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European Space Agency

ESA Fire Products

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Max Planck Institute for Chemistry





Global mapping of burned areas: ESA Fire_cci project

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Max Planck Institute for Chemistry
Grupo de investigación en Teledetección Ambiental
Universidad de Alcalá

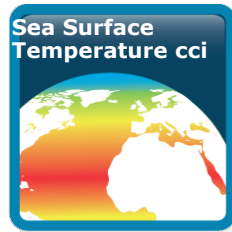
and the members of the Fire_cci consortium





CCI Programme

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

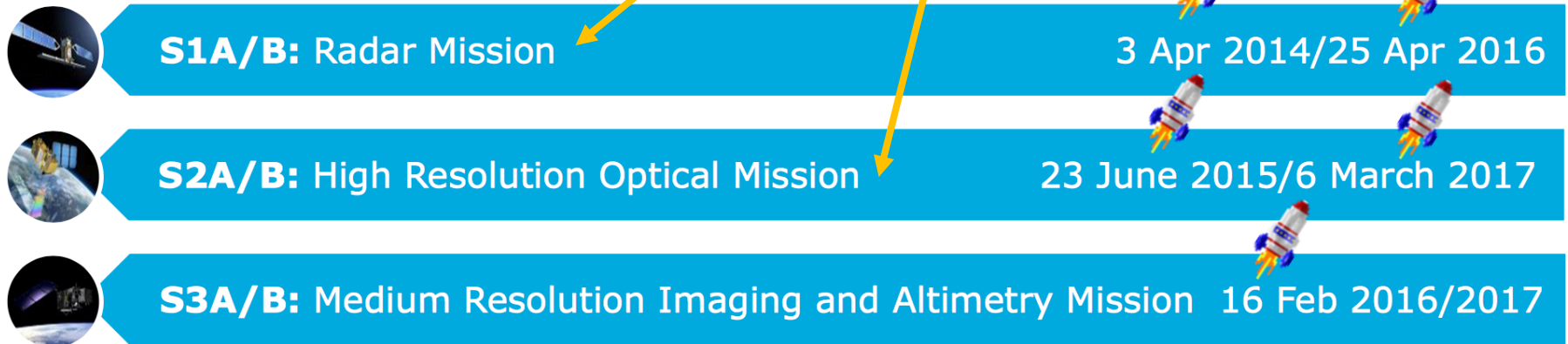


BA algorithms for Fire_cci

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- MERIS (2003-2011)
 - MODIS (2000-2015)
 - Proba-V (launch 2013)
- ← regional small fires database

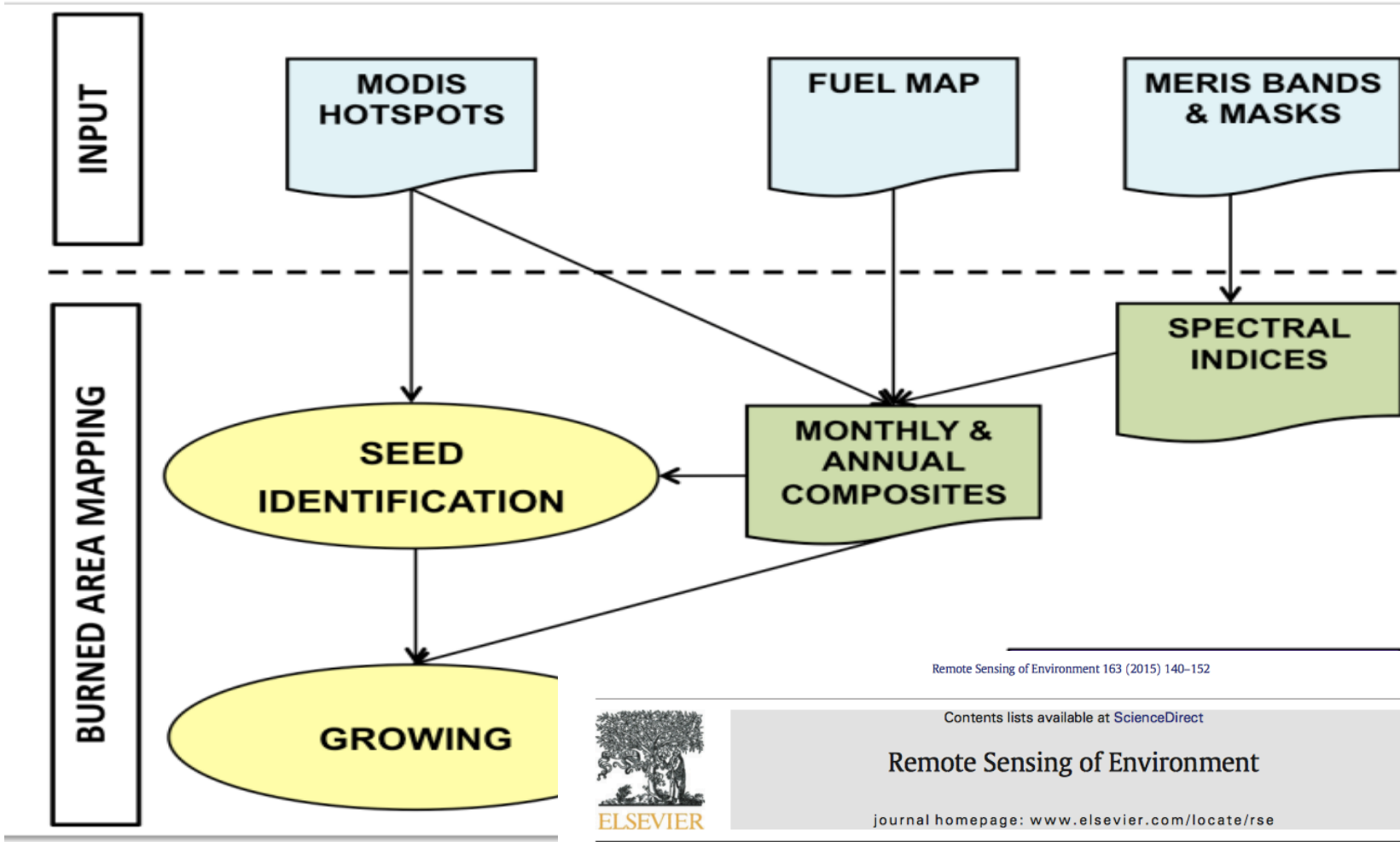
Sentinel Launches





Global BA algorithm (MERIS)

