

Comparison of RegCM4 and gauges for temperature and precipitation characteristics in Sao Paulo on high frequency timescales

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The crop development and yield are affected not only by the average conditions of the atmosphere, but also by the frequency of weather events. Due to the limitations of Global Climate Models in representing the daily weather fluctuations, most of the climate impact evaluation of over crop yield make use of weather generators to disaggregate the monthly climate averages into daily, or hourly, timescale - necessary for most of crop models. Therefore, the process of temporal disaggregation insert further uncertainties to this evaluation process. In this study, we use weather generator considering the statistical distribution of temperature and precipitation derived from weather stations, according to the present climate. The first step was methods using the statistics of the present climate variability were tested temporally and spatially to assess the stationary of the variance and the validation of the parameters of the distribution. Then, we developed to generate realizations of daily temperature and precipitation for gridding datasets over Sao Paulo while preserving the spatial and temporal correlations. Here we evaluate a stochastic weather generator to examine the processes that produce daily precipitation and temperature from monthly data sets provided by a regional climate model. We compare several statistical properties of daily precipitation and temperature gridded station data and the simulations of the Regional Climate Model version 4 (RegCM4) for the present, and make composites from these data sets to generate future scenarios considering not only average anomalies but also the changes in the frequency of daily events. Each precipitation and temperature data were generated for two processes independently and compared: (a) National Institute of Meteorology (Instituto Nacional de Meteorologia - INMET; Agronomic Institute of Sao Paulo (Instituto Agronomico de Campinas-IAC) called IAC+INMET (1991 to 2011), and (b) INMET (1961 to 2011). The stochastic model for generating spatially and temporally characteristics daily precipitation and temperature reproduced the main statistics of the observed historical record of each individual weather station as well as the spatial characteristics among gauges in each month. The results show the characteristics of daily precipitation of according with independent data sample from Climate Research Unit (CRU3.0). We considered analysis of daily precipitation distributions for threshold major than 5 mm/day. We also selected summer-wet season (December-January-February, DJF) and Winter-dry season (June-July-August, JJA) data samples. It is noted that the Gamma distribution perform fit to precipitation, when alpha and beta parameter provided a good fit to the data. The normal curves were fit to the maximum and minimum temperature based on average and standard deviation. As the integral of the gamma function does not have analytical solution, we construct surfaces with theoretical values can estimate the typical values of the models conditions using advanced statistical software. All comparisons between gauges and generated precipitation and temperature dataset showed high concordance.