USING A WIRELESS QUANTUM SENSOR NETWORK TO MONITOR THE TEMPORAL DYNAMICS OF VEGETATION BIOPHYSICAL PARAMETERS IN A MEDITERRANEAN VINEYARD

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ABSTRACT

A wireless quantum sensor network has been installed at Mediterranean vineyard vegetation (Valencia Anchor Station, Spain). This network will supplement manual field data collections (DHP), which have been periodically collected throughout the growing season, allowing the performance of the automated systems to be assessed against established and accepted in situ measurement techniques.

OBJECTIVES

1. Monitor the temporal dynamics of biophysical variables using a wireless quantum sensor network.
2. Perform cross comparison with manual DHP data collection
3. Validation of satellite data

The Valencia Anchor Station is a CEOS LPV supersite (39.57° N, 1.28 W)

METHODS

Fraction of Absorbed Photosynthetically Active Radiation (FAPAR) derived at 10:00 local solar time (± 15 minutes)
Compared with DHP-derived FIPAR (assumes black leaves)

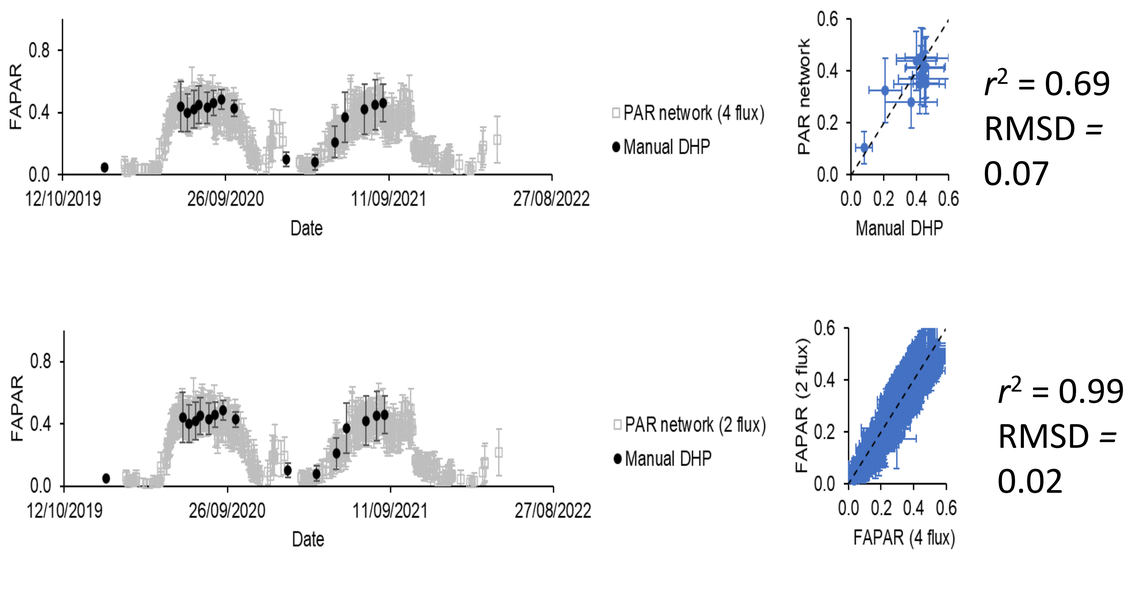
$$FIPAR = 1 - \overline{P(\theta_{SZA})}$$

Two- and four-flux definitions computed

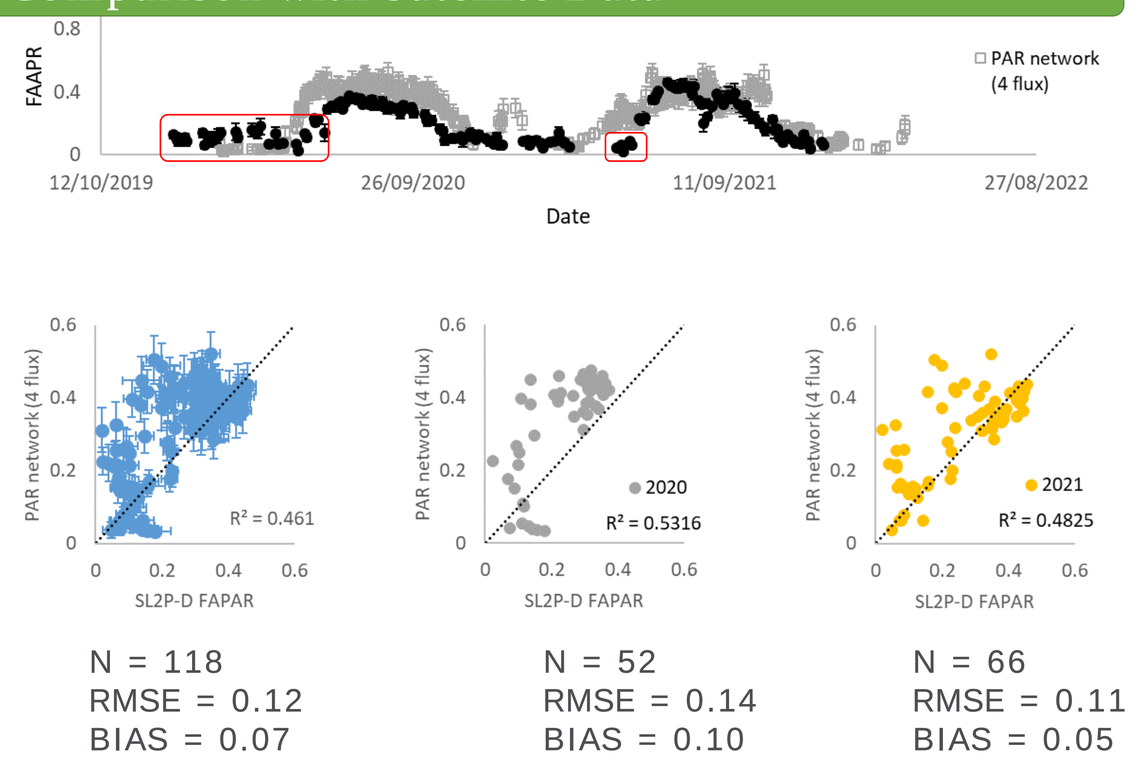
$$FAPAR_{\text{four}-flux} = \frac{I^{\downarrow}_{TOC} - I^{\downarrow}_{ground} + I^{\uparrow}_{ground} - I^{\uparrow}_{TOC}}{I^{\downarrow}_{TOC}}$$

$$FAPAR_{\text{two}-flux} = 1 - \frac{I^{\downarrow}_{ground}}{I^{\downarrow}_{TOC}}$$

Comparison with DHP data



Comparison with Satellite Data



DISCUSSION & CONCLUSION

1. Consistency with manual DHP data provides confidence that the investigated approaches can deliver data of comparable quality
2. Strong relationship with Satellite biophysical products although a bias between approaches
3. Investigate derivation of PAIe from the wireless quantum sensor networks

REFERENCES

Brown et al., 2021 “Validation of baseline and modified Sentinel-2 Level 2 Prototype Processor leaf area index retrievals over the United States”
Putzenlechner et al., 2020 “Accuracy assessment on the number of flux terms needed to estimate in situ fAPAR”
Putzenlechner et al., 2019 “Assessing the variability and uncertainty of two-flux FAPAR measurements in a conifer-dominated forest”