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Remote Sensing of Environment

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



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

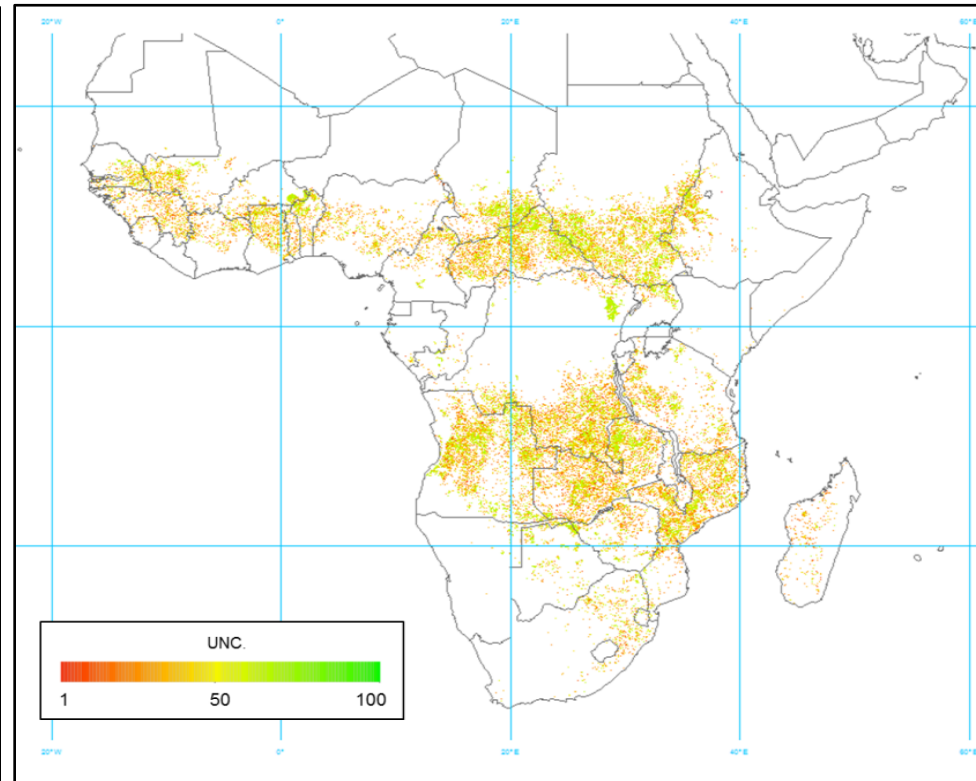
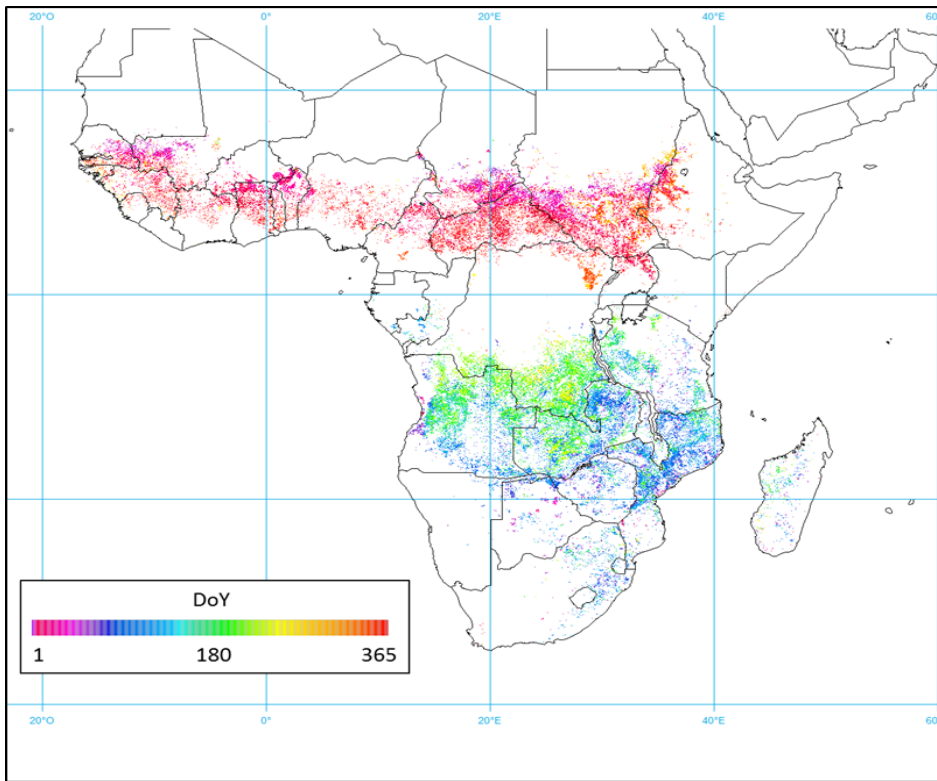
Itziar Alonso-Canas*, Emilio Chuvieco





DoD and Uncertainty (2008)

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Biweekly products.

