



Global Land Service



The 333m biophysical products in the Copernicus Global Land service

Roselyne Lacaze on behalf the consortia

Global Land Service

The Global Component of the Copernicus Land Service

• A global systematic monitoring service

- Production of Bio-geophysical variables over the globe
 > NRT delivery (hourly -> dekad)
 - > Consistent historical time series (15+ years)
- Quality control
- Archiving & re-processing
- Dissemination & user support

• To support and consolidate:

- EU contribution to GEO/GEOSS
- EU policies & commitments at international level
 Crop Monitoring and Food security in/outside Europe
 Biodiversity, Protected areas and Forest cover monitoring
 Drought Assessment and Desertification
 - Carbon modeling, land use and land cover change
 - Support to Earth Observation Activities in Africa



Currently **Portfolio**





More details on http://land.copernicus.eu/global/products

* Currently Africa only





Currently Quality Control: technical

• Each production center

 Monitoring individual processing steps, generated files and timeliness



Currently Quality Control: technical

• Each production center

- Monitoring individual processing steps, generated files and timeliness
- Checking for unreliable values by displaying statistics





Currently Quality Control: scientific

Per variable:

- Exhaustive evaluation of new products & version before "operational" status
- Following protocols and metrics defined by CEOS/LPV
- Quality monitoring, every 6 months, to check quality keeps stable along time





Currently Quality Control: scientific

• Per variable:

- Exhaustive evaluation of new products & version before "operational" status
- Following protocols and metrics defined by CEOS/LPV
- Quality monitoring, every 6 months, to check quality keeps stable along time

