

Daily evapotranspiration estimates from application of Shuttleworth-Wallace model with Sentinel-2 surface reflectance data over California vineyards

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Abstract

Efficient use of available water resources is key to sustainable viticulture management in California (CA) and other regions with limited water availability in the western US and abroad. This requires remote and frequent field-scale information on vineyard water status. Though the Sentinel-2 sensors offer good spatial (10-60m) and temporal (~5 days) coverages, their utility in monitoring vineyard evapotranspiration (ET) has not been considered viable primarily due to the lack of a thermal band. However, recently, a new spectral-based Shuttleworth Wallace (SW) ET model, which uses a contextual framework to determine dry and wet extremes from the Sentinel-2 (SW-S2) surface reflectance data, has shown promise when tested over a single GRAPEX (Grape Remote-sensing Atmospheric Profile and Evapotranspiration eXperiment) site in CA. However, current knowledge on its applicability across a climate gradient in CA with different topography, soils, trellis design and vine variety is lacking. Moreover, how the selection of modeling domain and meteorological forcing data influence model output is limited. Consequently, this presentation expands the evaluation of the SW-S2 model across multiple domains and meteorological inputs covering all three GRAPEX vineyard sites spanning a north to south climate gradient over three recent growing seasons (2018-2020). In comparison with flux tower observations, the size of the modeling domain and the source and quality of meteorological forcing data on the performance of the SW-S2 model as well as application to the three different vineyard study sites will be presented. Future research on merging output from more-frequent spectral and less-frequent thermal-based ET models to reduce latency in ET monitoring of California vineyards will also be discussed.

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