Total BA (2008/06/22)

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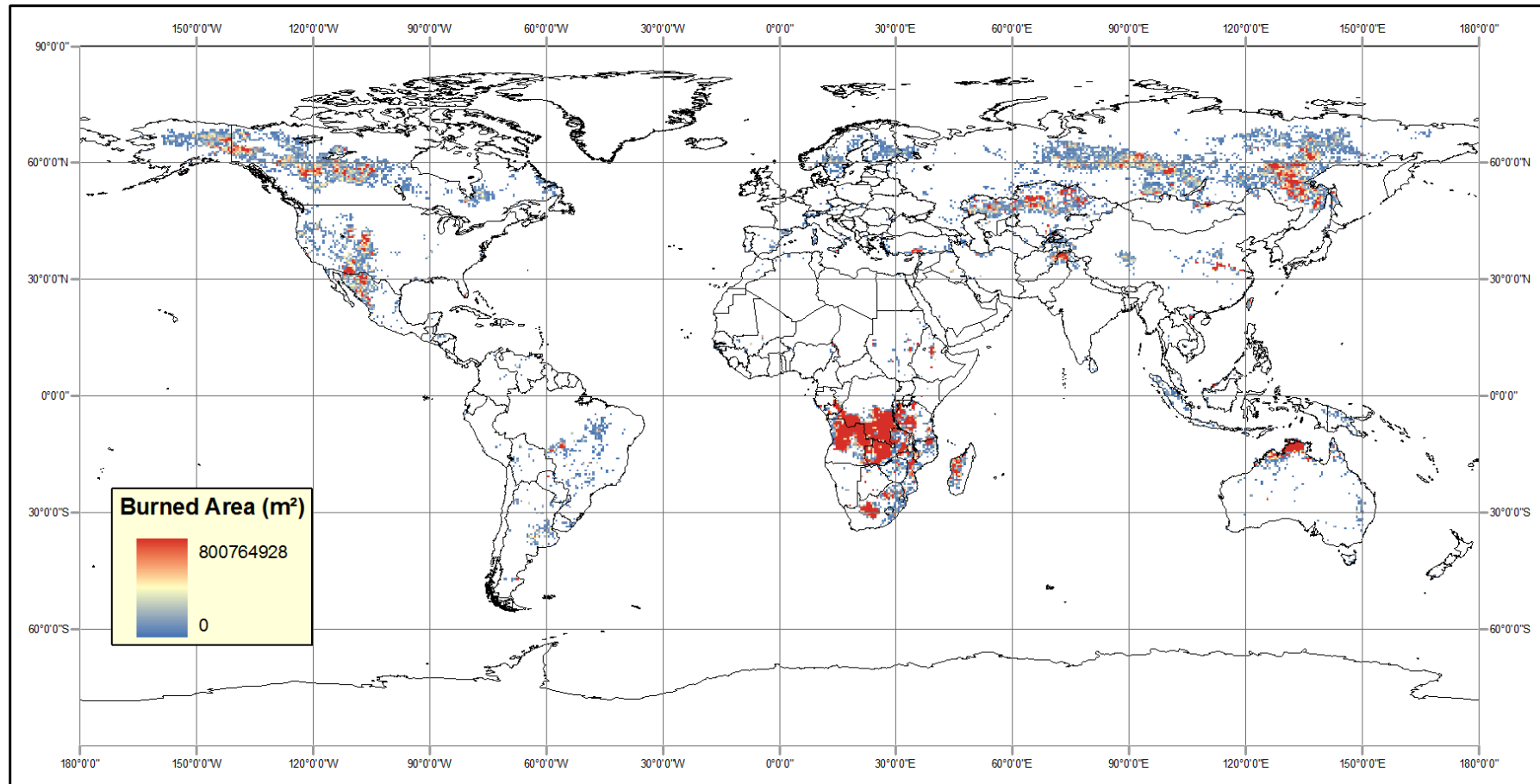
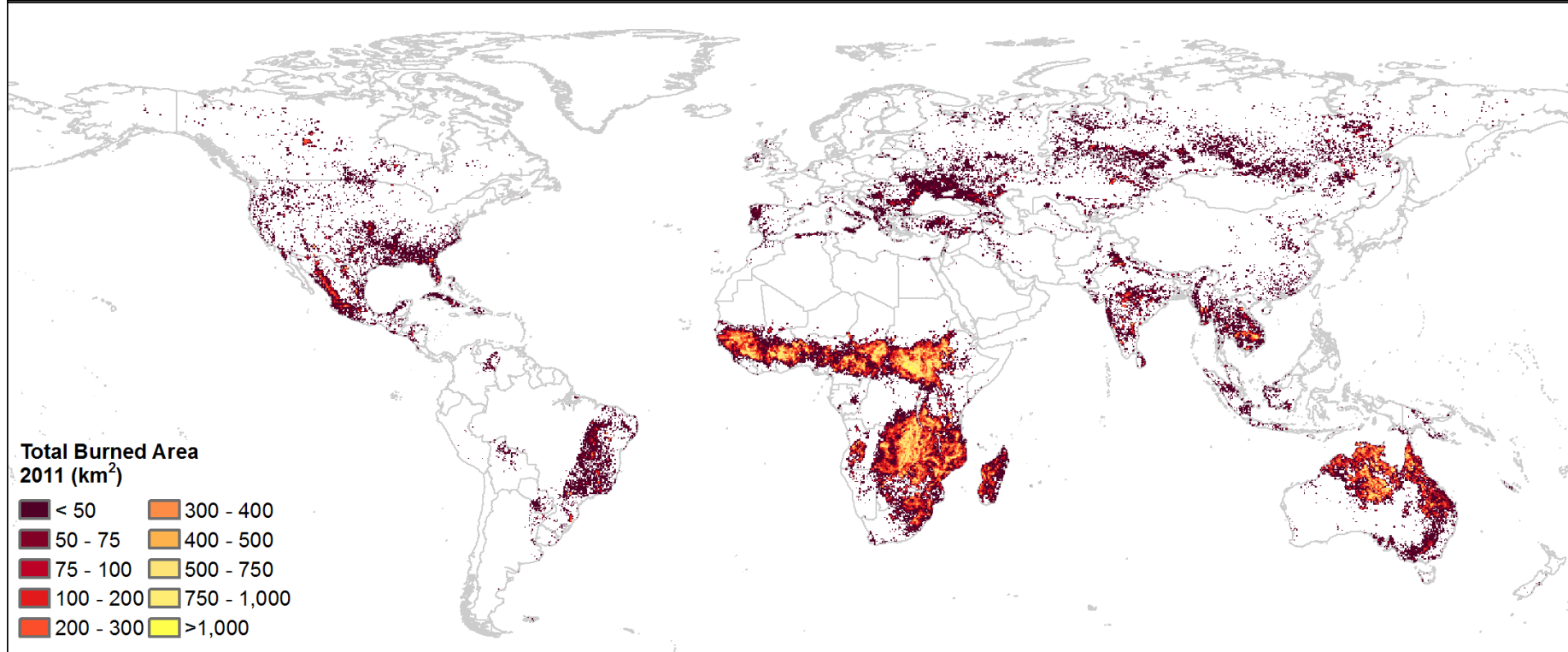


