ESA Fire CCI Burned Area Product Updates

Objectives of Phase 2

- Improve User requirement analysis.
- Extend long term time series of global BA.
- Create a small-fire database for Africa.
- Improve uncertainty characterization.
- Extend validation to include spatio-temporal patterns.
- Extend climate assessment and intercomparison.
BA product specifications

• Pixel product:
  o Monthly files, continental tiles, GeoTiff format:
  o 4 Variables: Day of detection (1-366), Confidence level (0-100), Burned land cover (derived from LC_cci), Sensor detecting.

• Grid product:
  o 15-day global files at 0.25 x 0.25 degree. NetCDF format.
  o 23 variables: total burned area, standard error, fraction of burnable area, fraction of observed area, number of patches and burned area of each land cover.
Global Products

- **Fire_cci v4.1:**
  - Based on MERIS FRS (300m) data.

- **Fire_cci v5.0:**
  - Based on MODIS RNIR channels (250 m).
  - Time series from 2001-2016.

- **Future products (in progress):**
  - LTDR: Extend backwards to 1982
  - Sentinel-3: OLCI and SLSTR.

- **Both algorithms:**
  - Hybrid: HS + reflectance changes.
  - Two phases: seed + growing.
  - Tile based.

- **Auxiliary data:**
  - MCD14ML HS.
  - LC_cci.
Annual composites

Products download from researchers of 48 countries

Chuvieco et al., 2016, GCB
Fire_cci BA product v5.0
(based on MODIS RNIR data)

15 day periods
Fire_cci BA product v5.0: Total BA

(01-15/07/2016)
Fire_cci BA product v5.0: Standard error

(01-15/07/2016)
Fire_cci BA product v5.0: Fraction of observed area (01-15/07/2016)
Fire_cci BA product v5.0: Fraction of burnable area

(01-15/07/2016)
Fire_cci BA product v5.0:
BA in Tree cover

(01-15/07/2016)
Fire_cci BA product v5.0: BA in Grasslands

(01-15/07/2016)
Fire_cci BA product v5.0
Annual composite 2016

Burned Area 2016
(km²)

- < 50
- 50 - 75
- 75 - 100
- 100 - 200
- 200 - 300
- 300 - 400
- 400 - 500
- 500 - 750
- 750 - 1,000
- >1,000

GOFC-GOLD Fire IT – 20-23 November 2017
Time trends

Global BA (km$^2$) 2001-2016

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Seasonal trends

Global BA (km²) 2005-2009

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Validation sample

- 1200 sampling units, 100 each year over 2003-2014
- Sampling intensity in each stratum proportional to BA extent
- Minimum 2 units in each stratum

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Padilla et al., 2017  
GOFC-GOLD Fire IT – 20-23 November 2017
Climate assessment: patch shape analysis (Fire_cci v4.1)

Richness

Evenness

Dispersion/diversity

GOFC-GOLD Fire IT – 20-23 November 2017
LTDR product – Time series

- Temporal inconsistency of the NIR reflectance
LTDR product – Time series

- Temporal trends of BT_CH4

![Time series - BT_CH4 Composite - Pixel Desert Sahara](image)

V4

![Time series - BT_CH4 Composite - Pixel Desert Sahara](image)

V5
LTDR algorithm

- Based on Random Forest.
- Trained with global datasets:
  - Landsat validation sample at 0.05 d.
  - MCD64 C6 at 0.05 d.
- Classification:
  - Discrete and regression trees.
Preliminary results: RF 3 classes (2008)

1 - 15 January 2008

1 - 15 August 2008

Spatial reference: GCS Unknown datum based upon the Clarke 1866 ellipsoid.

GOFC-GOLD Fire IT – 20-23 November 2017
Small Fire Database (2016)

• Inputs:
  o S2 MSI + MCD14DL C6 HS
  o **S1**: BA Interpherometry. Potential merging for persistent cloudy areas.

• Algorithm approach:
  o Multitemporal analysis of NIR, MIRBI and NBR2
  o Two phase: seed + growing
S2 Results

Roteta and Bastarrika, 2016
S-2 assessment

- Landsat-8
  - 29 study areas
  - OE: 8.3%
  - CE: 8.0%
  - Kappa: 0.914

Roteta and Bastarrika, 2016
SFD: Intercomparison with global products

GOFC-GOLD Fire IT – 20-23 November 2017
SFD: Intercomparison with global products

GOFC-GOLD Fire IT – 20-23 November 2017
SFD: Intercomparison with global products

Total burned surface in the first half of 2016

- SFD
- MCD45A1
- MCD64A1

Burned surface [km2]

GOFC-GOLD Fire IT – 20-23 November 2017
SFD: Comparison of emissions with global products

- S2 shows 37% more emissions than GFED4s and 56% more than GFED4.
SFD: Preliminary results from S-1 data

Coherence RGB (Nov-Dec)  
BA Classification – 2nd Half 2016

Wheeler and Tansey, 2017

GOFC-GOLD Fire IT – 20-23 November 2017
Participation of the Fire_cci project in the 11th EARSeL Forest Fires SIG Workshop

The 11th EARSeL Forest Fires SIG Workshop, was held at Chania, Crete (Greece), on 25-27 September 2017, at the Mediterranean Agronomic Institute of Chania (CIHEAM-MAICh). The head of ESA’s Climate Office and CCI Programme Manager, Pascal Leconte, presented in a keynote session the Climate Change Initiative Programme. The meeting also included a wide representation of the Fire_cci team.

Submitted by: MLP
Post date: 25 Sep 17

Upcoming Fire_cci User Workshop

The Fire_cci Climate Research Group is organizing a half-day user workshop as part of the 4th FireMIP workshop that will take place on 17-19 October at IMK-IFU, Garmisch-Partenkirchen, Germany.

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Submitted by: MLP
Post date: 18 Sep 17

Spatial evaluation of Indonesia’s 2015 fire-affected area and estimated carbon emissions using Sentinel-1

A new article by the Fire_cci team has been published in Global Change Biology (DOI 10.1111/gcb.13841)

Fires raged once again across Indonesia in the latter half of 2015, creating a state of emergency due to poisonous smoke and haze across Southeast Asia as well as incurring great financial costs to the...

Submitted by: MLP
Post date: 31 Aug 17

Stratification and sample allocation for reference burned area data

The Fire_cci team has published a new article in Remote Sensing of Environment (DOI 10.1016/j.rse.2017.06.041)

Statistical estimation protocols are one of the key means to ensure that independent and objective information on product accuracy is communicated to end-users. Methods for...

Submitted by: MLP
Post date: 07 Jul 17