Across variables, using a Land Data Assimilation System

- Assimilation of LAI and SWI
- Passive monitoring of FAPAR, Albedo and LST



and SWI on FAPAR estimates

RAQRS – Valencia – 22nd – 26th September 2014





FAPAR estimate Without & With assimilation

2014-01

2014-02

e O

201

9

201

201

90

0.2

Currently Quality Control – independent assessment

• Audit: statement on the service

performed on October 2013

Reviews: decisions on evolutions of the service

- First cycle performed on May 2014
- Next in November 2014 and Feb 2015

• Technical User Board: define product specifications

- First meeting in May 2014
- Next in November 2014





Currently **Distribution - website**

http://land.copernicus.eu/global

| lobo | opernicu | JS | | | | | | | h thi | s site |
|--------------------------|---|---|--|---|--|--|--|--|--|--|
| me Prod | Global Laı | nd Service | | | | | | | nicu | s Land ser |
| ome | Home Products FAQ | Helpdesk Links News & | events About the global is | and service | | | | | | |
| | BA | OMP FAPAR | R FCover | LAI | NDVI | VCI | VPI | LST | SA | |
| e Global I rvice to o | Surface Albedo | (SA) | | | | | | | | |
| e compler | The surface albedo (albedo) is the integr | quantifies the fraction of ation of the bi-directiona | the incoming solar rad I reflectance over the | viewing hemisp | ohere. It assumes all energy | is coming from a | direct radiation fi | rom the sun, it is cor | mputed fo | |
| e compler | The surface albedo albedo) is the integr reflectance (also ca The Global Climate SA characteristi Access Algorithm | uantifies the fraction of ation of the bi-directiona led white-sky albedo) is Observing System (GCC CS Quality Application | the incoming solar rad I reflectance over the the integration of the (5) specified the black Technical Document | liation reflected viewing hemisp directional albe - sky albedo (di | by the surface of the cards obere. It assumes all energy ado over the illumination her irection albedo) as an Esser | is coming from a nisphere. It assur ntial Climate varia | direct radiation fi nes a complete d ble and the produ | rom the sun, it is cor iffuse illumination. ict required for clima | mputed fo aila ite change | I ble Read m |
| e compler | The surface albedo albedo) is the integr reflectance (also ca The Global Climate SA char acteristi Access Algorithm Product version | auantifies the fraction of ation of the bi-directiona led white-sky albedo) is Observing System (GCO CS Quality Application Access | the incoming solar rad I reflectance over the the integration of the (5) specified the black Technical Document Status | Nation reflected viewing hemisp directional albe -sky albedo (di | Temporal coverage | is coming from a nisphere. It assur ntial Climate varia Spatial inforn | direct radiation fi nes a complete d ble and the produ nation | rom the sun, it is cor iffuse illumination. .ct required for clima | mputed fo ate change VI Time)72 | 1ble Read m 2.0 |
| ecial it | The surface albedo albedo) is the integr reflectance (also ca The Global Climate Access Algorithm Product version 1 | auantifies the fraction of ation of the bi-directiona led white-sky albedo) is Observing System (GCC CS Quality Application Access Data Portal | the incoming solar rad I reflectance over the the integration of the (S) specified the black Technical Document Status Operational | iation reflected viewing hemisg directional albe - sky albedo (di s Sensor SPOT-VGT | Temporal coverage Dec 1998 - May 2014 | is coming from a misphere. It assum tial Climate varia Spatial inform Global, 10°×1 | direct radiation fi nes a complete d ble and the produ nation 0° tiles, contine | rom the sun, it is cor iffuse illumination. Ict required for clima ental tiles, 1km | mputed fo ite change VI Time)72 Archivodu | Read m 2.0 21 cts (201406 |
| | The surface albedo albedo) is the integr reflectance (also ca The Global Climate Access Algorithm Product version 1 | auantifies the fraction of ation of the bi-directiona led white-sky albedo) is Observing System (GCC CS Quality Application Access Data Portal Expected Nov'14 | the incoming solar rad I reflectance over the the integration of the (S) specified the black Technical Document Status Operational In development | stion reflected viewing hemisp directional albe -sky albedo (di Sensor SPOT-VGT PROBA-V | Temporal coverage Dec 1998 - May 2014 Dec 1998 - May 2014 Jun 2014 - present | is coming from a nisphere. It assun tial Climate varia Spatial inform Global, 10°×1 Global, 10°×1 | direct radiation fines a complete d ble and the produ nation 0° tiles, contine 0° tiles, contine | rom the sun, it is cor iffuse illumination. ict required for clima ental tiles, 1km ental tiles, 1km | mputed fo ite change VI Time)72 Archi _{lo} du Withi ^{Ir Re} | Read m 2.0 21 cts (201406 cts (201406 cts (201406 |
| e compler | The surface albedo albedo) is the integr reflectance (also ca The Global Climate SA choracteristi Access Algorithm Product version 1 1 1 | auantifies the fraction of ation of the bi-directional led white-sky albedo) is Observing System (GCC CS Quality Application Access Data Portal Expected Nov'14 GEONETCast | the incoming solar rad I reflectance over the the integration of the o DS) specified the black Technical Document Status Operational In development In development | Sensor SPOT-VGT PROBA-V PROBA-V | Temporal coverage Dec 1998 - May 2014 Jun 2014 - present Near - real time only | spatial inform Global, 10°×1 Africa, South | direct radiation fines a complete d ble and the produ nation 0° tiles, contine 0° tiles, contine | rom the sun, it is cor iffuse illumination. Ict required for clima ental tiles, 1km ental tiles, 1km | withi | Read m 2.0 21 cts (201406 sal Time. Read m |



