

Atlantic and Pacific Sea Surface Temperatures and Corn Yields in the Southeastern USA

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Sea surface temperature (SST) variability can provide valuable predictive information on climate and crop yield variations in many regions around the world. While commonly used indices of SST variability have proven useful for this purpose, the SST variability represented by such indices are for specific, pre-defined regions. The utilization of SSTs for entire regions eliminates any spatial bias as to which SST region has the strongest relationship with climatic variability in a given locale and can assist in identifying SST regions that are not currently represented in existing indices.

The goal of this work was to identify Pacific and Atlantic SST regions that show persistent co-variability with county corn yields in the states of Alabama, Florida, and Georgia during the period 1970-2005. SST regions showing persistent co-variability were identified using Singular Value Decomposition (SVD) analysis, an effective statistical method for identifying orthogonal modes of co-variability between two data sets. SVD analysis was conducted using both concurrent and lagged seasonally averaged SSTs. In addition to SVD analysis, single-field Principal Component Analysis (PCA) was used to confirm the coupling found between the two data sets. The strength of coupling between seasonal SSTs and corn yields were evaluated using heterogeneous correlation maps. The field-significance of the correlation maps was determined using a Monte Carlo technique.

Field-significant correlations were found between county corn yields and seasonally averaged SSTs in the previous summer, fall, and winter prior to the growing season with the strongest correlations found in the tropical Pacific. The largest number of counties (83.7%) showing significant correlation was found with SSTs from the previous summer season. The spatial pattern of correlations found between SSTs and county corn yields confirms the importance of the El Niño-Southern Oscillation (ENSO) phenomenon on corn yields in the southeastern USA.

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