Quality Assessment of LAI, FAPAR and FCover global products derived from SPOT/VGT data in the Copernicus Global Land Service

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ABSTRACT

This study is focused on the Quality Assessment, methodology and results, of GEOv1 LAI, FAPAR and FCover global products developed in the framework of Copernicus. From 1st January 2013, the **Copernicus Global Land Service** is operational, providing continuously a set of biophysical variables over the whole globe at one kilometer resolution. The LAI, FAPAR and FCover products are currently generated every 10 days on a reliable and automatic basis from SPOT/VGT data.

METHODOLOGY

The Quality Assessment methodology follows of CEOS - OLIVE (Committee on Earth Observation Satellite - On Line Interactive Validation Exercise) metrics. Accuracy was estimated against ground-based maps.

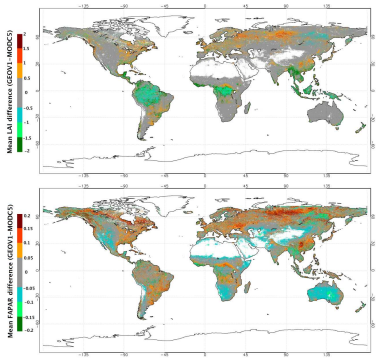
METRICS 2003-2005 period	CEOS / OLIVE	
Spatial Consistency	Maps of the products and difference maps with reference products	
Global Statistical Analysis	Histograms and Scatter-plots (R^2, RMSE, Bias, Scattering) per biomes	✓
Temporal Consistency	Temporal profiles over 686 sites were analyzed	✓
Temporal Smoothness	Measure of the short time stability	✓
Regional Assessment	Difference maps, scatter-plots and metrics per main biome	
Accuracy Assessment	Direct comparison with reference maps	✓

PRODUCTS	GEOv1 (LAI, FAPAR, FCOVER)	GEOv0 (LAI, FCOVER)	REFERENCE PRODUCTS CYCV31	GLOBV2	JRC SeaWIFS	MOD15A2-C5
Sensor/ Plataform	VGT/ SPOT	VGT/ SPOT	VGT/ SPOT	AATSR +VGT	SeaWiFS Orbview-2	MODIS/ TERRA
Spatial Resolution	1 km	1 km	1 km	1 km	2.71 km	1 km
Temporal frequency	10-days	10-days	10-days	10-days	1-day	8-days
Temporal Window Product Date	30-days (+17)	30-days (+30)	30-days (+15)	30-days (+10)	1-day	8-days
Proyection	Plate carrée	Plate carrée	Plate carré	Plate carré	Sinusoidal	Sinusoidal

