USING ENSEMBLE-BASED FORECASTS AS AN IRRIGATION PLANNING AID
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Abstract
Recent droughts and the continuing water wars between the states of Georgia, Alabama, and Florida have made agricultural producers more aware of the importance of managing their irrigation systems more efficiently. Many southeastern states are beginning to consider laws that will require monitoring and regulation of water used for irrigation. In fact, last year, Georgia suspended issuing irrigation permits in some portions of the southwest part of the state to try and limit the amount of water being used in irrigation. However, even in southern Georgia, which receives on average between 23 and 33 inches of rain during the growing season, irrigation can significantly impact crop yields. In fact, studies have shown that when fields do not receive rainfall at the most critical stages in the life of cotton, yield for irrigated fields can be up to twice as much as fields for non-irrigated cotton.

This leads to the motivation for this study, which was to produce a forecast tool that will enable producers to make more efficient irrigation management decisions. First, we calculated the forecast error associated with ensemble-based forecasts (here the ECMWF model) for a portion of the agricultural region in southern Georgia. These errors were calculated based upon observations from the Georgia Automated Environmental Monitoring Network. Once the errors were calculated, we applied a q-to-q bias correction technique to the data in an effort to improve the precipitation forecasts over the selected region. Once we applied the bias corrections, we then used the check-book method of irrigation scheduling to determine the probability of receiving the required amount of rainfall for each week of the growing season during the years 2010, 2011 and 2012. Brier Scores were calculated for climatology, the model and for the corrected model runs. The Brier Scores showed that the model performed much better than climatology for the years 2010, 2011 and 2012. The Brier Scores also showed that the corrected model was an improvement over the model results. The techniques used here suggest how probabilistic forecasts may be used to optimize agricultural practices in a very general sense.
An ensemble of meteorological simulations with the WRF model at convection-allowing resolution (2km) is analysed in a multi-variable evaluation framework over Europe. Besides temperature and precipitation, utilized variables are relative humidity, boundary layer height, shortwave radiation, wind speed, convective and large-scale precipitation in view of explaining some of the biases. Furthermore, the forecast skill of evapotranspiration and irrigation water need is ultimately assessed. With respect to evapotranspiration and irrigation need, the errors using the MYJ configuration were in opposite directions and eventually cancel out, producing overall smaller biases. Forecasting is the essence of planning because planning also aims at deciding what is to be done in the future. 2. Depends upon Past and Present Event: Actually, forecasting is made by analyzing the past and present relevant data. Based on these and the opinions of sales managers, a reasonable trend of the future sales can be calculated. These forecasts are good for short range planning since sales people are not sufficiently sophisticated to predict long-term trends. Often companies use the results of national or regional econometric models as a major portion of a corporate econometric model. While such models are useful in forecasting, their major use tends to be in answering what-if questions. Moreover, it was found that most ensemble based studies used the conventional ensemble-ML methods such as bagging, AdaBoost, and stacked generalization to apply diversity, train the same ML models and aggregate the results into one complete model. However, this study incorporates the prediction resulted from ML models and the prediction resulted from the statistical model, which cannot be achieved by the conventional ML-based ensemble models. [19] have proposed a Theta model as a decomposition approach for forecasting applications. This model is based on modifying the local curvature of the time series data using a coefficient called Theta(θ) that is applied to the second derivative of the data as shown in Eq. (12). Forecasting as an Aid to Planning. Forecasts are key aids to planning in the following ways: Image: Planning and Forecasting. How are planning and forecasting related? The best alternative would be to make use of the existing forecasting instruments in a judicious manner, allowing for the risk factor involved and plan accordingly. In our daily actions, some amount of forecasting is inevitable. The very fact that so many people (economists, politicians, managers) employ forecasting as an instrument bears ample testimony to the fact that it is an invaluable guide to steer people to suitable actions. Forecasts do not have to be right to be useful. In spite of all its limitations, business forecasting is immensely useful and therefore The best ensemble forecasts are from the optimally combined subset of models. Sun, X.; Xie, L.; Shah, S.U.; Shen, X. A Machine Learning Based Ensemble Forecasting Optimization Algorithm for Preseason Prediction of Atlantic Hurricane Activity. Atmosphere 2021, 12, 522. https://doi.org/10.3390/atmos12040522. AMA Style. Sun X, Xie L, Shah SU, Shen X. A Machine Learning Based Ensemble Forecasting Optimization Algorithm for Preseason Prediction of Atlantic Hurricane Activity. Atmosphere. 2021; 12(4):522. https://doi.org/10.3390/atmos12040522. Chicago/Turabian Style. Sun, Xia; Xie, Lian; Shah, Shahil U.; Shen, Xipeng.