climate change initiative
European Space Agency

Updates of the Fire_cci project

Emilio Chuvieco

On behalf of the Fire_cci consortium

Universidad de Alcalá

Universidad del País Vasco Euskal Herriko Unibertsitatea

Brockmann Consult GmbH

University of Leicester

IRD Institut de recherche pour le développement

Instituto Superior de Agronomia Universidade de Lisboa

Max-Planck-Institut für Chemie

VU University Amsterdam

UCL

CCI Programme

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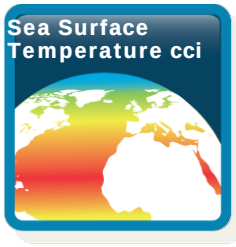

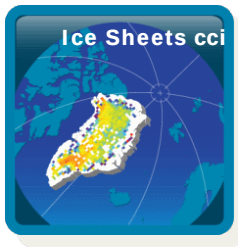

- ESA contribution to GCOS.
- Generation of temporal series of ECV.

Project structure (phase 2)

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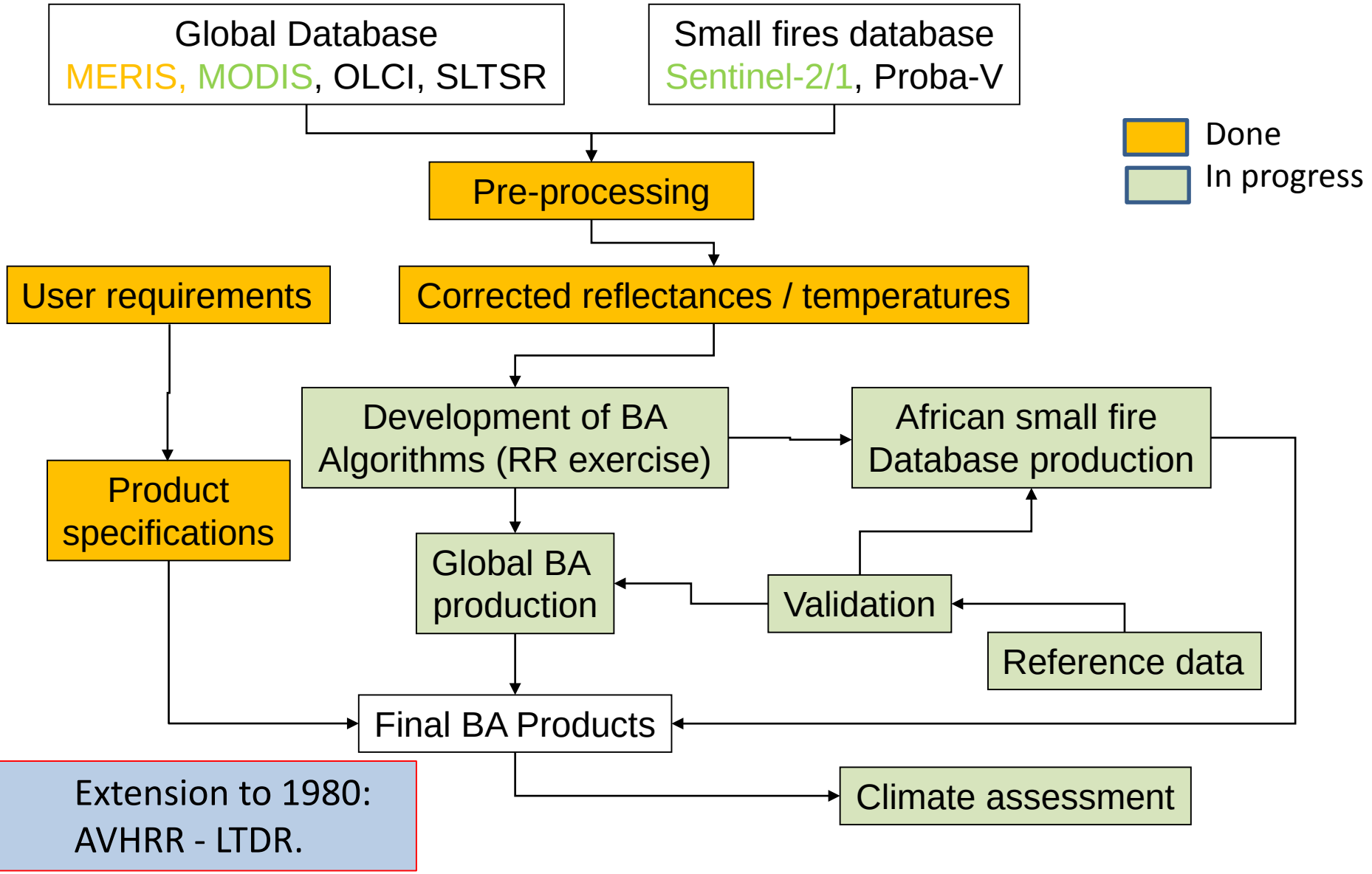
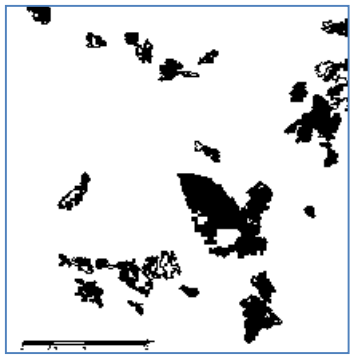
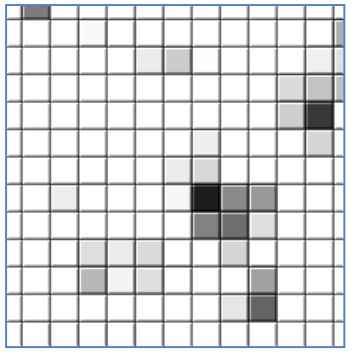


Phase-2 BA products

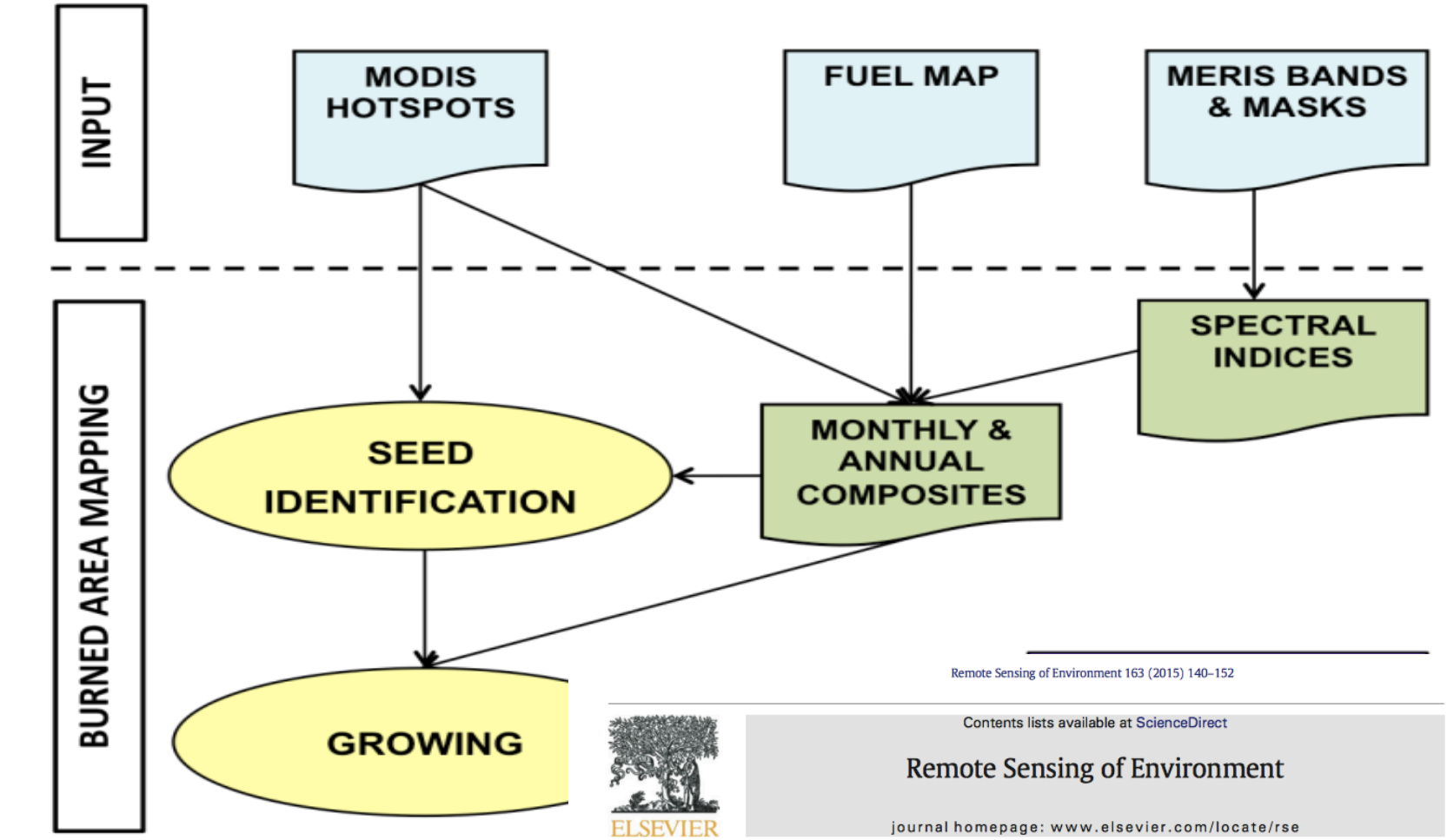
- Pixel product:
  - 4 variables: date of detection, uncertainty, burned land cover (derived from LC_cci) and sensor detecting.
  - Monthly files, continental tiles, GeoTiff format.



- Grid product:
  - 22 variables: total burned area, standard error, % observed area, number of patches and burned area of each land cover.
  - 15-day files at 0.25 x 0.25 degree.
  - NetCDF4 format.



