This study provides an overview of South Carolina’s climatic trends and variability over the last century. Most studies nationally have focused on large-scale temperature and precipitation trends, but examination of regional and local trends are needed to monitor the significance of the state’s climate signal and advance our understanding of the complex physical controls on the region’s climate. The behavior of several climatic elements since the 1900s were evaluated for 66 sites in Georgia, South Carolina and North Carolina to determine the variability of the system on annual, seasonal and decadal scales, including the use of threshold approaches to assess climate patterns.

Changes in South Carolina’s surface temperature and precipitation over the last 100 years were analyzed using station data from the US Historical Climate Network (USHCN) and the National Weather Service Cooperative Network (COOP). Observations from 66 USHCN stations spanning the period 1901–2010 and 26 COOP stations spanning 60 to 100 years provide adequate spatial coverage for the three-state region. The USHCN is a dataset that includes adjustments for changes in station location, urbanization and time of observation and the COOP network provided the daily data needed for supplemental threshold approach evaluations.

Seasonal temperature and precipitation trends based on USHCN data were analyzed using the least squares method. Results showed a general precipitation decrease in the majority of the region for summer (≥1.0” decrease for 55 out of the 66 stations), with 36 out of the 66 stations experiencing a decreasing precipitation trend ≥ 2.50”. The fall season trend analysis was the inverse of summer with all stations across the study area experiencing an increasing precipitation trend (61 stations had an increasing fall precipitation trend ≥1.0”) (Figure 1). The winter average precipitation trends show mixed results with a drier trend in the higher elevations and the river headwater regions and a wetter trend in the outer and inner coastal plains. Spring precipitation trends are geographically similar to winter, but with a weaker signal.
Figure 2 displays the seasonal and annual trend for each station. Aiken was the only station with an increasing precipitation trend greater than 1” for all seasons. Seven stations had a decreasing annual precipitation trend greater than 3” while six stations had an increasing annual precipitation trend greater than 3”.

South Carolina temperature patterns are less clearly defined with differential changes in minimum temperature (Tmin) and maximum temperature (Tmax). Winter and spring Tmax has generally warmed (Figure 3), but the Tmin during these seasons has shown little variation or actually cooled over time. Summer and fall Tmax and Tmin don’t consistently demonstrate a uniform trend with some stations warming while others have cooled across the region.

There are limitations to using a linear trend to analyze climate variability so moving averages and various threshold approaches were analyzed. The 10-year moving average for statewide annual precipitation shows a decreasing precipitation trend during the 1950s, increasing trend during the 1960s with a decreasing trend over the past decade (Figure 4). The 10-year moving average for statewide temperature shows a decreasing temperature trend from the late 1950s through the 1960s with a steady temperature increase since the 1970s (Figure 4). Future analysis should evaluate potential forcing mechanisms contributing to these local variations over time.