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Discrimination of agro-zones using UAVs platform in a commercial vineyard. Case study of the Merlot variety in Yepes-Toledo.

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Water is the main constrain for yield in semiarid vineyards, as in Spain. Therefore, effective management of the water resource is a priority to alleviate the instability in productivity and negative socio-economic impacts that the drought phenomena may cause. Vine growers always seek a certain level of water stress in vineyards, increasing wine quality. This target implies monitoring of crop water status during the agronomic campaign.

Traditional methods for field data acquisition involve extensive sampling and time-consuming, destructive and discrete measurements, thus impractical for monitoring large areas and commercial-scale farming. Nonetheless, vineyards are heterogeneous and sparse crop systems with significant intra- and inter-field variability, being soil one of the sources of this variability(Taylor, J., & Bramley, R., 2004). Remote sensing technology is a valuable tool for studying the significant complexity of vineyards agroecosystems. Among the remote sensing techniques, unmanned aerial vehicles (UAVs) have become a technology with affordable operational costs, non-invasive, and high spatial and temporal resolution used in commercial vineyards. UAVs are coupled with multispectral and thermal cameras that acquire aerial images of specific spectral responses of the vegetation and thermal infrared region of the spectrum.

This work aims to study how soil variability influences the monitoring of crop water status through multispectral and thermal infrared sensors installed in the UAV platform. In order to do it, a commercial Merlot variety vineyard located in Yepes, Toledo, was arranged on a trellis with a plantation frame 2.60 x 1.10 m established in 2002. This variety is located in two soil types present distinctive hydraulic properties and different water retention capacity

Canopy temperature and thermal-based indicators from airborne thermal imaging are used to map spatial variability and quantify crop water status. The crop water stress index (CWSI) is one of viticulture's most common water stress indices(Idso, et al., 1981) The normalized difference vegetation index (NDVI) has been proven to represent crop structural characteristics and vigour, correlated to vine water status in environments where soil water deficit is a determinant factor for vine crop(Hall, et al., 2002)

The results point out that the difference between both zones is statistically significant, indicating the role of soil in the water status. Several conclusions are obtained when comparing the physiological parameters.

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