Global BA algorithm (MERIS)



Remote Sensing of Environment 163 (2015) 140–152

Contents lists available at ScienceDirect

Remote Sensing of Environment

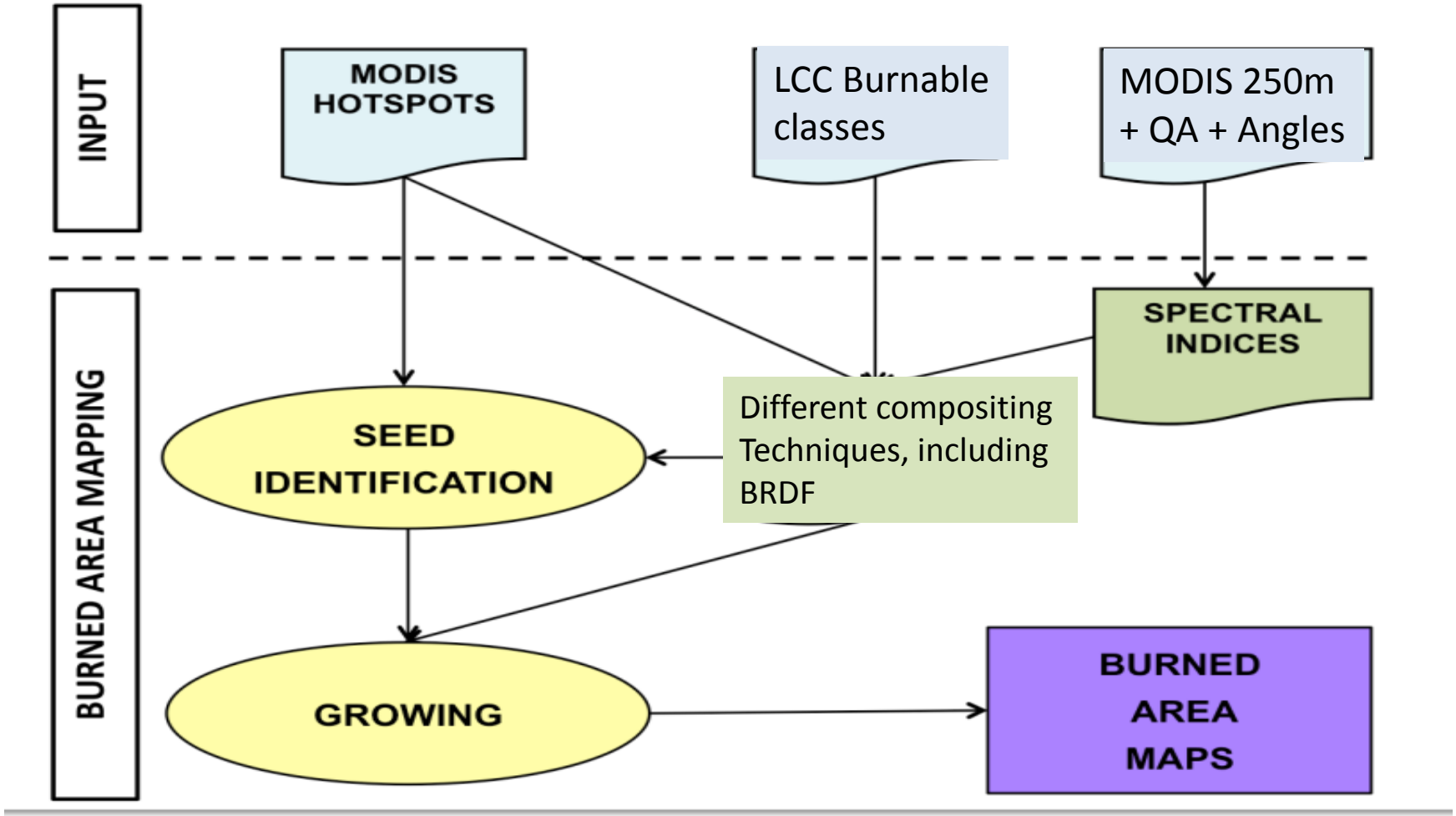
journal homepage: www.elsevier.com/locate/rse

ELSEVIER

Global burned area mapping from ENVISAT-MERIS and MODIS active fire data

Itziar Alonso-Canas *, Emilio Chuvieco

Global BA algorithm (MODIS, In progress)



Fire_cci BA product v4.1

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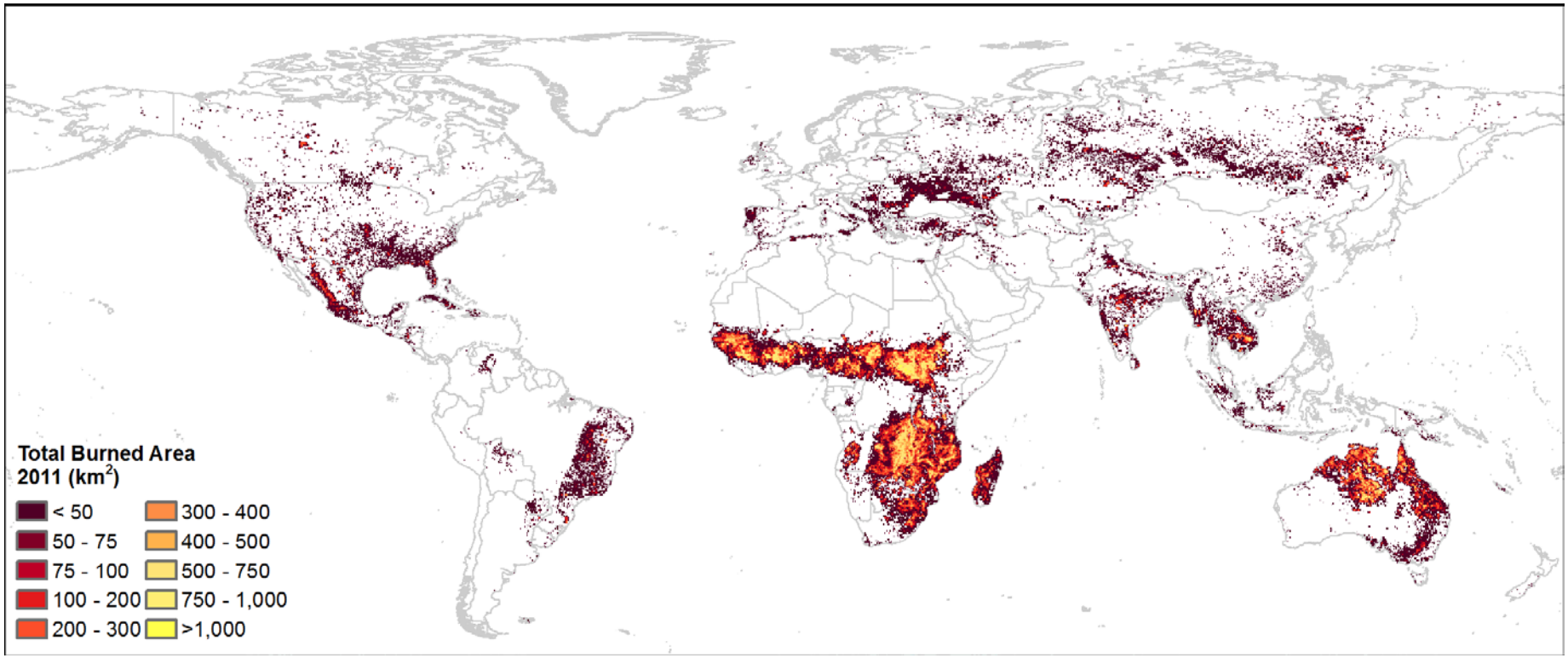

