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Future scenarios for viticultural bioclimatic indices in Europe

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Winemaking has a predominant economic, social and environmental relevance in several European countries. Studies addressing the influence of climate variability and change in viticulture are particularly pertinent, as climate is one of the main conditioning factors of this activity. In this context, bioclimatic indices are a useful zoning tool, allowing the description of the suitability of a particular region for wine production. In this study, we compute climatic indices (concerning to thermal and hydrological conditions) for Europe, characterize regions with different viticultural aptitude, and assess possible variations in these regions under a future climate conditions using a state-of-the-art regional climate model. The indices are calculated from climatic variables (mostly daily maximum and minimum temperatures and precipitation) obtained from the NCEP reanalysis dataset. Then, the same indices are calculated for present and future climate conditions using data from the regional climate model COSMO-CLM (Consortium for Small Scale Modelling - Climate Limited-area Modelling). Maps of theses indices for recent-past periods (1961-2008) and for the SRES A1B scenario are considered in order to identify significant changes in their patterns. Results show that climate change is projected to have a significant negative impact in wine quality by increased dryness and cumulative thermal effects during growing seasons in Southern European regions (e.g. Portugal, Spain and Italy). These changes represent an important constraint to grapevine growth and development, making crucial adaptation/mitigation strategies to be adopted. On the other hand, regions of western and central Europe (e.g. southern Britain, northern France and Germany) will benefit from this scenario both in wine quality, and in new potential areas for viticulture. This approach provides a macro-characterization of European areas where grapevines may preferentially grow, as well as their projected changes under human-induced forcing. As such, it can be a useful tool for viticultural zoning in a changing climate.