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Monitoring Environmental Variables to Promote Precision Agriculture

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Precision agriculture is a modern approach based on farm and irrigation management to improve the efficiency in the use of water resources. Precision agriculture, therefore, maximizes crop productivity and yield through technologies that identify, analyze, and monitor variability within a field and optimize profitability, sustainability, and land protection. This study proposes a combination of approaches to monitor a suite of environmental variables with the goal of improving agricultural management. We selected the experimental vineyard of Grignanello (Tuscany, Italy), located on a mild slope at 350 m.a.s.l in the famous Chianti wine region, where extensive ecohydrological data are available. In combination with this set of ground-based observations, the Environmental Policy Integrated Climate Model (EPIC) is adopted to model key variables for crop production, including soil temperature and soil water content. Using the EPIC model, we generate three sets of simulations based on three different parameterizations (i.e., original cosine, enhanced cosine, and pseudo heat transfer). By comparing model output against ground-based measurements and UAV-based soil temperature, we assess what model set-up is more accurate and for which environmental variable of interest. Furthermore, a new set of soil temperature and soil moisture estimates is obtained by taking the mean of the three EPIC simulations. Thus, we assess the possibility to improve the performance of the single models, as shown in previous studies across the Central Valley in California. Outcomes from this work will provide a solid basis towards developing a decision guidance system for precision agriculture management.