Temporal trends
GFED 4 – GFED4s – Fire_cci4.1

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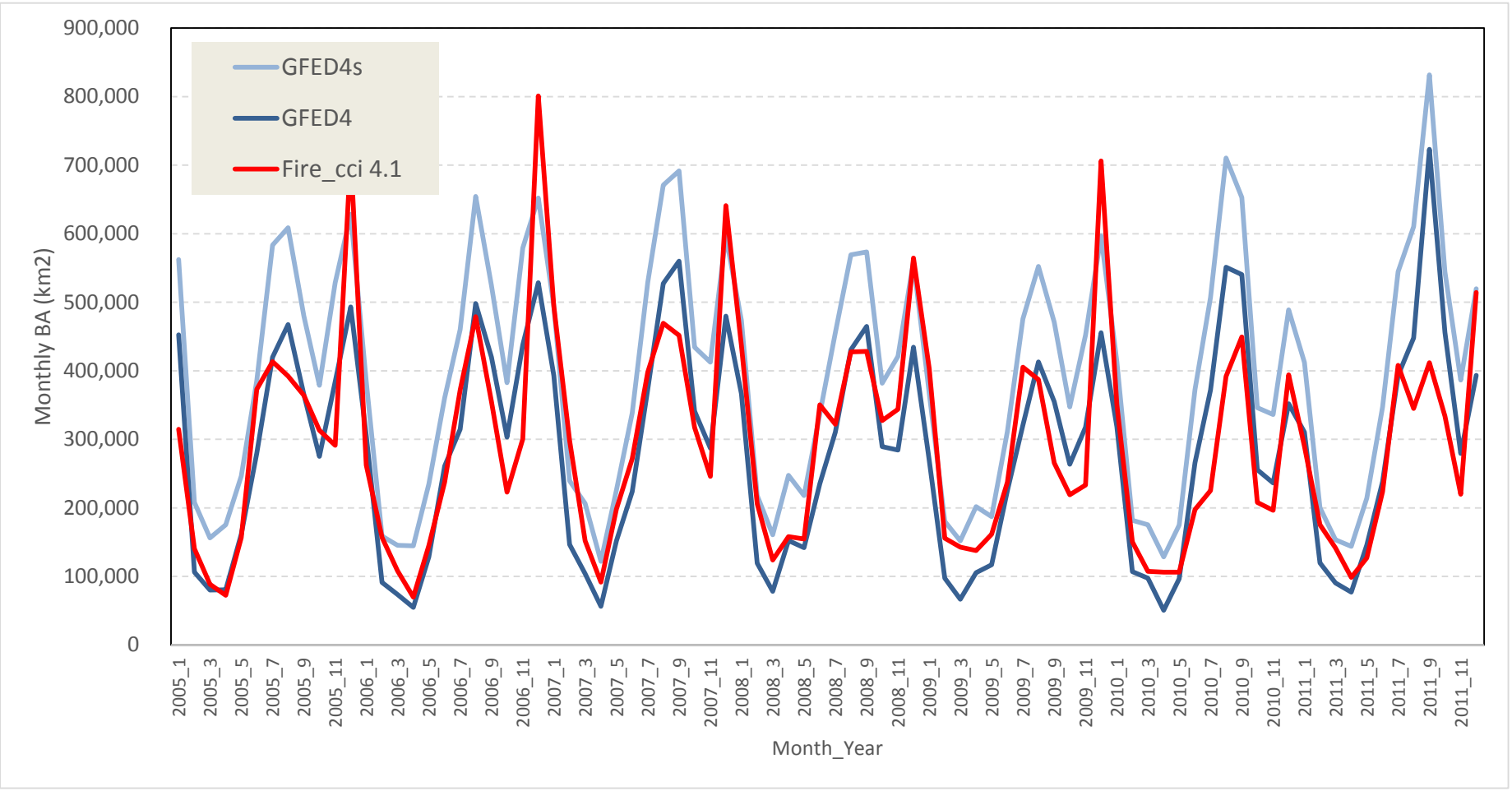
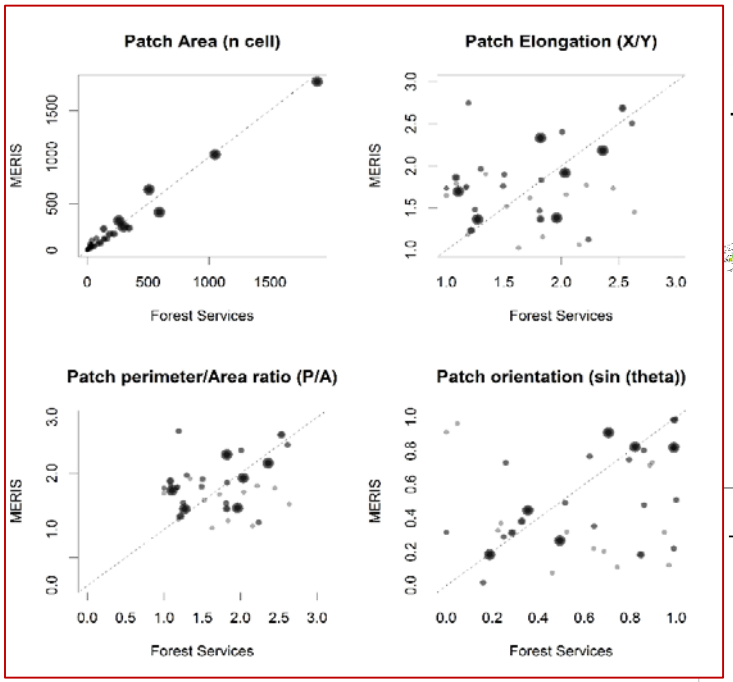
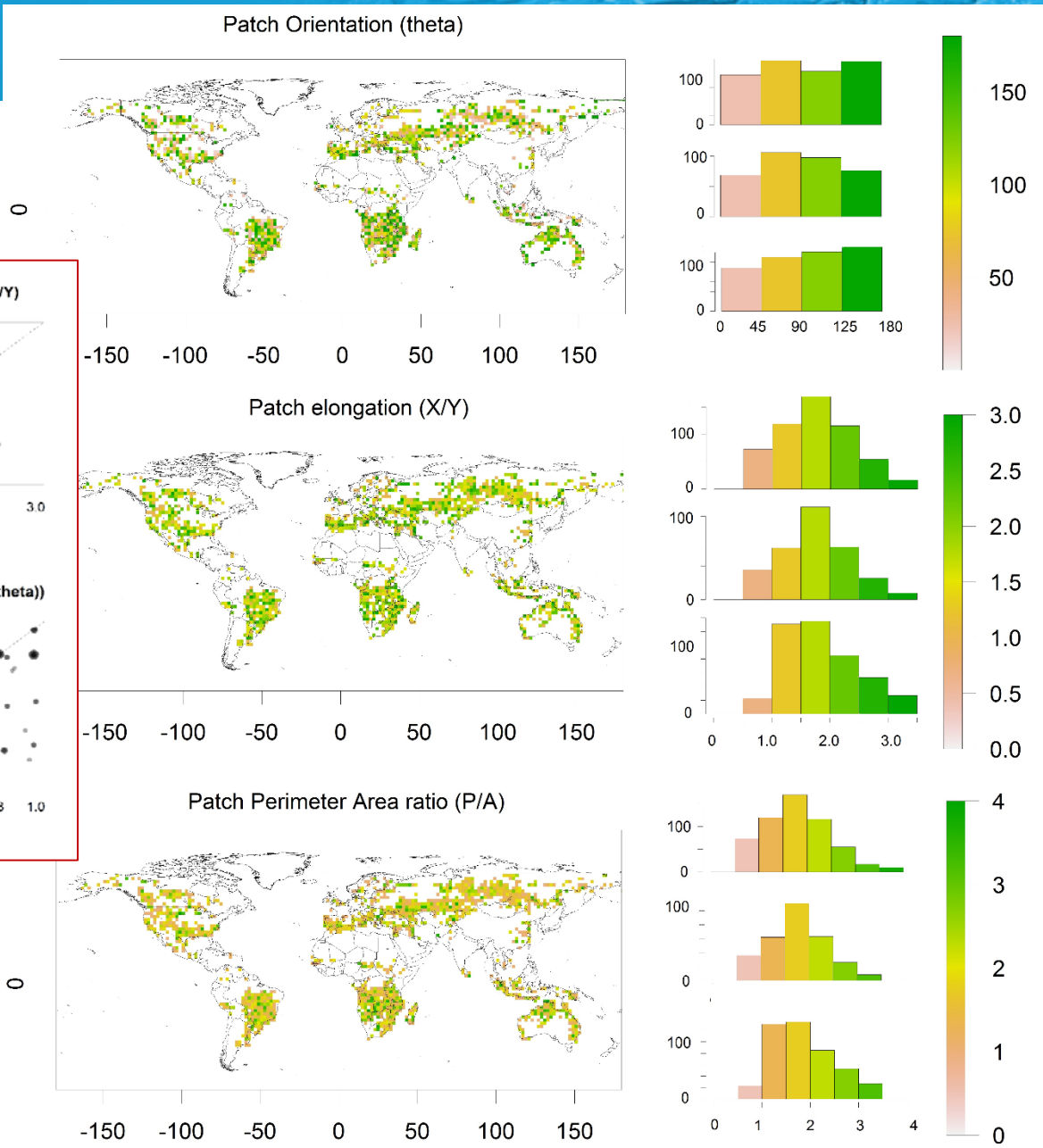


Fire patch analysis v3.1





Chuvieco et al., 2016, GEB

Emission comparisons (v3.1)

	Burned area (Mha yr^{-1})	CO emissions (TgCO yr^{-1})	Carbon emissions (PgC yr^{-1})
GFED4 data set	346	258	1.6
ORCHIDEE – GFED4	346	329	2.0
ORCHIDEE – Prognostic	232	346	2.0
ORCHIDEE – Fire_cci	369	351	2.1
GFED3.1 data set	346	334	1.9

Chuvieco et al., 2016, GEB

Global Ecology and Biogeography, (Global Ecol. Biogeogr.) (2016)

MACROECOLOGICAL METHODS

A new global burned area product for climate assessment of fire impacts

Emilio Chuvieco[1*], Chao Yue[2,3], Angelika Heil[4], Florent Mouillot[5], Itziar Alonso-Canas[1], Marc Padilla[1,6], Jose Miguel Pereira[7], Duarte Oom[7] and Kevin Tansey[6]

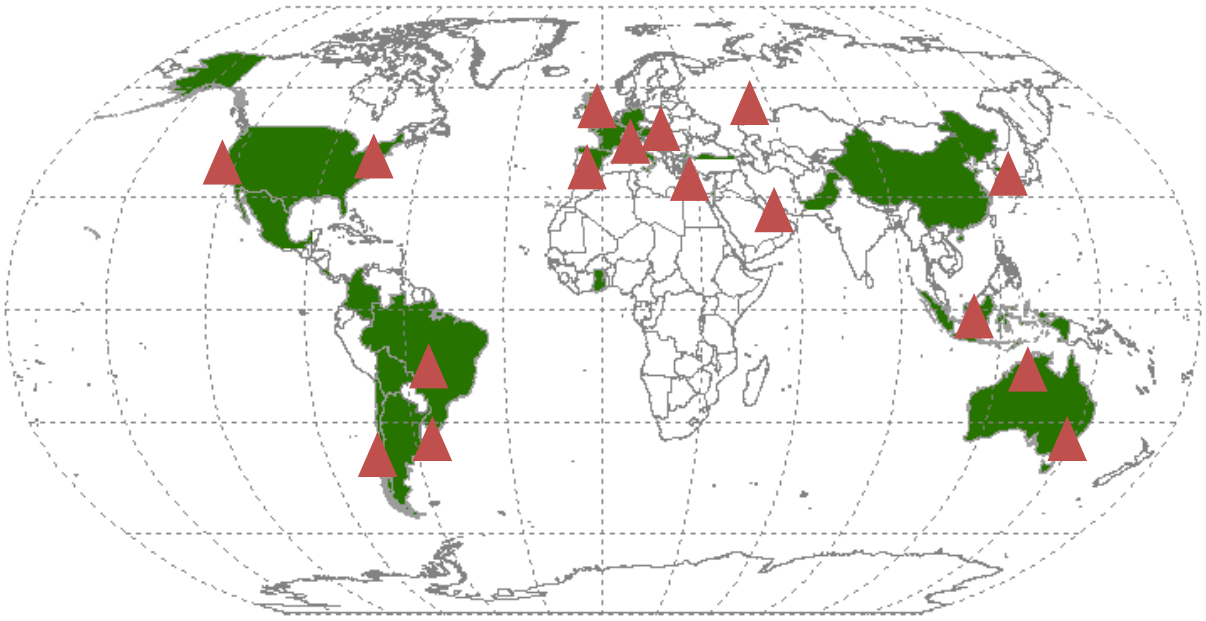
[1]Environmental Remote Sensing Research Group, Department of Geology, Geography and the Environment, Universidad de Alcalá, Spain, [2]Laboratoire de Glaciologie et