Currently **Documentation**





Currently **Distribution - website**

http://land.copernicus.eu/global

| e Prod | Global La | nd Service | | | | | | nicu | s Land |
|-----------------------|--|--|---|--|--|---|--|--|---|
| ne | Home Products FAQ | Helpdesk Links News 8 | & events About the global k | and service | | | | | |
| | BA | DMP FAPA | AR FCover | LAI | NDVI | VCI V | PI LST | SA | |
| Global I vice to o | Surface Albedo | (SA) | | | | | | | |
| | reflectance (also ca | alled white-sky albedo) i | is the integration of the | directional albe | edo over the illumination he | misphere. It assumes a | complete diffuse illumination. | aila | ble |
| cial ii | reflectance (also ci The Global Climate SA characterist Access Algorithm | alled white-sky albedo) i Observing System (GC tics Quality Application | Technical Document | directional albe c-sky albedo (d | edo over the illumination he irection albedo) as an Esse | misphere. It assumes a ntial Climate variable an | complete diffuse illumination. d the product required for clim | aila ate change | ible Read |
| cial iı | reflectance (also ci The Global Climate SA characterist Access Algorithm Product version | alled white-sky albedo) i observing System (GC tics Quality Application | Technical Document | directional albe c-sky albedo (d ts Sensor | edo over the illumination he irection albedo) as an Esse Temporal coverage | sphere. It assumes a ntial Climate variable an Spatial information | complete diffuse illumination. d the product required for clim | vI Time)72 | 2.0 |
| cial ir | reflectance (also ci The Global Climate SA characterist Access Algorithm Product version 1 | led white-sky albedo) i c Observing System (GC Quality Application Access Data Portal | Technical Document Status Operational | directional albe c-sky albedo (d ts Sensor SPOT-VGT | deo over the illumination he irection albedo) as an Esse Temporal coverage Dec 1998 - May 2014 | spere. It assumes a ntial Climate variable an Spatial information Global, 10°x10° tile | complete diffuse illumination. d the product required for clim a s, continental tiles, 1km | VI Time)72 Archivoduc | Read 2.0 21 cts (2014) |
| cial iı | reflectance (also c: The Global Climate SA characterist Access Algorithm Product version 1 | alled white-sky albedo) i observing System (GC Quality Application Access Data Portal Expected Nov'14 | Technical Document Status Operational In development | directional albe c-sky albedo (d ts Sensor SPOT-VGT PROBA-V | Temporal coverage Dec 1998 - May 2014 Jun 2014 - present | Spatial information Global, 10°×10° tile | complete diffuse illumination. d the product required for clim es, continental tiles, 1km | VI Time)72 Archi ¹ oduc Withi ¹⁷ Re | 2.0 21 cts (2014) sal Time. |
| cial ir | reflectance (also ci The Global Climate SA characterist Access Algorithm Product version 1 1 | Identified of the Brodine Choine Choi | Technical Document Status Operational In development In development | directional albe directional albe (sky albedo (d Sensor SPOT-VGT PROBA-V PROBA-V | Temporal coverage Dec 1998 - May 2014 Jun 2014 - present Near - real time only | Spatial information Global, 10°×10° tile Africa, South Ameri | complete diffuse illumination. d the product required for clim es, continental tiles, 1km es, continental tiles, 1km ca continents | VI Time)72 Archi'oduc Withi | eble Read 2.0 21 cts (2014 eal Time. Read |
| cial iı | reflectance (also ci The Global Climate SA characterist Access Algorithm Product version 1 1 1 0 | alled white-sky albedo) i e Observing System (GC Quality Application Access Data Portal Expected Nov'14 GEONETCast DevCoCast website | Technical Document Status Operational In development Operational | spot-vgt spot-vgt spot-vgt spot-vgt spot-vgt spot-vgt spot-vgt | Temporal coverage Dec 1998 - May 2014 Jun 2014 - present Near - real time only Aug 2007 - May 2014 | Spatial information Global, 10°×10° tile Africa, continent an | complete diffuse illumination. d the product required for clim es, continental tiles, 1km es, continental tiles, 1km ca continents id countries | VI Time)72 Archivoduc Withi ^{Ir Re} Withi | eble Reso 2.0 21 cts (2014 eal Time. Reso |

Currently Distribution – data portal

Free and open product access

- Anonymous query
- Automated Registration

2 data download channels

- Internet: NRT + full archive
- Broadcast

EUMETCast Africa & South-America
 NRT products only

| Opernicus Global Land Service | Login Register Help FAQ Contact |
|------------------------------------|--|
| 🖤 भ् भ् 💐 🚱 💽 👩 🚺 👩 🗌 🚺 👔 🚺 legend | European Commission Watch our video tutorials A Q III W III |
| | Vegetation Dynamics - LAI V1 |
| | □ Leaf Area Index LAI V1 (3962 products) |
| | Fraction of Vegetation Cover Fraction of APAR |
| | ▼ Basic |
| | Date Stor Start date 06/06/2012 |
| | End date 10/07/2012 |
| | Search Reset |
| 5000 km 2000 mi | Number of results per page 50 |
| | 2 ² ···· – 20 September 2014 |

