

AUTHORS: C. Latorre⁽¹⁾, F. Camacho⁽¹⁾, F. de la Cruz⁽²⁾, R. Lacaze⁽³⁾, F. Baret⁽⁴⁾, M. Weiss⁽⁴⁾

⁽¹⁾ EOLAB SPAIN, Parc Científic Universitat de València. Catedrático José Beltrán, 2. 46980 Paterna (Valencia), Spain. Tel: 963543841. E-mail: consuelo.latorre@eolab.es
⁽²⁾ ITAP, Spain. ⁽³⁾ HYGEOS, France. ⁽⁴⁾ INRA, France.

ABSTRACT

This paper evaluates the continuous ground-based measurements collected during 2014 inter-annual campaign in Las Tiesas –Barrax (Albacete, SPAIN). These results will be useful for mapping biophysical variables in the study area, for direct validation studies of Copernicus Global Land Service. The site and the continuous monitoring activities are in the context of **ImagineS** project (Implementing Multi-scale Agricultural Indicators Exploiting Sentinels), funded by the European community within the FP7 program. The field activities support the Copernicus LAI/FAPAR product validation focused on the evolution to **PROBA-V** and **Sentinels**.



STUDY AREA

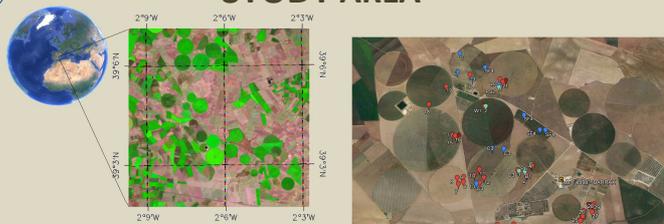


Figure 1. TOA false composition (RGB-SWIR, NIR, RED)

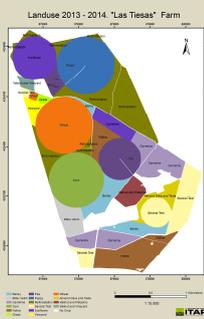


Figure 3. Land Use map. (UTM 30 N)



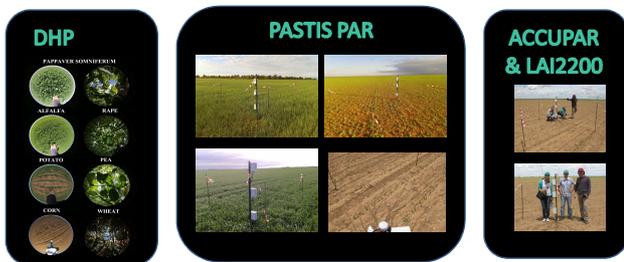
Figure 2. Distribution of ESUs over the Barrax site.

MEASUREMENTS

Distribution of 36 ESUs over BARRAX site



Figure 4. In Situ Characterization.



CEOS METHODOLOGY

The standard procedure for validation follows the best practices of CEOS/LPV (Committee on Earth Observation Satellites) group (Morissette et al., 2006), existing protocols (e.g., Fernandes et al., 2012) and previous global validation exercises (Camacho et al., 2013; Garrigues et al., 2008; Weiss et al., 2007).

The methodology has been applied to the agricultural area of Barrax using LAI (Leaf Area Index), FAPAR (Fraction of Photosynthetic Active Radiation FPAR Absorbed by vegetation) and FVC (Fraction of Vegetation Cover) estimates from DHP (Digital Hemispherical Photography), Accupar and LAI2200 measurements and deriving PAI (Plant Area Index based on light transmittance) from PASTIS-PAR sensors (PAI Autonomous System from Transmittance Sensors).