ABSTRACT

Aim This paper presents a new global burned area (BA) product developed within the framework of the European Space Agency's Climate Change Initiative (CCI) programme, along with a first assessment of its potentials for

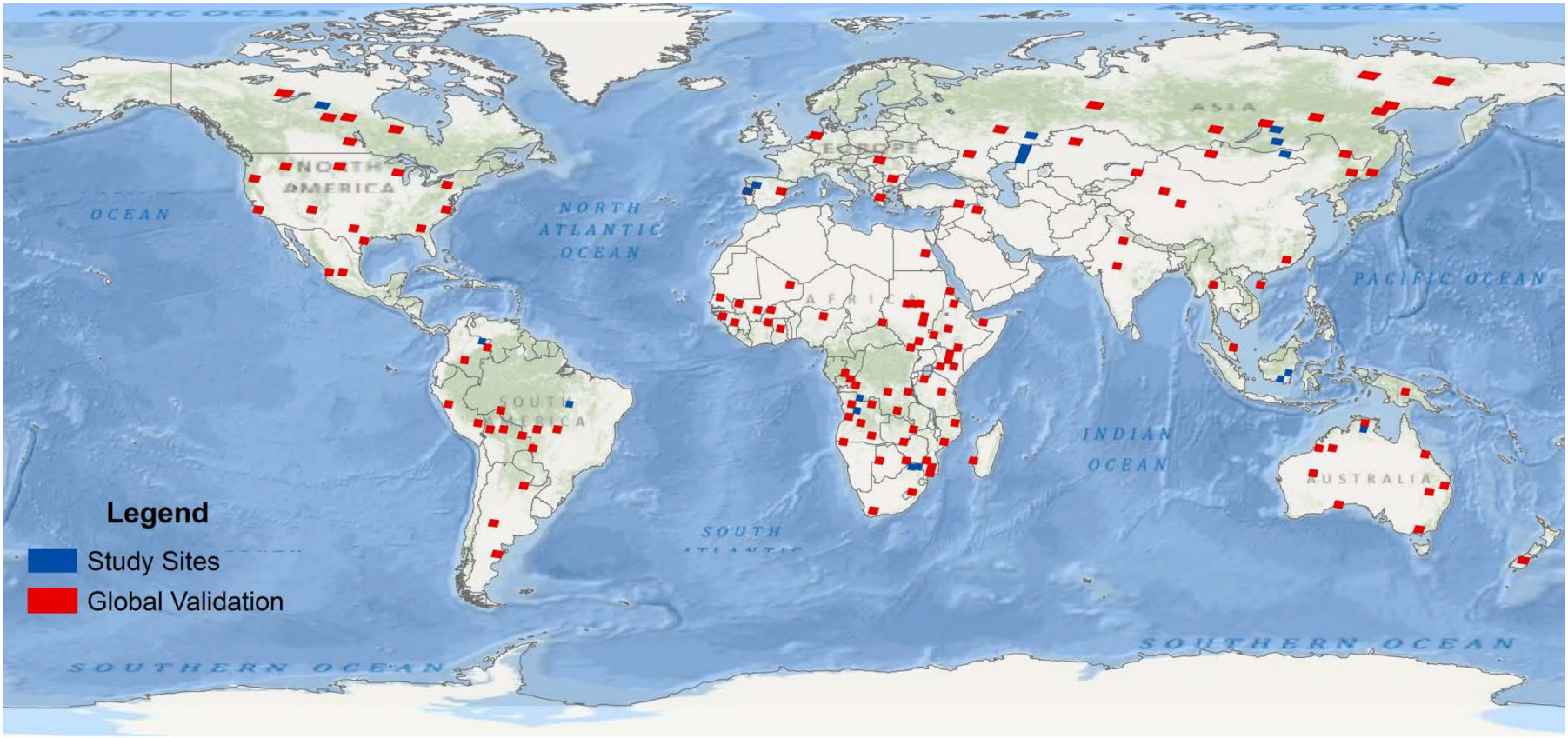
Product Downloads

- Version 3.1:
  - 65 researchers from 28 countries (+ESA, JRC, FAO).
- Version 4.1 (available since July, 2016):
  - 35 researchers from 18 countries.



Project presentations 2010-2016

Validation

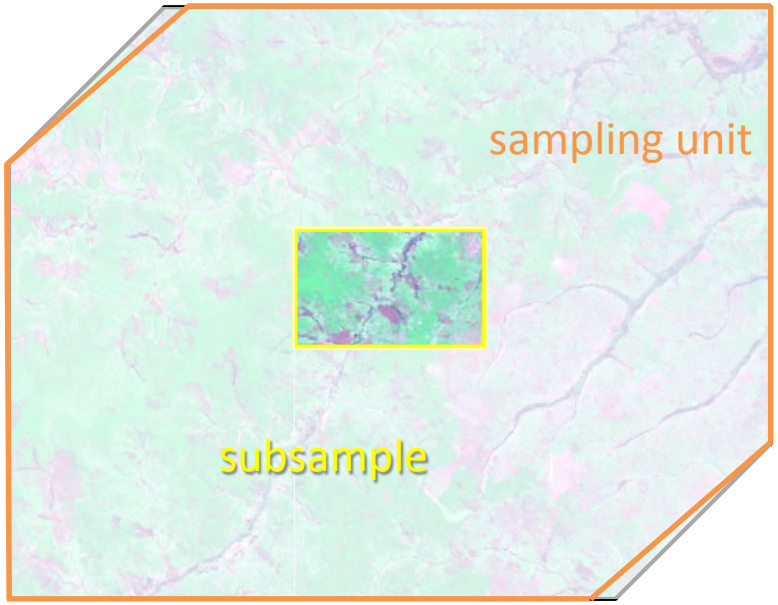


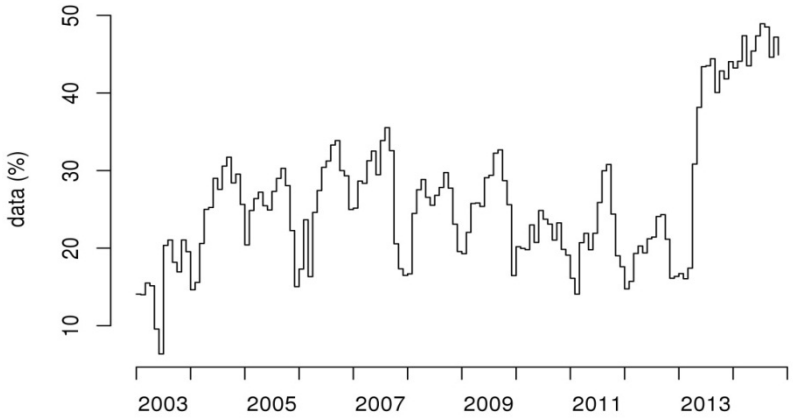
- 242 pairs of Landsat TM/ETM+ images.
- 130 sites for spatial validation from 2008 (red)
- 112 pairs for temporal validation (blue).

Phase 2 validation datasets

Two-stage cluster sampling

- 1st stage: sampling units selected with a stratified random sampling:
  - Years / Biomes / BA
- 2nd stage: subsample of a spatial cluster of pixels in each sampling unit
- This allows for an increase in the number of sampling units that can be processed

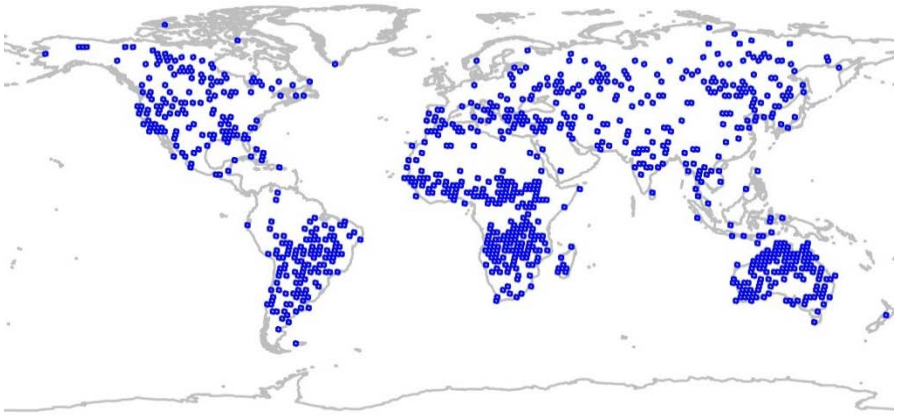




Padilla et al., 2016

The 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



n_h

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Others	2+2	4+2	2+2	6+2	4+2	2+2	2+2	3+2	13+2	9+2	2+2	4+2
Tropical Forest	5+2	5+2	5+2	4+2	5+2	3+2	4+2	6+2	3+2	4+2	4+2	4+2
Temperate Forest	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2
Boreal Forest	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2
Tropical and Subtropical savanna	60+10	60+10	59+12	58+10	58+11	58+13	60+11	59+11	52+11	54+11	63+10	59+10
Temperate grassland and savanna	5+2	3+2	4+2	4+2	4+2	6+2	5+2	3+2	3+2	4+2	3+2	5+2
Mediterranean Forest	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2	2+2