Evolution – 2014 Secure continuity of km products

• Keeping consistency between sensors

- SPOT/VGT switch off: end of May 2014
- NRT PROBA-V products: "Demonstration"
 - ► NDVI, VCI, VPI, DMP
 - Preliminary Quality Assessment: comparison VGT vs PROBA-V products over overlap period
 - Full Quality Assessment with one year of product



- NRT PROBA-V products: "In development"
 - ► LAI, FAPAR, FCover
 - Burnt Areas, Water Bodies
 - ➤ TOC Reflectances, Surface Albedo
 - Algorithm adaptations necessary





Evolution – Short term (2014 - 2015) Introduce 333m products

Derived from PROBA-V data

Time series starting mid October 2013



Algorithms and chains developed in FP7/ImagineS

- NRT production in "demonstration" mode, over Europe
 - > LAI, FAPAR, FCover: starting in November 2014
 - ➤ TOC reflectance, Albedo: starting in February 2015











- Algorithm defined by INRA
- Processing chain developed by HYGEOS
 - Following specifications of Global Land service
 - Complete review process
- Operated by VITO in Global Land Service







LAI/FAPAR/FCOVER retrieval













- Algorithm defined by Meteo-France
- Processing chain developed by HYGEOS
 - Following specifications of Global Land service
 - Complete review process
- Operated by VITO in Global Land Service





Albedo retrieval



| | 333 m (1/336°) | 1 km (1/112°) |
|------------------|-----------------------------|---|
| Methodology | BRDF model integration + | inversion + angular spectral integration |
| Time compositing | 20 jours | 30 jours |
| Time frequency | 5 days | 10 days |

Finer resolution

- Better cloud decontamination
- Shorter compositing period

 Finer frequency to discriminate albedo from bare soil and from vegetation

Links between ImagineS and the Global Land Service



ImagineS

- Variables
 - LAI, FAPAR, FCover
 - Albedo
 - Crop maps
 - Biomass, C fluxes
- Resolution: 333m & 30m
- Activities: R&D
 - set-up new algorithms
 - quality assessment
 - development of chains

Global Land service

- Variables
 - LAI, FAPAR, FCover, NDVI, DMP, Burnt Areas
 - TOC-r, Albedo, LST
 - Water bodies, SWI
- Resolution: ≥ 1km& 333m
- Activities: operations
- NRT production and re-Integration processing
 - Continuous quality monitoring
 - Dissemination

Long Term Evolution (2015 ...)

Sustainable global monitoring

- at 1km and 300m resolution
- towards 100m?

• Add "worldwide" hot-spot monitoring

- 10m-100m major protected areas
- using Sentinel-2 data

Benefit of capabilities of new sensors

e.g. SWI from Sentinel-1 (launched on 28th March 2014)

Integration of new requested products

phenology, water level, snow extent,...





Conclusion

Global Land service is operational

- Sustainable delivery of NRT 13 global products
- Linked to consistent time series
- Continuous quality monitoring
- 700+ registered ftp users, 100+ receiving stations

• Challenging continuity of 1km products

- Replacement of SPOT/VGT by PROBA-V sensor data
- Products in "demonstration" until full quality assessment

• Evolution towards 300m products

- Starting with vegetation variables over Europe
- Gradual extension of production to globe
- Close collaboration with research project





Contacts Thank you for your attention!



- http://fp7-imagines.eu
- Coordinator: Roselyne Lacaze – HYGEOS <u>rl@hygeos.com</u>
- Consortium







- <u>http://land.copernicus.eu/global</u>
- Coordinator: Bruno Smets VITO

bruno.smets@vito.be

- S&T contact: Roselyne Lacaze HYGEOS rl@hygeos.com
- Helpdesk: <u>helpdeskticket@vgt.vito.be</u>
- Contract Management:
 - copernicuslandproducts@jrc.ec.europa.eu

