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EDITORIAL

A multi-disciplinary assessment of the southeastern United States climate

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The southeastern United States (SUS) is a region that exhibits considerable climate variability throughout the year along with high-impact weather extremes of severe weather and land-falling Atlantic tropical cyclones in the summer and fall, freeze events in the winter season, and tornadoes in the spring season. The SUS region has rapidly grown in terms of human population for last several decades that further exposes vulnerabilities to the frailties of nature. Furthermore, in the recent times, the agricultural production of the region has grown significantly with the rise in consumption and demand for bio fuels, increase in price and demand for commodity and food crops and increasing irrigation infrastructure that is subsidized by the state governments in the SUS. Similarly, the coastal development and capitalization of natural marine resource environment have also risen with the growing wealth of the population. All of these developments have led to an increasing interest in the understanding of the climate variations and change on the built and the natural environments of the SUS. This special issue is a manifestation of such an interest in the SUS with contributions from several climate-related inter-disciplinary groups including the Southeast Climate Consortium (SECC; http://seclimate.org/), the Florida Climate Institute (FCI; http://floridaclimateinstitute.org/), the University of Florida Water Institute (http://waterinstitute.ufl.edu/), and the Florida Water & Climate Alliance (FloridaWCA; http://www.floridawca.org).

There are 15 research papers in this special issue covering climate science and its applications in hydrology, ecology, economy, crop science, and social science. It is quite apparent from the diverse set of papers that the demand for "reliable" regional-scale climate data over the SUS is of considerable interest for climate impact assessment. As a result, there are several papers in this collection which dwell on developing the regional-scale climate information from dynamic downscaling (e.g., Misra et al. 2012), or from statistical downscaling (e.g., Asefa and Adams 2013) or from a combination of statistical and dynamical downscaling (e.g., Hwang et al. 2013). Asefa and Adams (2013) introduced in their paper a new statistical bias correction technique for regional climate projections over central Florida based on a Bayesian approach that weights on the reliability of the global climate model in reproducing the observed climate. Hwang et al. (2013) highlight the merit of using dynamically downscaled and statistically bias-corrected climate data for hydrological applications over the Tampa Bay watershed. Misra et al. (2012) show the advantage and fidelity of dynamically downscaling the twentieth-century global atmospheric reanalysis (20CR) to 10 km grid resolution. For example, they demonstrate that data inhomogeneity issues over SUS in the 20CR are greatly ameliorated by the internal variations resolved by the dynamic downscaling to 10-km grid resolution.

The interest in regional-scale climate information over SUS is also evidenced in a number of papers in this special issue investigating the reliability of some of the existing high-resolution regional climate datasets. LaRow (2012) analyzes the surface wind and precipitation in land-falling Atlantic tropical cyclones over the SUS from one of the existing global reanalyses downscaled to 10 km grid resolution. Similarly, Obeysekera (2013) interrogates the reliability of the meteorological variables used in the calculation of the surface evapotranspiration from the

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downscaled climate integrations of the North American Regional Climate Change Assessment Program (NARCCAP). Likewise, Cammarano et al. (2013) examine the veracity of dynamically downscaled climate data on simulated wheat (winter) and maize (summer) yields over the SUS. All of these studies provide a different perspective on the evaluation of climate datasets based on their application in analysis of extremes, hydrology, and crop science.

There are several papers in this special issue, which examine the latest suite of the models in the Coupled Model Intercomparison Project (CMIP5), which is being used for the preparation of the fifth assessment report of the International Panel for Climate Change (IPCC AR5). A question that is often asked is which of the CMIP5 models are the most reliable for climate projections over the SUS given their large range of projections? Unfortunately, there is no straight answer to this question. However, in a related paper, Michael et al. (2013) discuss verification of the features of the El Niño and the Southern Oscillation (ENSO) in the twentieth-century simulations of the CMIP5 models. It is well recognized that ENSO has a very strong influence on the winter and spring season climate variations in the SUS, while in the summer and fall seasons, its influence on the Atlantic tropical cyclone activity is also equally well known. Similarly, Bastola (2013) examines the hydrological implications of the CMIP5 simulations of the twentieth-century and the twenty-first century projections over several watersheds across the SUS with added discussion on the sources of the uncertainty of the future climate projections. Asefa and Adams (2013) demonstrated the efficacy of their statistical downscaling approach using the CMIP5 suite of models.

The availability of CMIP5 integrations does not necessarily make CMIP3 (which was used in preparing IPCC AR4) redundant as the dynamically downscaled integrations lag by a few years from the completion of the global climate model runs. Moreover, Bastola (2013) finds that the model uncertainty of projections of precipitation over SUS is comparable between CMIP5 and CMIP3. Therefore, NARCCAP model integrations and other regional climate integrations done specifically for SUS using the CMIP3 global models continue to be of relevance even now. Selman et al. (2013) investigated the cause for the differing projections of the summer climate over the SUS from a global climate model of CMIP3 and a regional climate model nested to the same global climate model. Similarly, Mirhosseini et al. (2012) used the projections of three CMIP3 global climate models and the corresponding regional climate projections nested into them to develop the rainfall intensity–duration–frequency (IDF) curves for the future climate for the state of Alabama. These rainfall IDF curves are used quite extensively in the design of infrastructures for water management. Likewise Bucklin et al. (2012) examined the sensitivity of dynamical and statistical climate projections from the CMIP3 suite of models on the future geographical distribution of threatened and endangered vertebrates of the SUS using climate envelope models.

A clear and present vulnerability of the SUS is the sea level rise issue especially in the highly developed regions of south Florida and the site of the world's largest wetland restoration—the Florida Everglades. Karamperidou et al. (2013) offer a perspective on this issue by looking at the relative impact of natural variations and the secular change in the sea level on the Everglades national park.

The valuation of the climate data on various sectoral applications is an equally important component of the overall climate assessment of the SUS. Solís and Letson (2012) in their economy paper study the implication of the interannual climate variability on agricultural production in the SUS and also assess the economic value of climate forecasts on the agricultural sector in the SUS. They warn us of biased technical efficiency estimates in the event of ignoring the role of climate information in agricultural production that could ultimately manifest in misdirected rural development policies. Bolson et al. (2013) on the other hand provide evidence of under utilization of seasonal climate forecasts by water managers across the SUS and provide recommendations on how this situation could be improved. For example, they indicate limited development in integrating usable climate information into decision making. Bartels et al. (2012) in another related paper discuss on innovative stakeholder engagements like establishing climate learning network consisting of row crop farmers, agricultural extension specialists, researchers, and climate scientists working in the SUS to create interactive spaces for knowledge coproduction using participatory tools. Such thought out stakeholder engagements are necessary for improving the usefulness of climate information in decision support and strengthening of the adaptive capacity of vulnerable communities to a varying and changing climate. Overall, this special issue conveys a strong and consistent message that the appetite for climate information in the SUS for sectoral application is on the rise. In short, the papers in this special issue leave us with what has been and what can be achieved in applied climate research in the SUS.

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