Padilla et al., 2016

SLSTR BA algorithm

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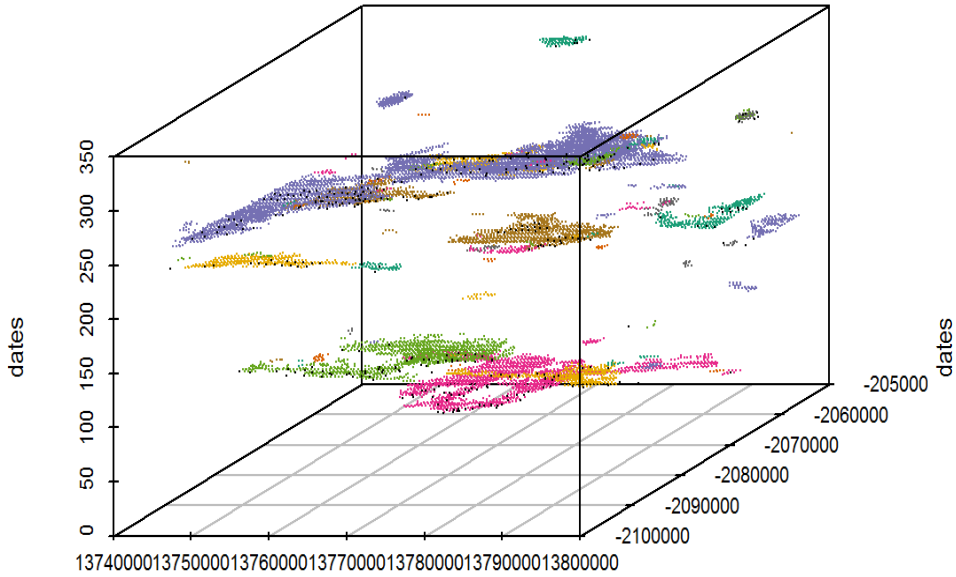
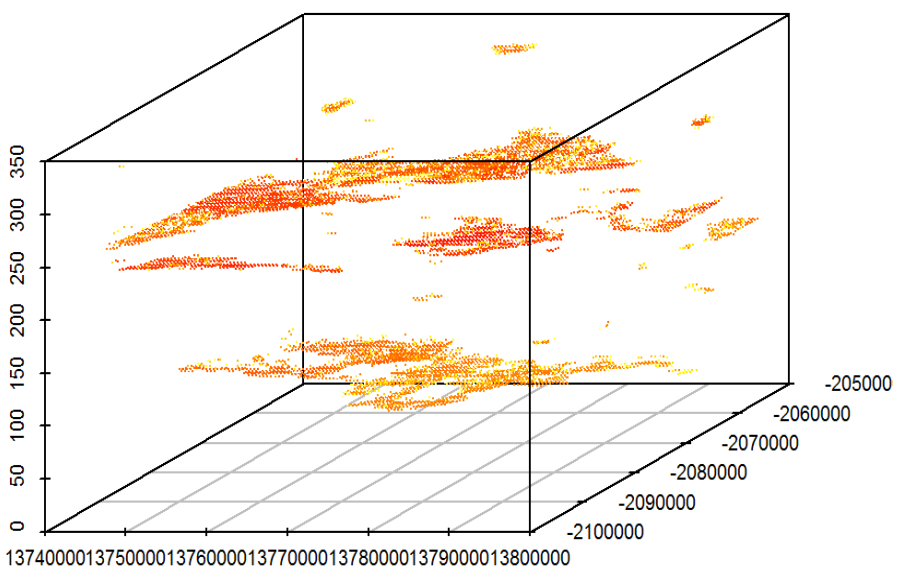
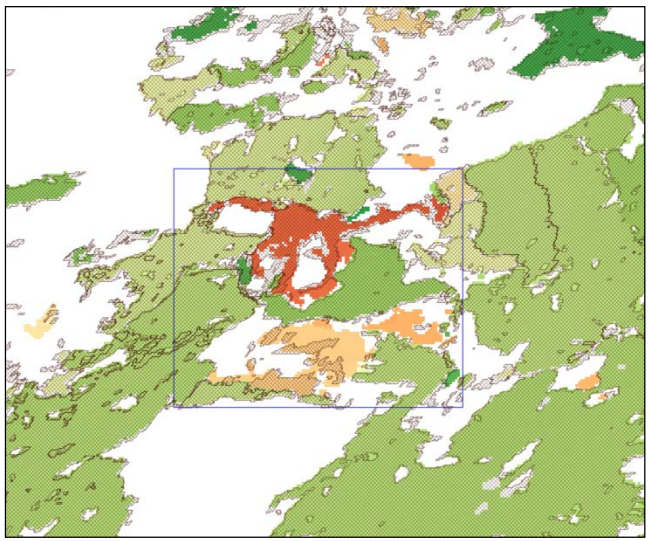


Mscores. High = red; Low = yellow



- Spatio-temporal patches (clusters of NBR change events) derived from the graph.

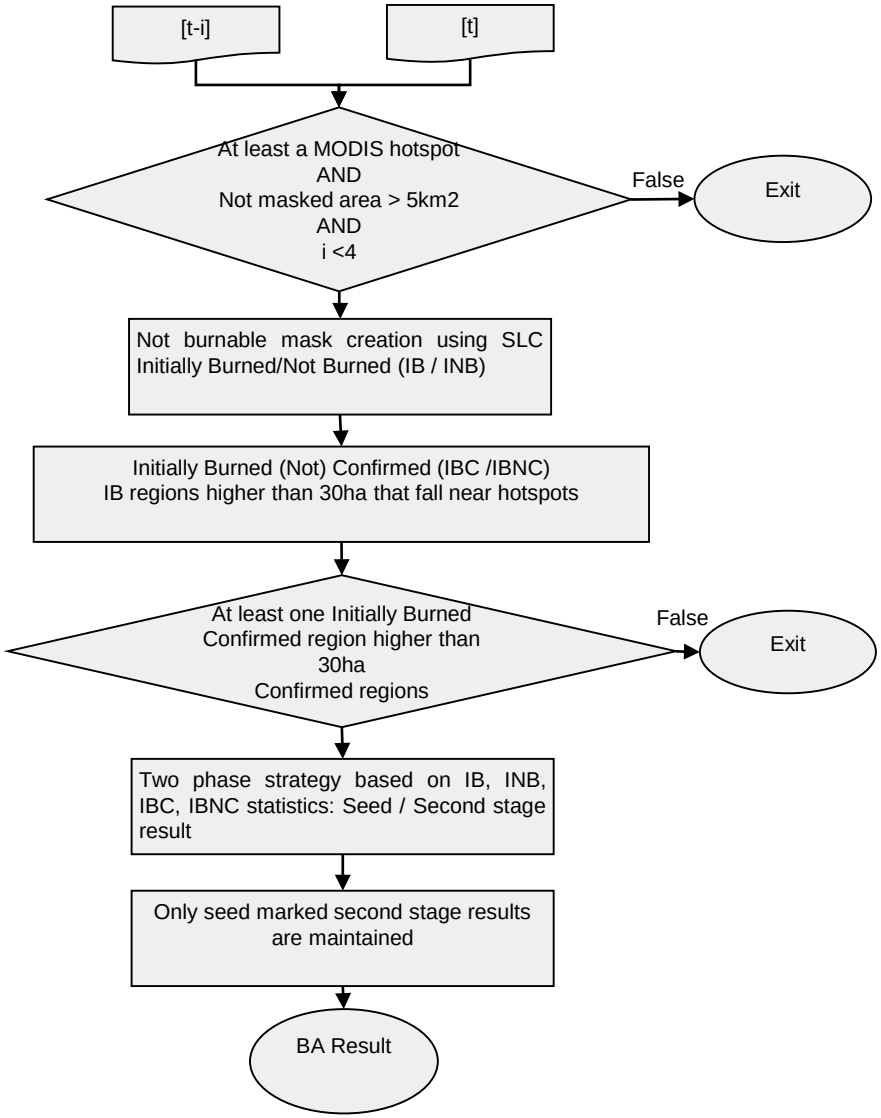


- MaxEnt scores for each pixel in the patches labeled as burned.

Pereira et al., 2016

Small Fire Database: Sentinel-2 BA algorithm

- Inputs:
  - Pre-fire image (t-i)
    - MIRBI
    - NBR2
    - NIR (B8A)
    - SCL
  - Post-fire image (t)
    - MIRBI
    - NBR2
    - NIR (B8A)
    - SWIR2 (B12)
    - SCL
  - MODIS hotspots