Plate Carrée Projection
Central Meridian: 0.00

Fire_cci BA product v4.1

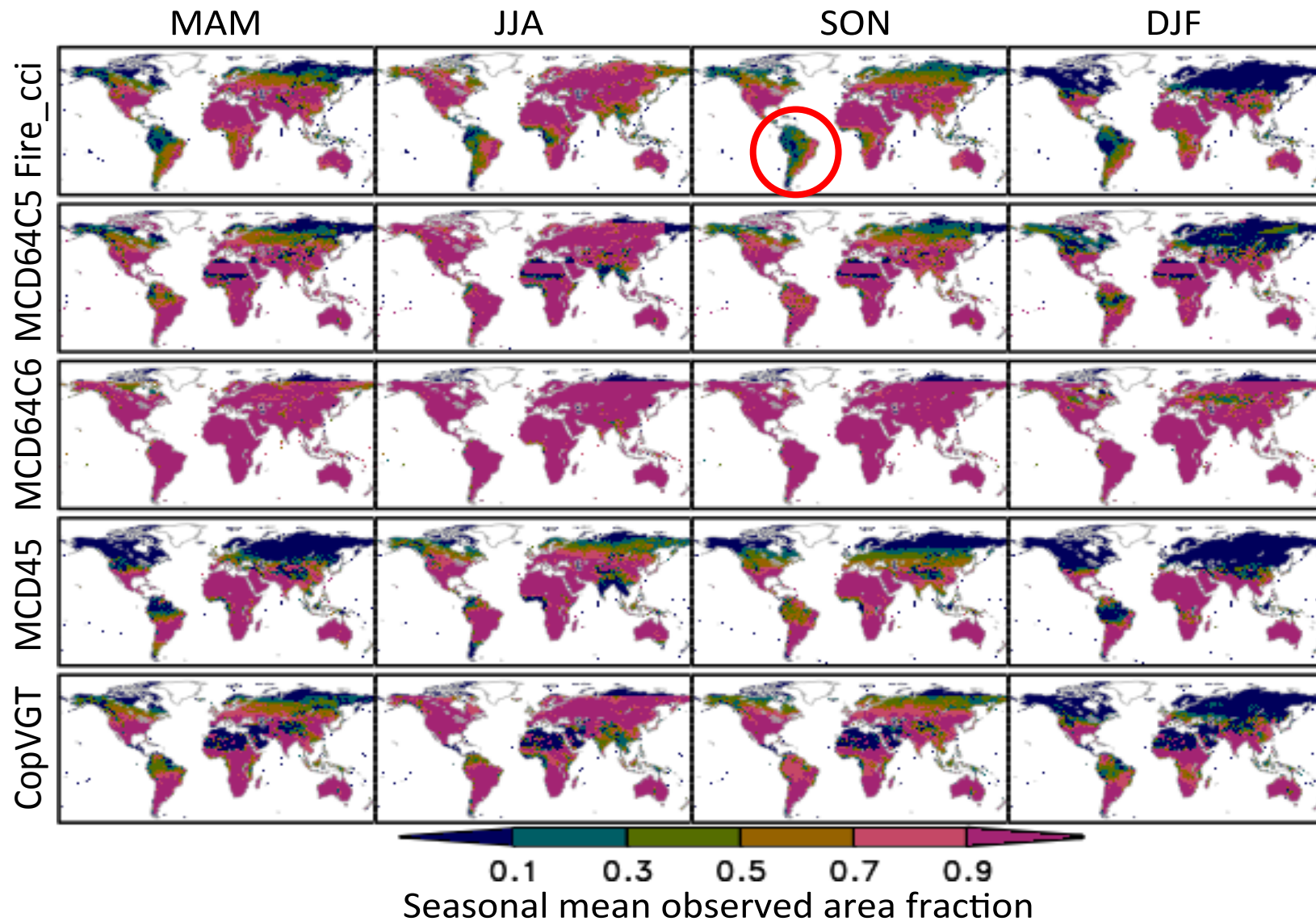
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Observed area fraction (FOA) Seasonal mean (2005-2011)

