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Data Driven Discovery Approach for Understanding the Multiscale Spatio-Temporal Vegetation Variability

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The spatio-temporal vegetation variability is affected by a large number of factors such as topographic attributes (elevation, slope, aspect, etc.), soil properties, climate variability (temperature, radiation, precipitation, etc.), among others. With the advent of remote sensing data, such as MODIS products, it is now possible to probe these variabilities at very fine scales. However, in order to deal with the very large number of variables and large data sizes, we need to develop new techniques that can provide comprehensive analyses of these dependencies. In the absence of such methodologies, the use of these datasets are limited to small fragments of the entire volume or selected few variables. This limits our ability for formulating and testing hypothesis. In addition, our scientific vision is stymied due to the use of fragmented and limited datasets, and our ability to handle only "few variables" at a time. This limits the nature of hypothesis that are proposed and tested. We demonstrate new spatio-temporal knowledge discovery techniques for the analysis of vegetation indices obtained from high resolution remote-sensing and related data. The novelty of our work consists of (1) data driven exploration of relationships between ecosystem and topography related variables using high resolution data over extensive domains, and (2) enabling improved parameterization for hydroclimatological modeling.