RESULTS

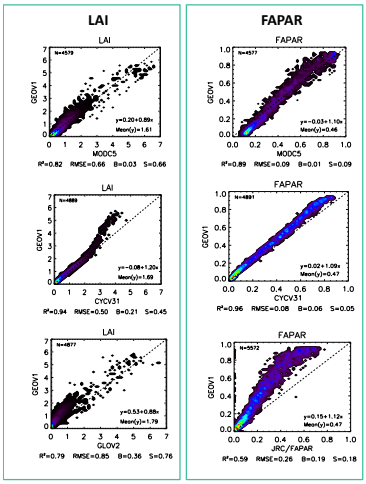
INTERCOMPARISON VALIDATION

SPATIAL CONSISTENCY

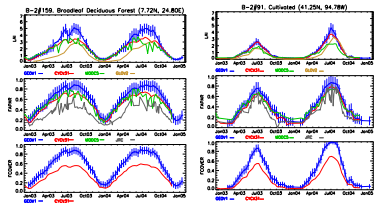


PRODUCT CONTINUITY

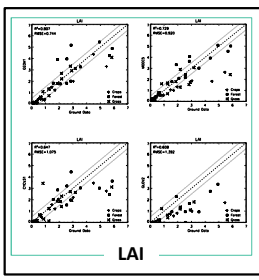
GLOBAL STATISTICAL ANALYSIS



TEMPORAL CONSISTENCY



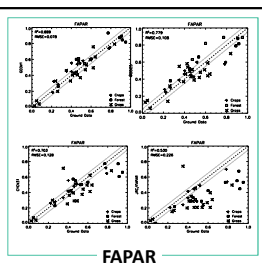
DIRECT VALIDATION



LAI

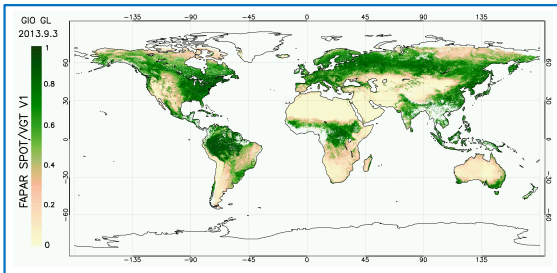
LAI	REFERENCE PRODUCTS GEOV1	CYCV31	MODC5	GLOV2
N	48	45	49	27
RMSE	**0,74**	1,07	0,92	1,39
B	**-0,10**	-0,36	-0,26	-1,05
S	**0,737**	1,01	0,88	0,92
R^2	**0,807**	0,647	0,729	0,608
Slope	**0,85**	0,59	0,69	0,46
Offset	0,15	0,41	0,31	**0,02**

FAPAR	REFERENCE PRODUCTS GEOV1	CYCV31	MODC5	SeaWiFS
N	42	39	42	40
RMSE	**0,08**	0,13	0,11	0,23
B	0,014	-0,04	**0,006**	-0,16
S	**0,08**	0,12	0,11	0,16
R^2	**0,889**	0,707	0,779	0,53
Slope	**0,91**	0,69	0,77	0,54
Offset	**0,05**	0,45	0,11	0,06



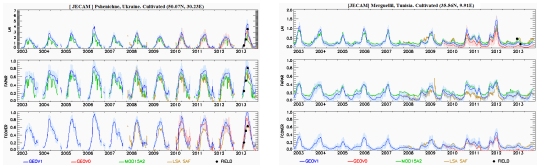
FAPAR

NEAR REAL TIME PRODUCTS



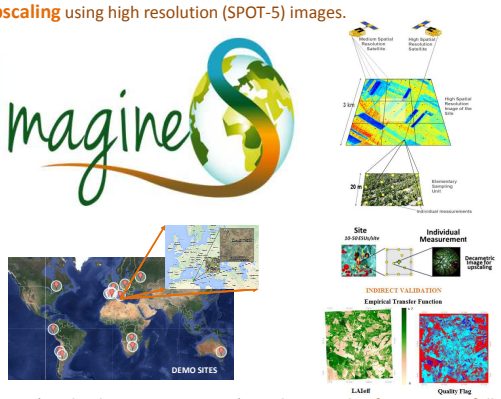
The objective of the continuous **Quality Monitoring** is to verify that the recent operational LAI, FAPAR products keep the same level of quality that the fully validated products.

TEMPORAL CONSISTENCY 2002-2013



EVOLUTION

ImagineS will contribute to the collection of continuous ground data over a network of demo sites around the world and the **upscaling** using high resolution (SPOT-5) images.



GEOv1 (Geoland BioPar Version 1) products is the first version fully operational, **GEOv2** is currently under validation.

The field activities of the **FP7 ImagineS** project in support of the Copernicus LAI/FAPAR product validation focused on the evolution to **PROBA-V** and **Sentinels.**

CONCLUSIONS

BioPar GEOv1 products have reached a **validation stage level of 2 according to CEOS LPV** criteria.

Full validation results can be found in ***Camacho et al. 2013*** *"GEOV1: LAI, FAPAR essential climate variables and FCOVER global time series capitalizing over existing products. Part 2: Validation and intercomparison with reference products". Remote Sensing of Environment 137 (2013) 310–329*

PERFORMANCE Concluding Remarks	Summary of Product Evaluation GEOV1	MODC5	CYCV31	GLOV2 LAI	JRC-FAPAR
Continuity (Missing values)	-	-	-	-	nd
Magnitude High values	+	+	-	+	-
Magnitude Low values	+	-	+	+	+
Temporal consistency (Precision)	+	+	+	-	+
Smoothness	+	-	+	monthly	daily
Direct validation (Accuracy)	+	+	+	-	-

The version **GEOv2** was developed to improve GEOv1 product continuity .

(see Poster S7.16 ***A. Verger et al.*** *"Near Real Time Estimation of Biophysical Variables within COPERNICUS global land service").*