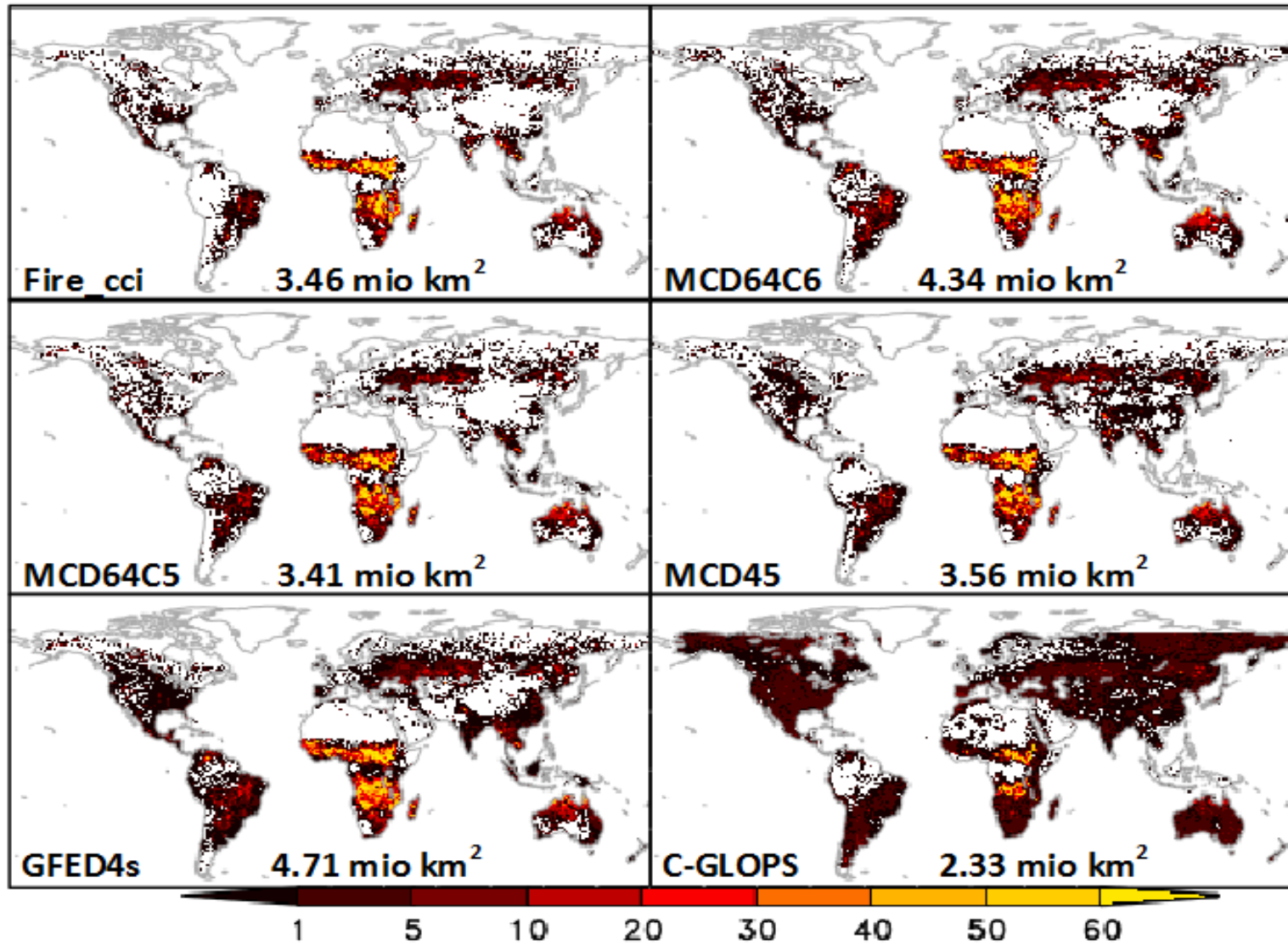
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Mean annual BA (2005-2011)

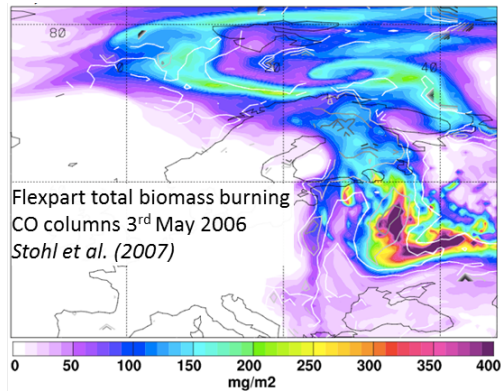
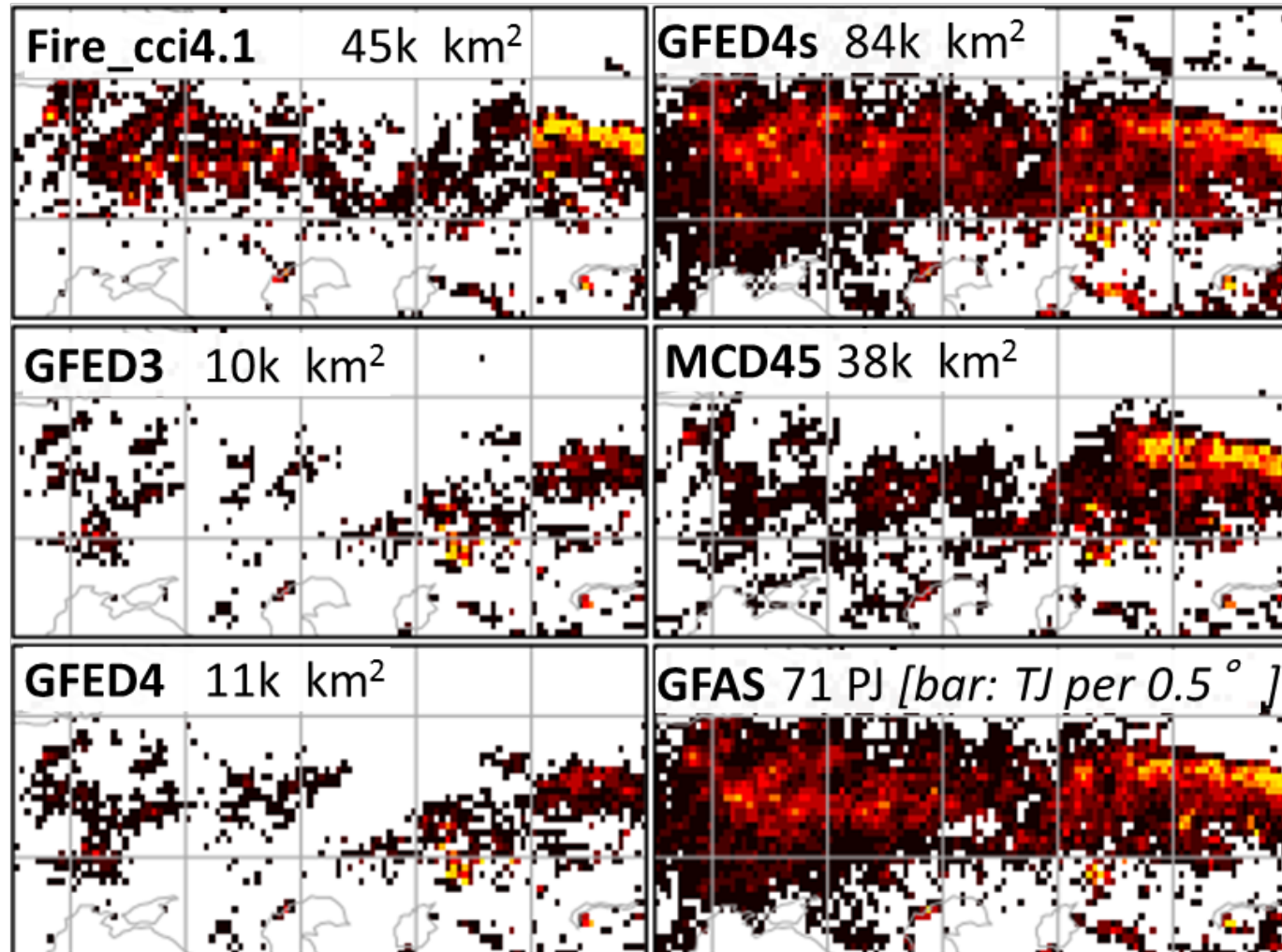
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Mean annual burned area proportion [%]