Roteta and Bastarrika, 2016

Results

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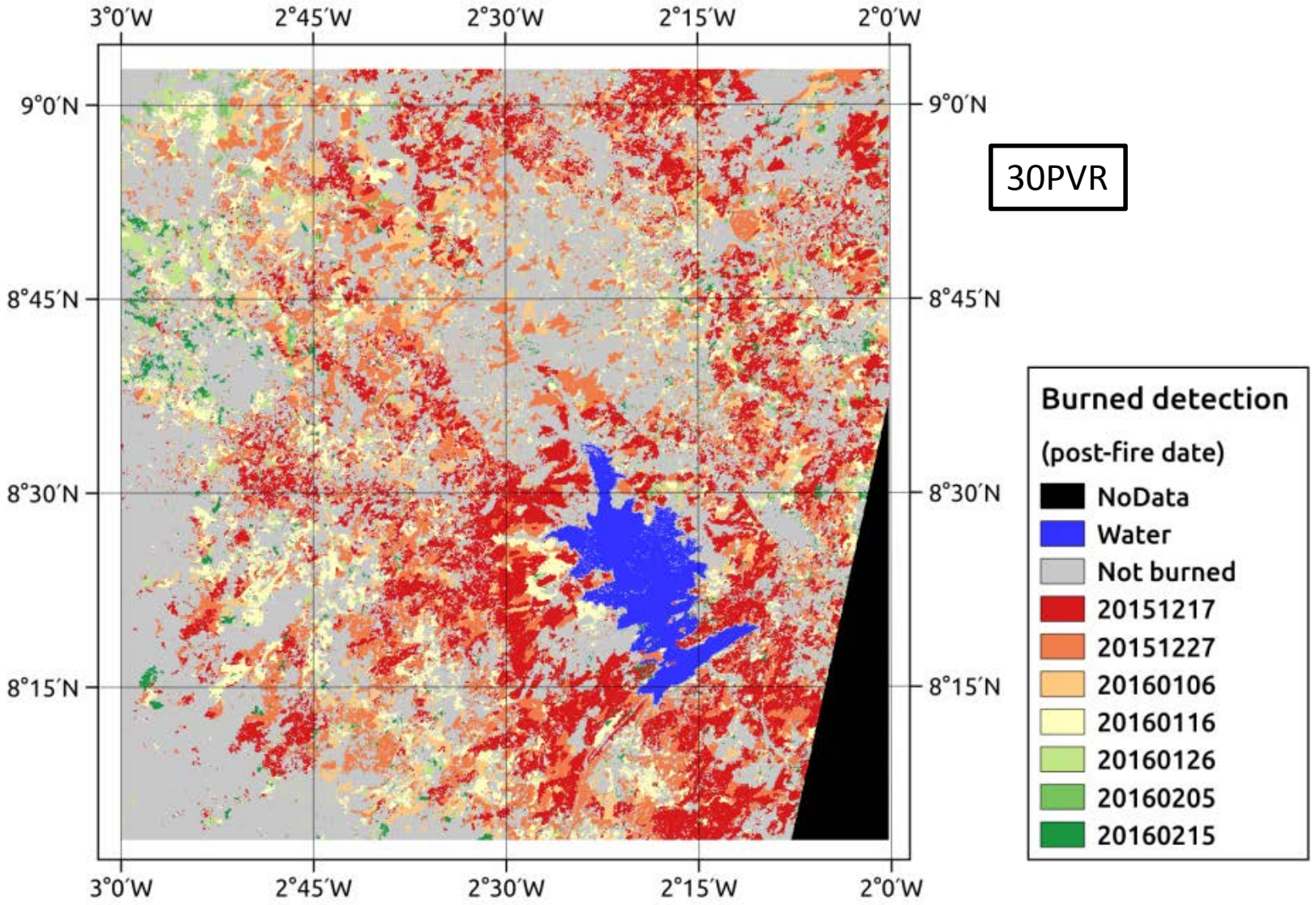
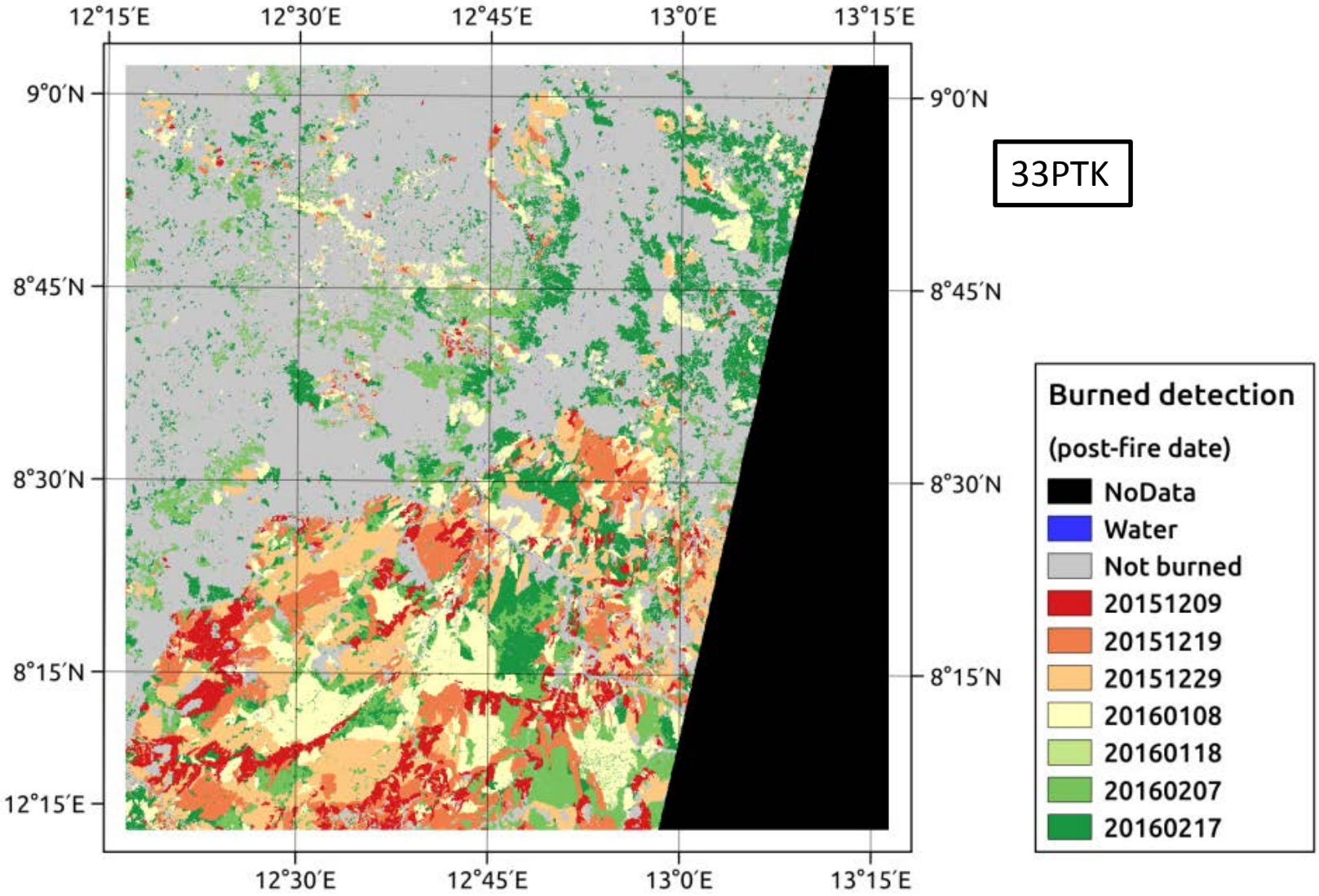


Roteta and Bastarrika, 2016

Results

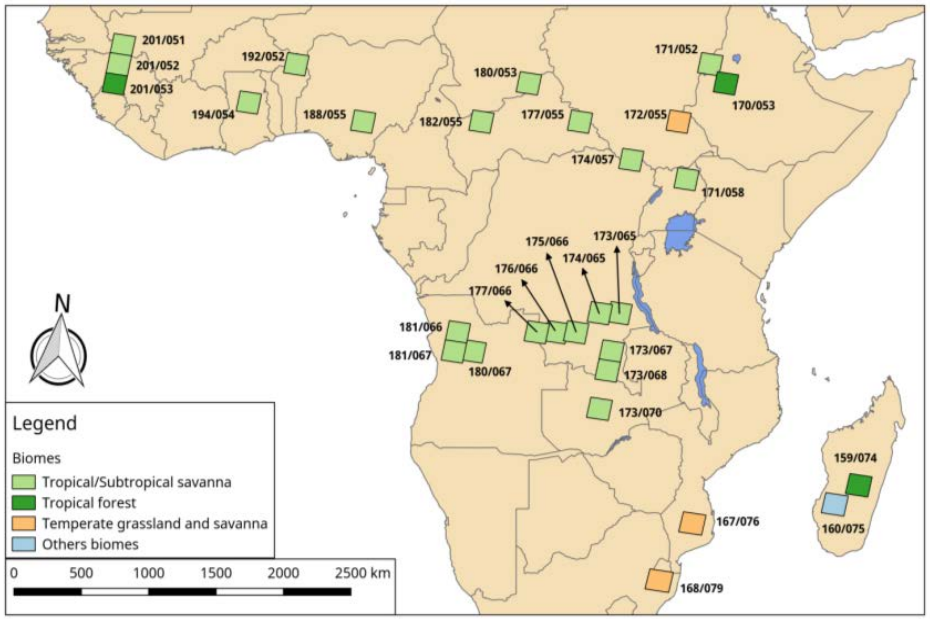


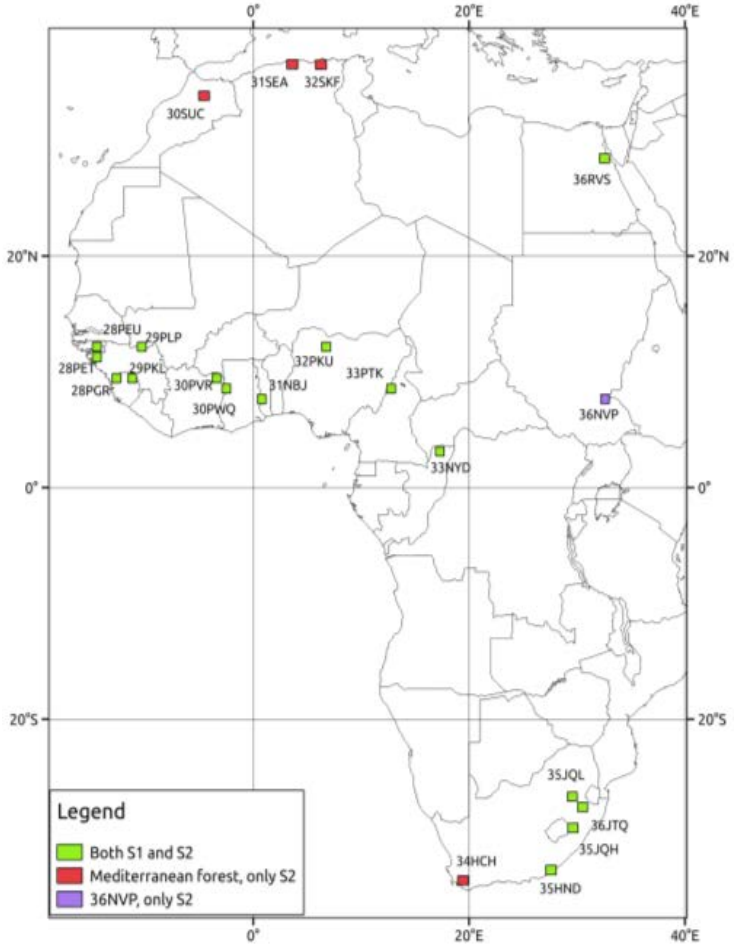
Roteta and Bastarrika, 2016

Assessment

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

Cloudy areas will be covered by S-1 images.





