Monitoring Vineyards with Planet Dove Satellites

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Abstract

Spectral-based vegetation indices (VI) have been shown to be good proxies of grapevine stem water potential (Ψstem), potentially assisting in irrigation-decision making of commercial vineyards. However, VI-Ψstem correlations are mostly reported at the leaf or canopy scales using sensors attached to leaves or very-high-spatial resolution images derived from sensors mounted on small airplanes or drones. Here, for the first time, we take advantage of the high spatial resolution (3-m), near-daily images acquired from Planet's nano-satellites constellation to derive VI-Ψstem correlations at the vineyard scale. Weekly Ψstem were measured along the growing season of 2017 in six vines in 81 commercial vineyards and in 60 pairs of vines in a 2.4 ha experimental vineyard in Israel. The clip application programming interface (API), provided by Planet, and Google Earth Engine platform were used to derive spatially continuous time series of four VIs: GNDVI, NDVI, EVI, and SAVI in the 82 vineyards. Results show that per-week multivariable linear models using variables extracted from VI time series successfully tracked spatial variations in Ψstem across the experimental vineyard (Pearson's-r = 0.45–0.84: N=60). A simple linear regression model enabled monitoring seasonal changes in Ψstem along the growing season in the vineyard (r = 0.80–0.82). Planet VIs and seasonal Ψstem data from the 82 vineyards were used to derive a 'global' model for in-season monitoring of Ψstem at the vineyard-level (r = 0.81: RMSE = 17.5%: N=970). The 'global' model, which requires only a few VI variables extracted from Planet images, may be used for real-time weekly assessment of Ψstem in Mediterranean vineyards, substantially reducing expenses of conventional monitoring efforts.

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1. AIM & 2. APPROACH

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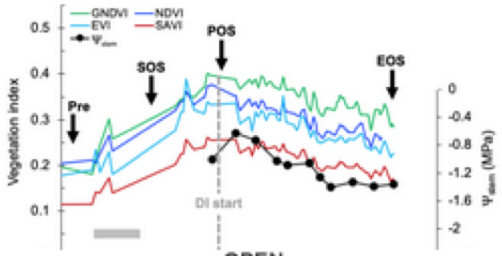
5. RESULTS I Mevo Beitar



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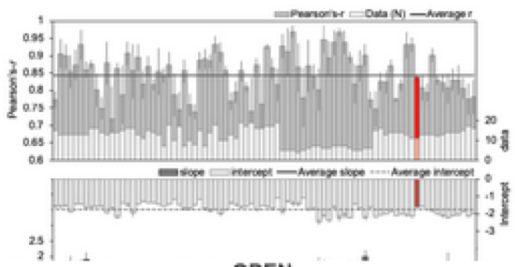
6. RESULTS II 81 Commercial



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7. MODEL EVALUATION

We **EVALUATED** our 'global' model in Mevo Beitar experimental vineyard.

Figure 7 shows **Ψstem** predicted from a multivariable regression model using data along the season in Mevo Beitar (**MB-Reg**) and the same model with per date data (**MB-Mult**). Ψstem at Mevo Beitar from the 'global' model (**Global-Mult**), without using data from

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3. PLANET & 4. GEE

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SUMMARY

- Deficit irrigation is a commonly used irrigation strategy in vineyards aiming to achieve high-quality berries for premium wine production.
- Stem water potential measured in the field has been a key parameter in assessing the vineyard's water status.
- The relationship between stem water potential and vegetation indices was evaluated in Mediterranean vineyards through the use of

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