Regional differences

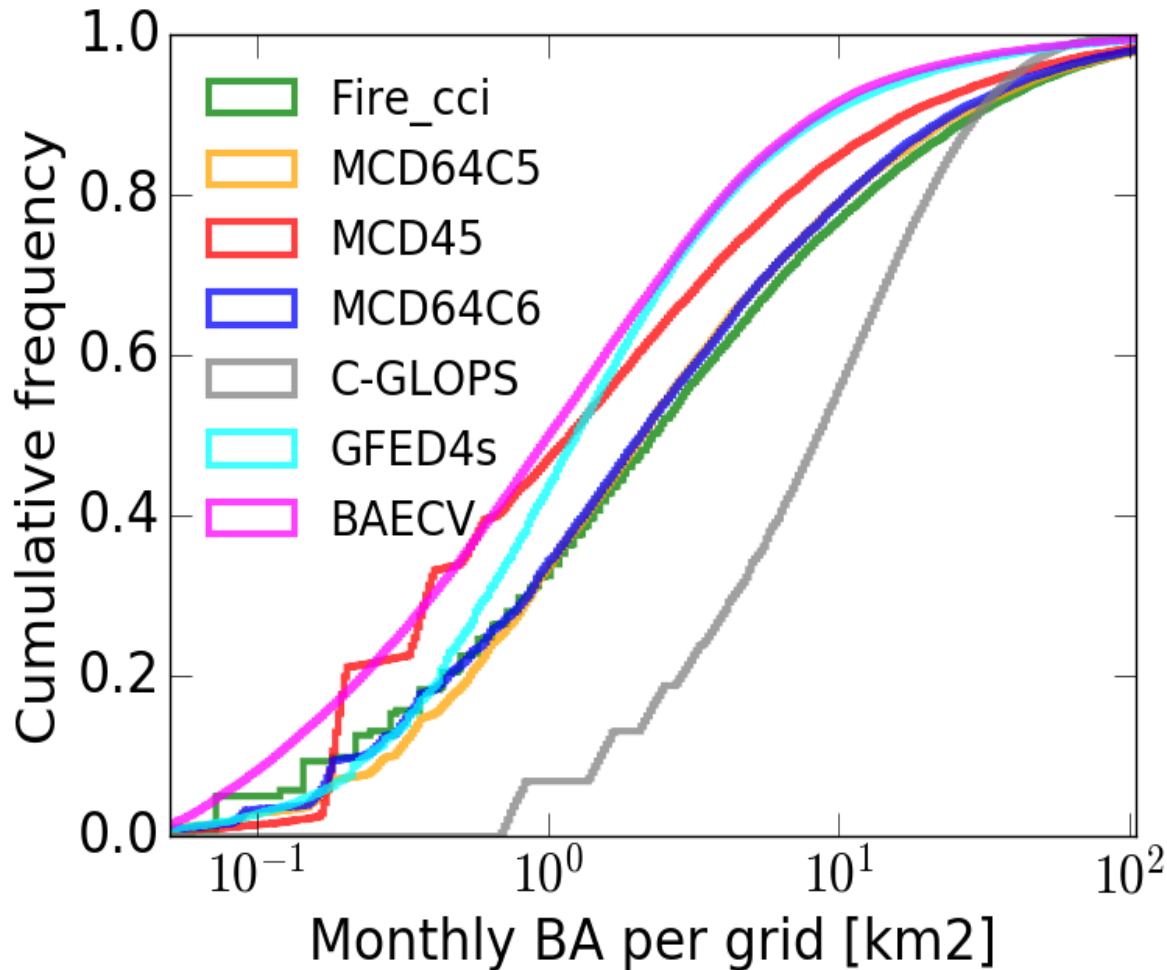
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Fire size distributions