Roteta and Bastarrika, 2016

BA algorithm for Sentinel-1

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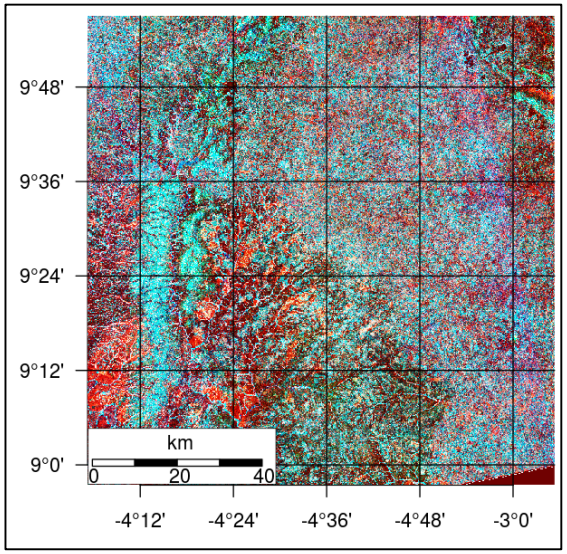
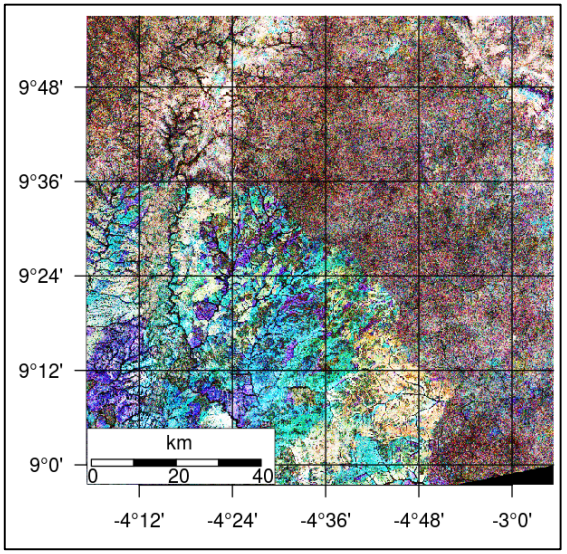
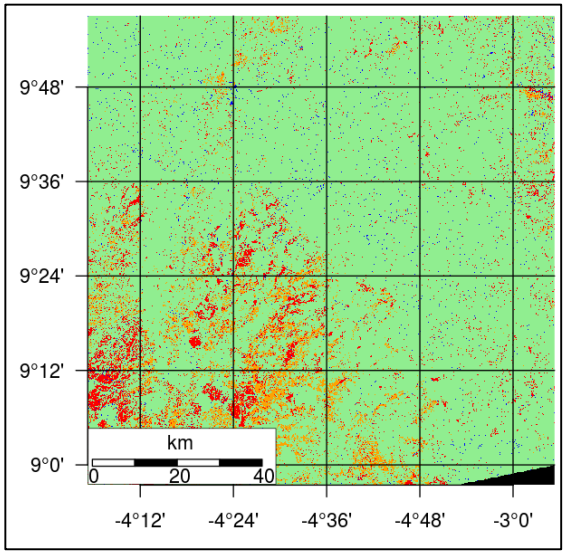
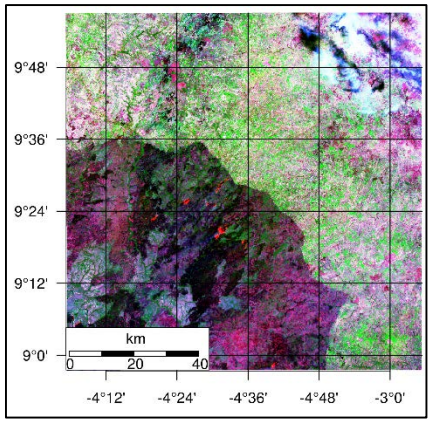


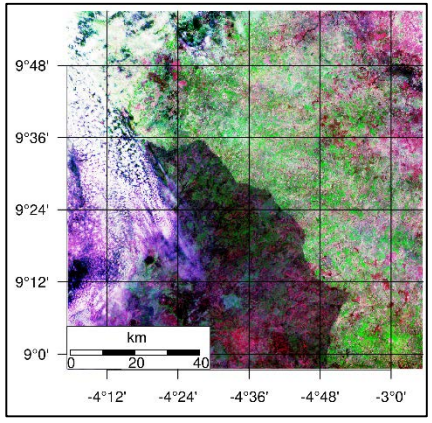




Clockwise from top left:

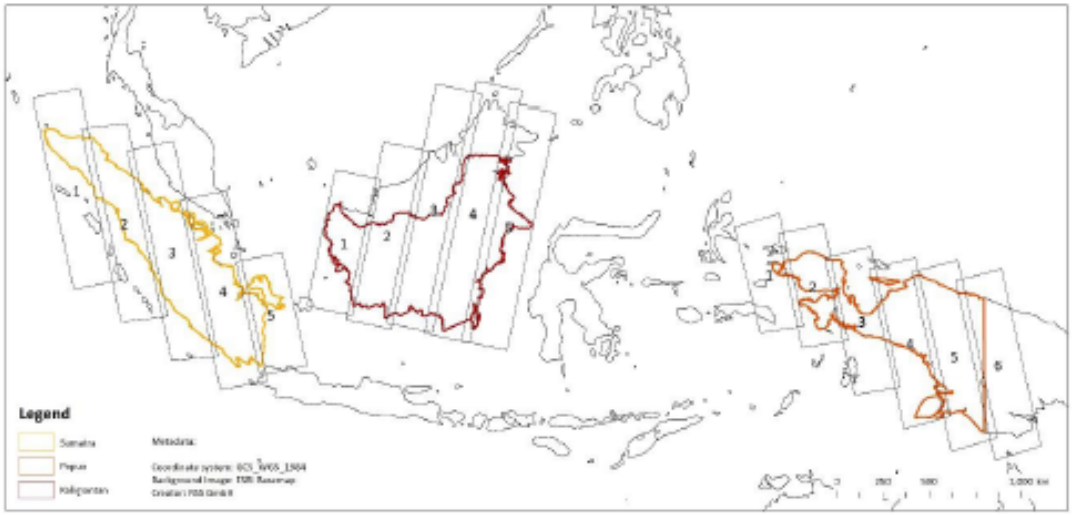
- VV, VH backscatter difference RGB
- VV Coherence RGB
- BA Classification
- S2 Post
- S2 Pre





Tansey et al., 2016

BA algorithm for Sentinel-1



- S1
- C-band
- 10 m spatial resolution
- 2015
- # of tiles 164
  - Kalimantan 2*31 tiles
  - Sumatra 2*25 tiles
  - Papua 2*26 tiles

  } Pre- and post-fire season
- Product type
  - Kalimantan, descending, dual-pol (VH,VV)
  - Sumatra, ascending, single-pol (VV)
  - Papua, ascending, single-pol (VV)

RSS, 2016

BA algorithm for Sentinel-1

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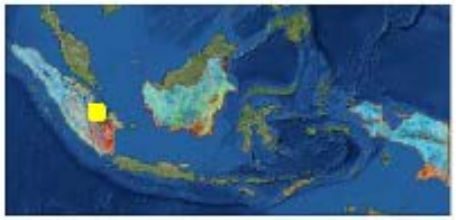
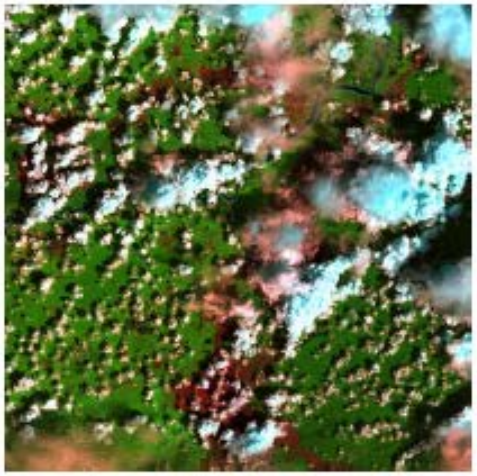
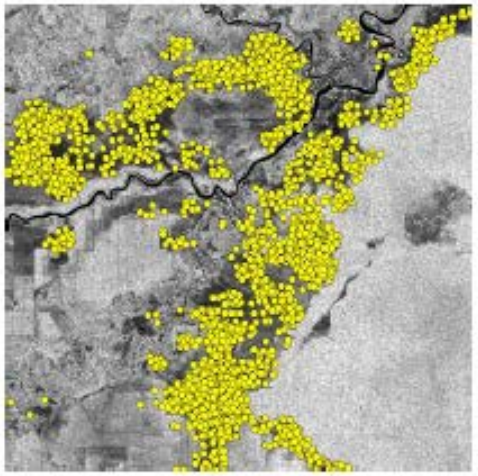


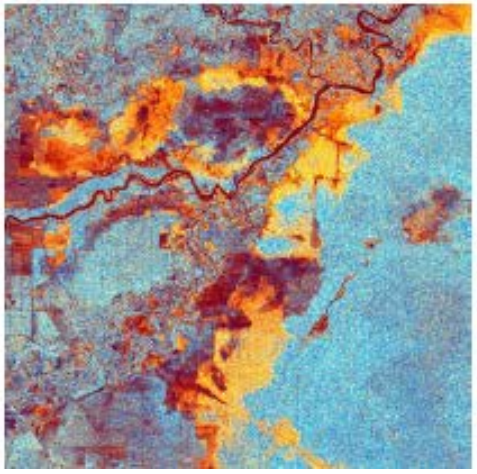
Landsat 8

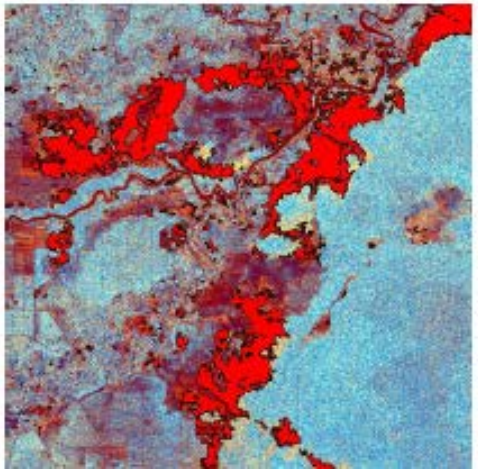




S1 VV & HS

S1
False color
composite





Classification
result

RSS, 2016

http://www.esa-fire-cci.org/

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esa

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ESA | aerosol | CCI | cloud | cmug | ghg | glaciers | ice sheets greenland | ice sheets antarctica | land cover | ocean colour | ozone | sea ice | sea level | soil moisture | sst

FIRE_CCI

Navigation

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- About Fire_CCI
- Resources
- Support

Questionnaire for users

Potential users of the BA Products are kindly requested to fill this questionnaire.