INSTRUMENTATION

Calibration - CANEYE Software

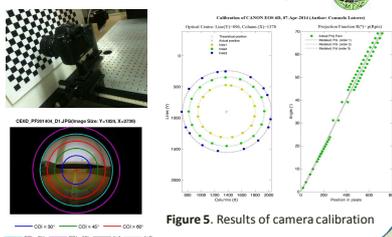


Figure 5. Results of camera calibration

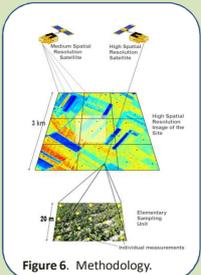


Figure 6. Methodology.

RESULTS

Ground Data Analysis

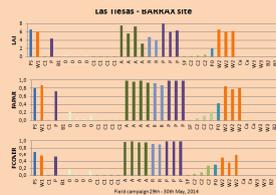
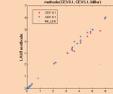


Figure 7. Distribution of Cropland types by ESUs. Intensive field campaign 29th May, 2014.

Figure 8. Correlation between different methods calculated by CAN-EYE software for LAI and LAIeff biophysical variables.



The instantaneous FAPAR is approximated at each solar hour as the gap fraction in the corresponding solar zenith angle:

$$FAPAR_{inst}(\theta_s) = 1 - P_{01}(\theta_s)$$

The daily integrated block day or direct FAPAR is computed as the following:

$$FAPAR_{int} = \int_{t_{start}}^{t_{end}} FAPAR_{inst}(\theta_s) dt = \int_{t_{start}}^{t_{end}} (1 - P_{01}(\theta_s)) dt$$

PASTIS PAR Analysis

Figure 9. Preliminary calibration over the sensors by INRA software

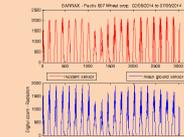
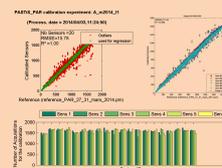


Figure 10. Example of Radiation measurements - PASTIS PAR located in a wheat field. Data in processing by INRA.

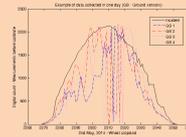


Figure 11. Measurements collected among one day by different sensors. Estimated FAPAR = 1-t.

Empirical Transfer Function

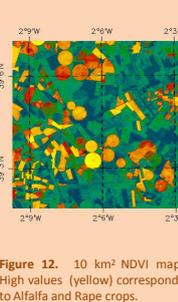


Figure 12. 10 km² NDVI map. High values (yellow) corresponds to Alfalfa and Rape crops.

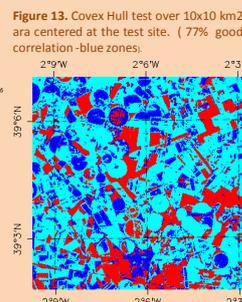


Figure 13. Covex Hull test over 10x10 km² area centered at the test site. (77% good correlation - blue zones).

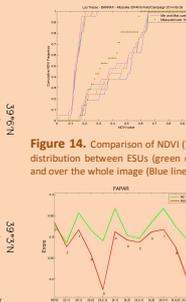


Figure 14. Comparison of NDVI (TOA) distribution between ESUs (green dots) and over the whole image (blue line).

UP-scaling

Ground Based High Resolution Maps



Figure 16. Map for FAPAR (LANDSAT8 image). NDVI mask has been created for lower ground data (Senescent Barley and Wheat, growing summer crops and bare soil areas)

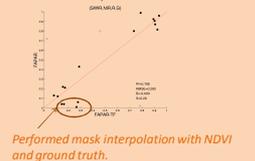
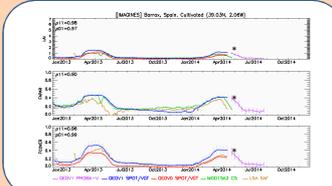


Figure 17. Scatter plot results for regression on reflectance using 4 bands combination. SWIR, NIR Red and Green.

Contribution to Validation of PROBA-V



Temporal Consistency

Figure 18. First PROBA-V results at 1 km resolution. Comparison the field data mean values (3x3 km area) with the temporal profile of GEOV1 - PROBA-V over the Barrax site.