CONUS, yearly BA, 2005-2011

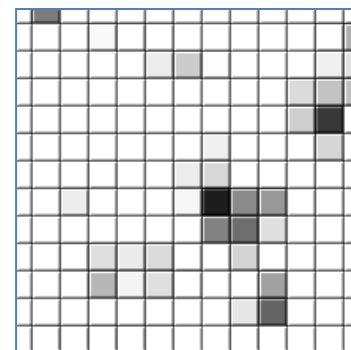
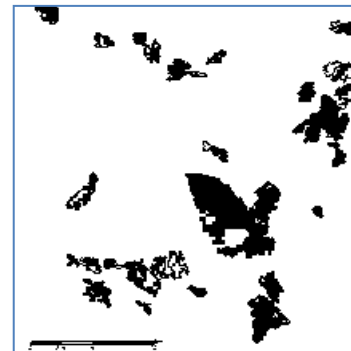




Global BA products from MERIS (and soon MODIS)

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- 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.





Small Fire Datasets

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The following burned area test products are being produced, for the years 2015 - 2016:

- Africa based on Sentinel 2 data.
- Africa based on Sentinel 1 data, to complement the cloudy regions of the Sentinel 2 images.
- Test sites of Africa based on Proba-V 100 m.
- [Test sites of Indonesia based on Sentinel 1, and emission calculation.](#)
- Test sites of South America based on Sentinel 1.

Different Sentinel 1 algorithms are being used for each continent, and a comparison of these algorithms will be performed within the project.



Active Fire Products



Active Fire Products

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- ESA World Fire Atlas from night-time observations by ATSR-2 and AATSR (1997-2011)
- soon Fire Radiative Power from SLSTR on S3A/B

Sentinel Launches



S1A/B: Radar Mission

3 Apr 2014/25 Apr 2016



S2A/B: High Resolution Optical Mission

23 June 2015/6 March 2017



S3A/B: Medium Resolution Imaging and Altimetry Mission

16 Feb 2016/2017



S4A/B: Geostationary Atmospheric Chemistry Mission

2022



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Sentinel-3 SLSTR active fire detection and FRP product: Pre-launch algorithm development and performance evaluation using MODIS and ASTER datasets

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^b RAL Space, Rutherford Appleton Laboratory, Harwell Science and Innovation Campus, Didcot OX11 0QX, United Kingdom

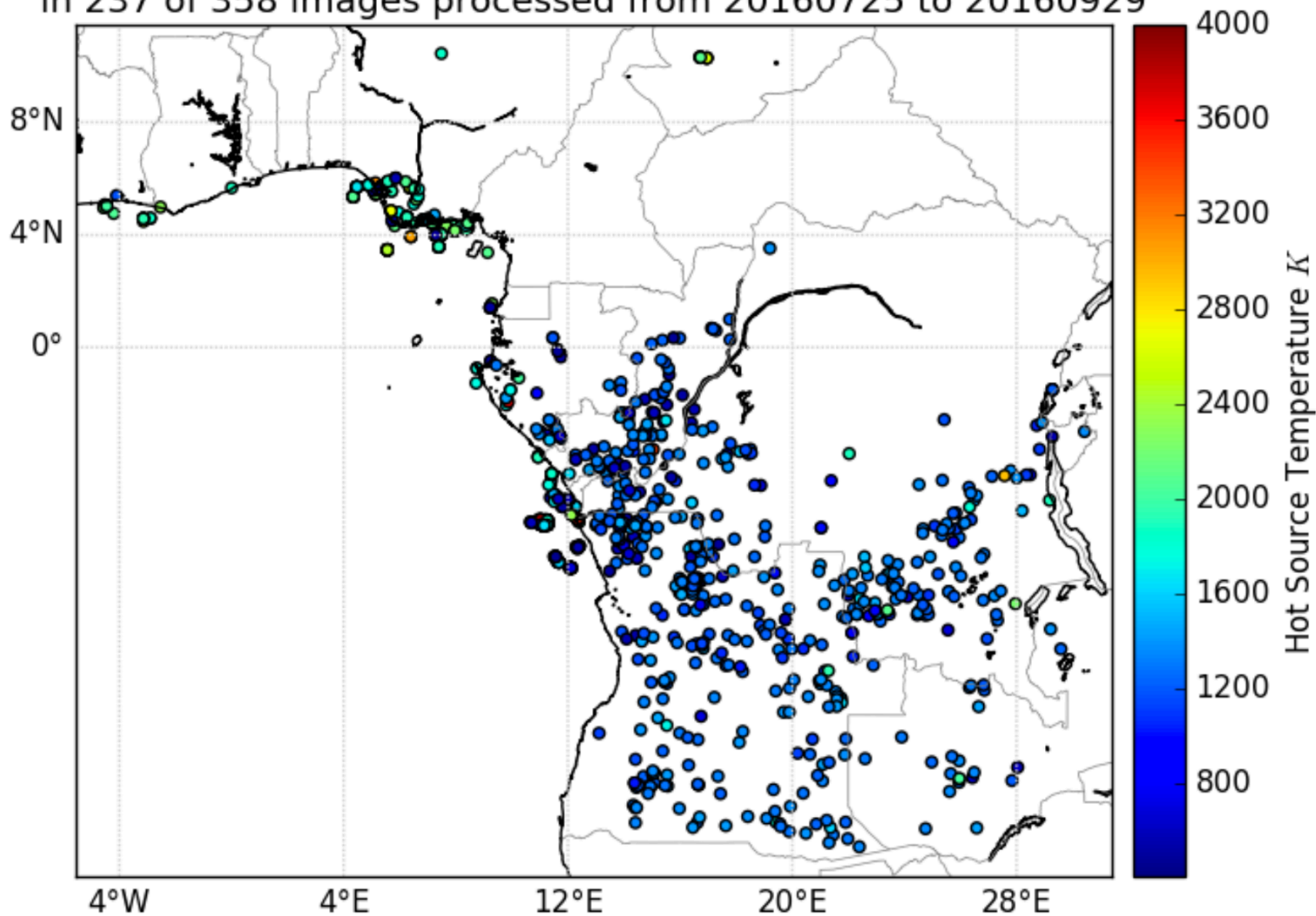
- long-term operational availability
- only morning equator crossing times



