatures of rainfall between regions. It also focuses on the rainfall intensity patterns of singular events and evaluates how well these are resolved within each dataset. These statistical analyses provide a comprehensive picture of spatial variation in rainfall dynamics and help to establish a foundation from which to realize severe rainfall events. These

results will then be correlated with landslide occurrence in order to better determine landslide triggering mechanism and provide more information with which to compile landslide vulnerability maps.