New publication of Fire_cci on Global Ecology and Biogeography

A new article detailing the methods and results of the global burned area (BA) product developed by the Fire_cci Team has been published in Global Ecology and Biogreography in March 2016.

The article, entitled "A new global burned area product for climate assessment of fire impacts", presents the methods for generating the global BA product, along...

Submmited by: MLP
Post date: 31 Mar 16

Overview

Why is information on burned areas needed?

It is estimated, that about 25%-35% of Greenhouse gases (GHG) are resulting from biomass burning and therefore they are considered an important factor in climate change (GTOS 68, T13 Fire Disturbance).

Aims of the Fire_cci project

Current global...

Submmited by: MLP
Post date: 28 Jan 16

Questionnaire for users

In order to generate a BA product that fits your needs you are kindly asked to complete the following questionnaire. Your input is very valuable to us and if you have more detailed comments or suggestions, please feel free to formulate them. While the focus of the ESA initiative is on climate change research and assessments, other user communities are very welcomed to use the Fire_cci products.

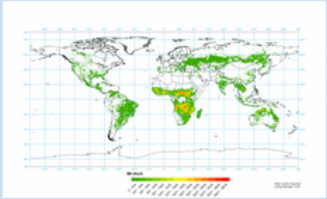
...

Submmited by: MLP
Post date: 24 Sep 15

Fire_cci Newsletter - Issue COP 21

Download BA products

Download the Burned Area products from here.



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Phase-2 Options

- Option 1: Interactions between FRP-BA information: MPI, VUA, UAH.
- Option 2: Extending historical BA time series with LTDR data: UAH, BC, MPI, UCLouvain.
- Option 3: Radar BA algorithms. UAH – Cubenube.

RSE fire paper trends

- Pre-fire papers:
  - Water content
  - Fuel types.
- Active fires:
  - New algorithms: VIIRS, Landsat.
  - Emissions.
- Burned area:
  - Validation.
  - Severity.
  - Large regions: from coarse to medium sensors.
  - Agricultural fires.

Connections of Fire and other ECVs

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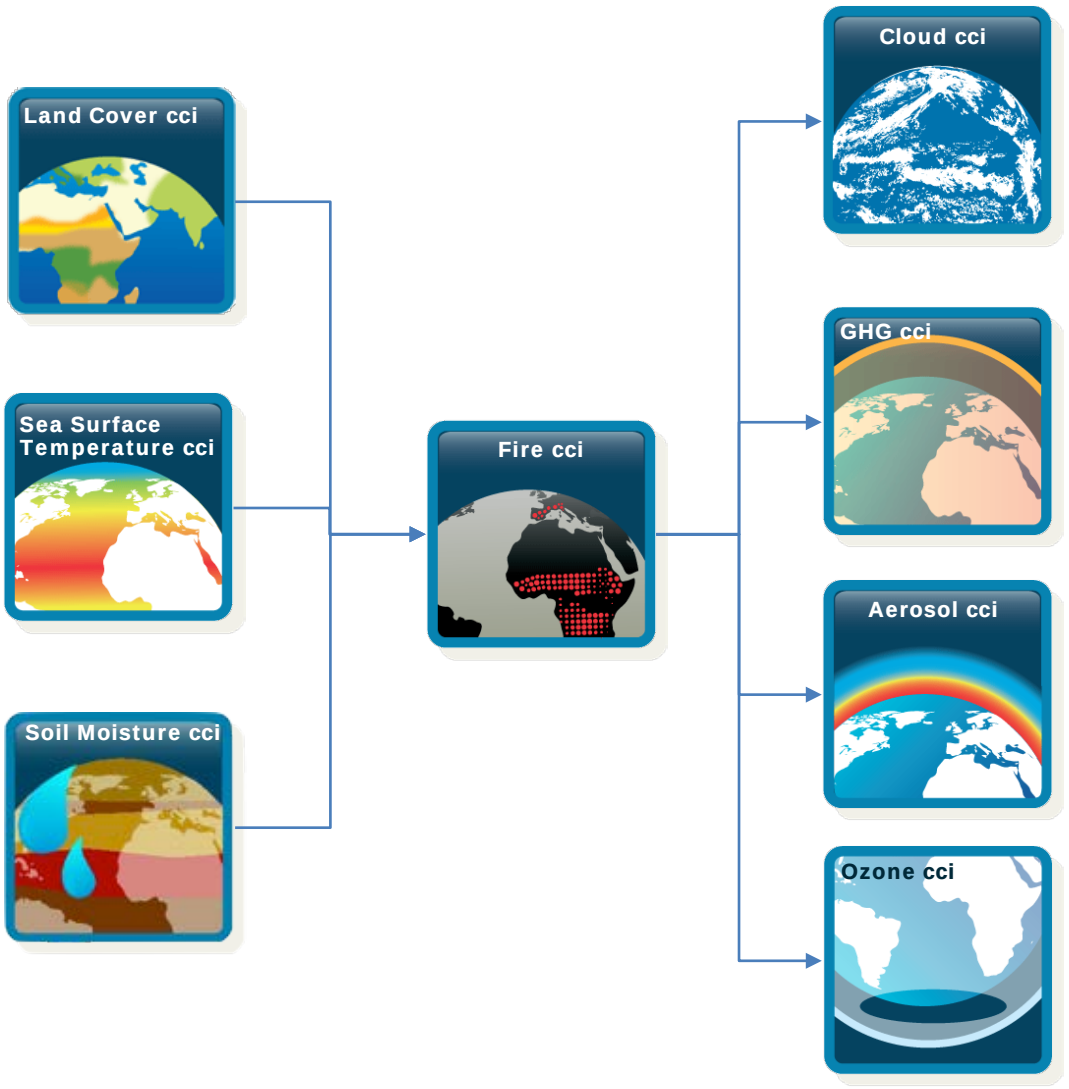
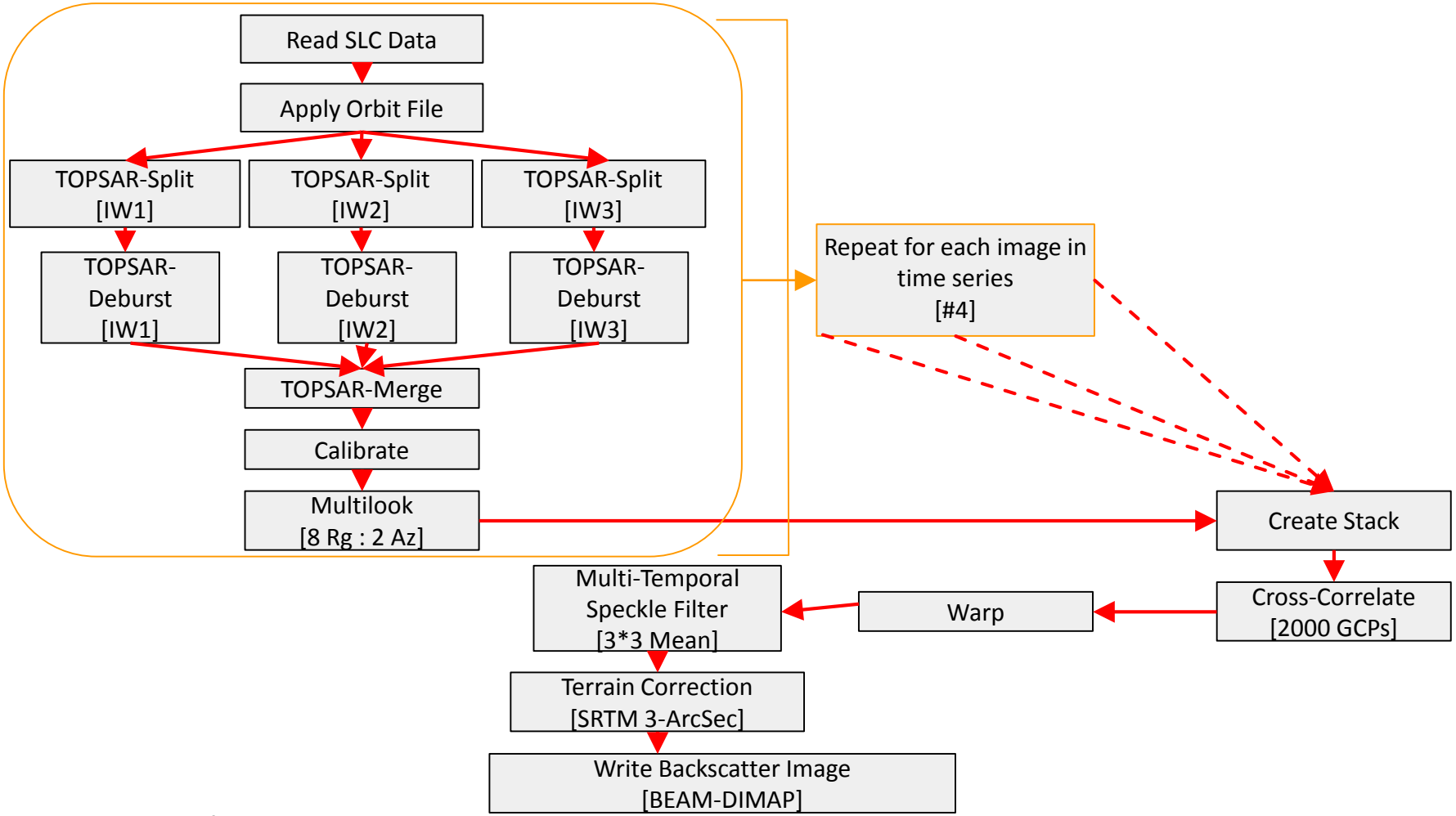


BA algorithm for Sentinel-1

- Workflow – S1 Backscatter



Tansey et al., 2016