Sentinel-3 gas flare detection (similar to VIIRS Nightfire)

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digitisation = 0.000000, 964 clusters
in 237 of 358 images processed from 20160725 to 20160929



courtesy Alexandre Caseiro, MPIC

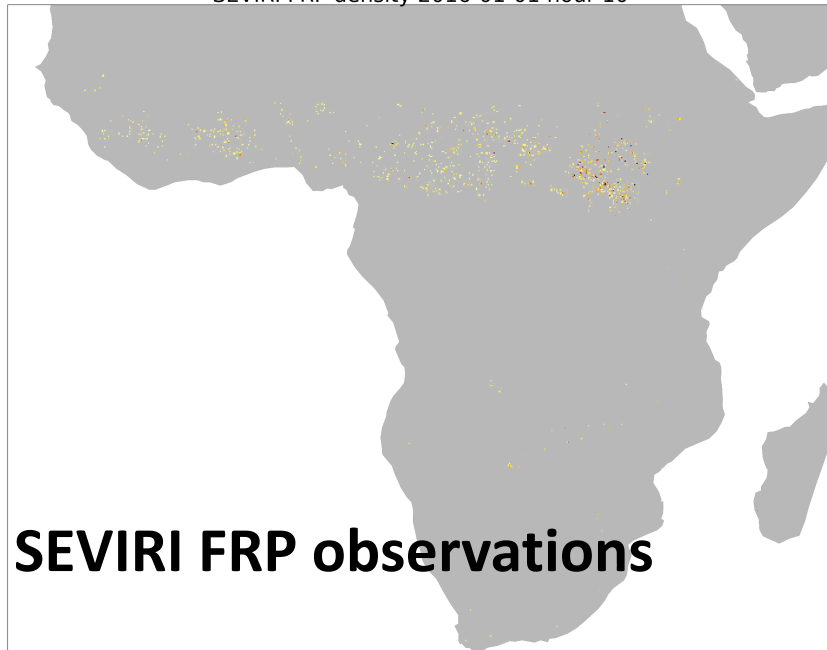


Related European Fire Products

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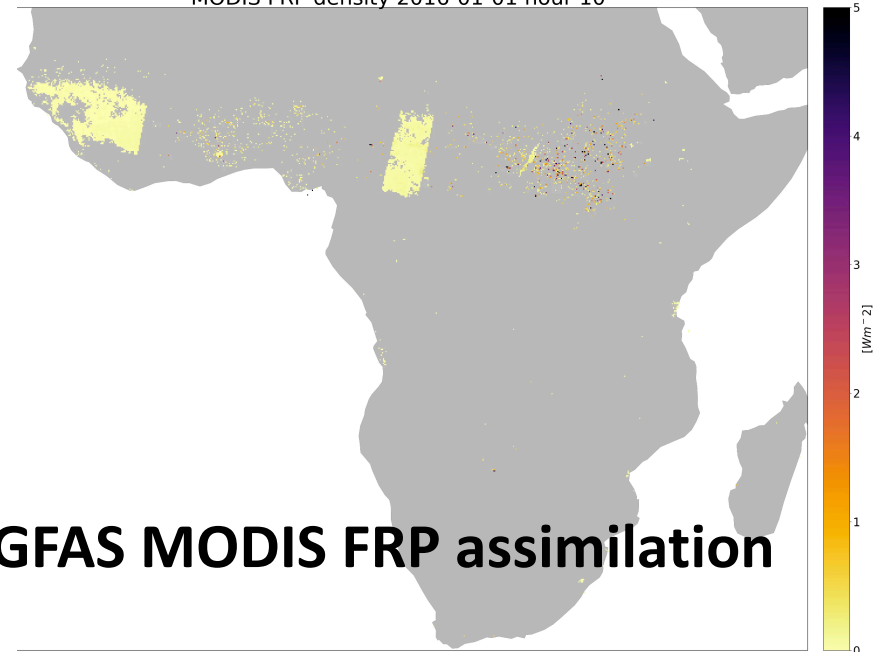
- SEVIRI FRP: geostationary every 15 min
- Global Fire Assimilation System (GFAS) of CAMS
 - currently based on MODIS FRP, more are being added
 - new: hourly resolution

SEVIRI FRP density 2016-01-01 hour 10



SEVIRI FRP observations

MODIS FRP density 2016-01-01 hour 10



GFAS MODIS FRP assimilation

animations courtesy Tadas Nikonovas, KCL



Take-home messages

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- ESA is building consistent, well-characterised burnt area products from several satellites.

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

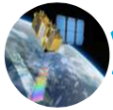
- The Copernicus Programme of EU provides long-term, operational, near-real-time characterisation of burnt area, fire radiative power and smoke observations through the
 - Sentinel satellites
 - Copernicus Atmosphere Monitoring Service

Sentinel Launches



S1A/B: Radar Mission

3 Apr 2014/25 Apr 2016



S2A/B: High Resolution Optical Mission

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S3A/B: Medium Resolution Imaging and Altimetry Mission 16 Feb 2016/2017



S4A/B: Geostationary Atmospheric Chemistry Mission

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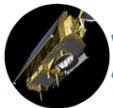
S5P: Low Earth Orbit Atmospheric Chemistry Mission

2017



S5A/B/C: Low Earth Orbit Atmospheric Chemistry Mission

2021



S6A/B: Altimetry Mission

2020