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Climate change and food security in the Mediterranean Basin

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Agriculture, a key economic sector in countries of the Mediterranean Basin, is currently facing a significant challenge: how to ensure the region's food security while the population is growing at a rapid rate, especially in North Africa and the Middle East where conditions related to climatic, soil properties and economic prosperity are generally less favourable than in the Basin's northwestern part? This challenge is likely to become even more testing in the near future because of projected climate change, and the associated increases in water scarcity and the frequency of extreme events. Developing policies that adequately address the complexity of this issue requires effective understanding of crop responses to changing environmental conditions, including climate and its variability, and changing atmospheric chemical composition. However, despite the important attempts that have been undertaken so far to predict the region's crop production under projected future climate change, there still remain large uncertainties associated with these predictions. Uncertainties that are inherent to climate projections, but also to crop model simulations. For instance, it recently has been shown that crop models are still unable to reproduce correctly some critical process governing crop growth and yield, such as CO2 fertilization and crop rotation effects on yield. Much effort is obviously still needed to reduce these uncertainties in order to make estimations of future crop production meaningful for effective policy making.
In this study, we attempt to shed light on the magnitude of the response of two major crops grown in the Mediterranean region (maize and wheat) to climatic change since the early 1960's. To achieve this goal, we used climate observations and crop yield records of the Food and Agricultural Organization, along with atmospheric CO2 observations and records on the effect of some major management practices on crop yield. Our findings provide critical insights on the response of yield of these crops to climate change under real-world growing conditions. The gained knowledge provides also insights on the reliability of current crop models and can be used in forthcoming investigations to improve their estimations of future crop production. This, ultimately, will help developing appropriate adaptation and policy making strategies.