TESTING THE PERFORMANCE OF DIFFERENT PROCESSES TO GENERATE TEMPERATURE AND SOLAR RADIATION: A CASE STUDY AT LLEIDA (NORTHEAST SPAI N)

The type of weather data that is available largely conditions weather generation at any given location. Weather generators that provide flexibility in the selection of generation methods are advantageous. ClimGen, a multivariate autoregressive first–order weather generation model, was used to compare different methods to generate weather series of daily maximum (Tx) and minimum (Tn) temperatures and bright sunshine hours (Bsh). Two of these methods (A1 and A2) can be applied at stations where daily precipitation (Prec), Tx, Tn, and Bsh data are available. Another method (B) can be applied at stations where Bsh data are lacking. Method A1 uses Tx, Tn, and Bsh in the multivariate generation process. Method A2 uses Tx, T = Tx – Tn, and Bsh. Method B only uses Tx and Tn. Two temperature–based methods to estimate solar radiation were used to complement method B. In addition, the two–parameter Weibull and Gamma distributions were compared for the generation of precipitation amounts.

The different methods were evaluated for agricultural applications at the Lleida region, in northeast Spain, a continental semiarid climate. Different climatological variables and agricultural indices were calculated using actual and generated data, and statistically compared at 5% and 10% levels of significance. It was concluded that: (1) The two–parameter Weibull distribution performed better in this region than the two–parameter Gamma distribution; (2) method A1 was slightly superior to method A2, mainly because the minimum temperature and the bright sunshine hours were better replicated; (3) method B was found satisfactory, but the complementary methods to estimate solar radiation from temperature did not perform well when they were calibrated at a given station and then used to generate for a station in a surrounding area; and (4) the methods tested well replicated chill units, growing degree days, the mean of heating degree days (but not its variance), and long hot or cold sequences, but they did not appear to reliably replicate short sequences as needed to assess problems such as crop frost potential. The generation of bright sunshine hours, as introduced in this study, is an alternative for locations where solar radiation data are not available to parameterize the weather generator.