Panel communication (Mathematics in sustainability and climate change)

Improving Water Management through Short-Term Temperature Forecast Calibration Using State-Space Models

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Abstract

With the increase in climate change over the years, these dry periods have been occurring more frequently and for longer, hence increasing risks due to natural meteorological phenomena that affect the water cycle and availability. Conversely, economic development has greatly over-exploited the water resources, making inefficient water management a growing hot potato globally. Water is still the most crucial natural resource on the planet, on which virtually all human activities depend. Agriculture in all its forms takes around 69%, industries take about 19%, while residential use takes up to 12% of the world's water use [1]. This has, therefore, driven home with increasing cogency the need for sustainability in water management; irrigation systems being an important aspect of that end.

This work is a part of the "TO CHAIR - Optimum Challenges in Irrigation" project, aiming to understand and analyze soil humidity behavior through mathematical and statistical modeling to find optimal solutions for improving the efficiency of daily water use in irrigation systems [2, 3]. Among the main objectives of this investigation is the improvement of short-term forecasting skills of maximum temperature-that is, a crucial evapotranspiration component-through real-time forecast calibration issuing from the *weatherstack.com* platform. The latter approach exploits state-space modeling for an improvement of forecast accuracy of the first h-steps ahead, taking a six-day-ahead forecast horizon into consideration. In such time series forecasting, state-space models are flexible in structure.

References

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[3] Pereira, F.C., Gonçalves, A.M., Costa, M.: Short-term forecast improvement of maximum temperature by state-space model approach: the study case of the TO CHAIR project. Stoch Environ Res Risk Assess 37, pp. 219–231 (2023)