

climate change initiative

→ FIRE

“Recent advances in the ESA FireCCI and C3S products”

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ESA CCI Programme (2010-...)



biomass

cci



fire

cci



**high resolution
land cover**

cci



lakes

cci



land cover

cci



**land surface
temperature**

cci

Land



aerosol

cci



cloud

cci



ghg

cci



ozone

cci



water vapour

cci

Atmosphere



salinity

cci



sst

cci



sea state

cci



sea ice

cci



**sea level
budget closure**

cci



sea level

cci



ocean colour

cci

Ocean



**antarctic
ice sheet**

cci



glaciers

cci



**greenland
ice sheet**

cci



permafrost

cci



snow

cci

Ice



cmug

cci



**open data
portal**

cci



toolbox

cci

Transversal



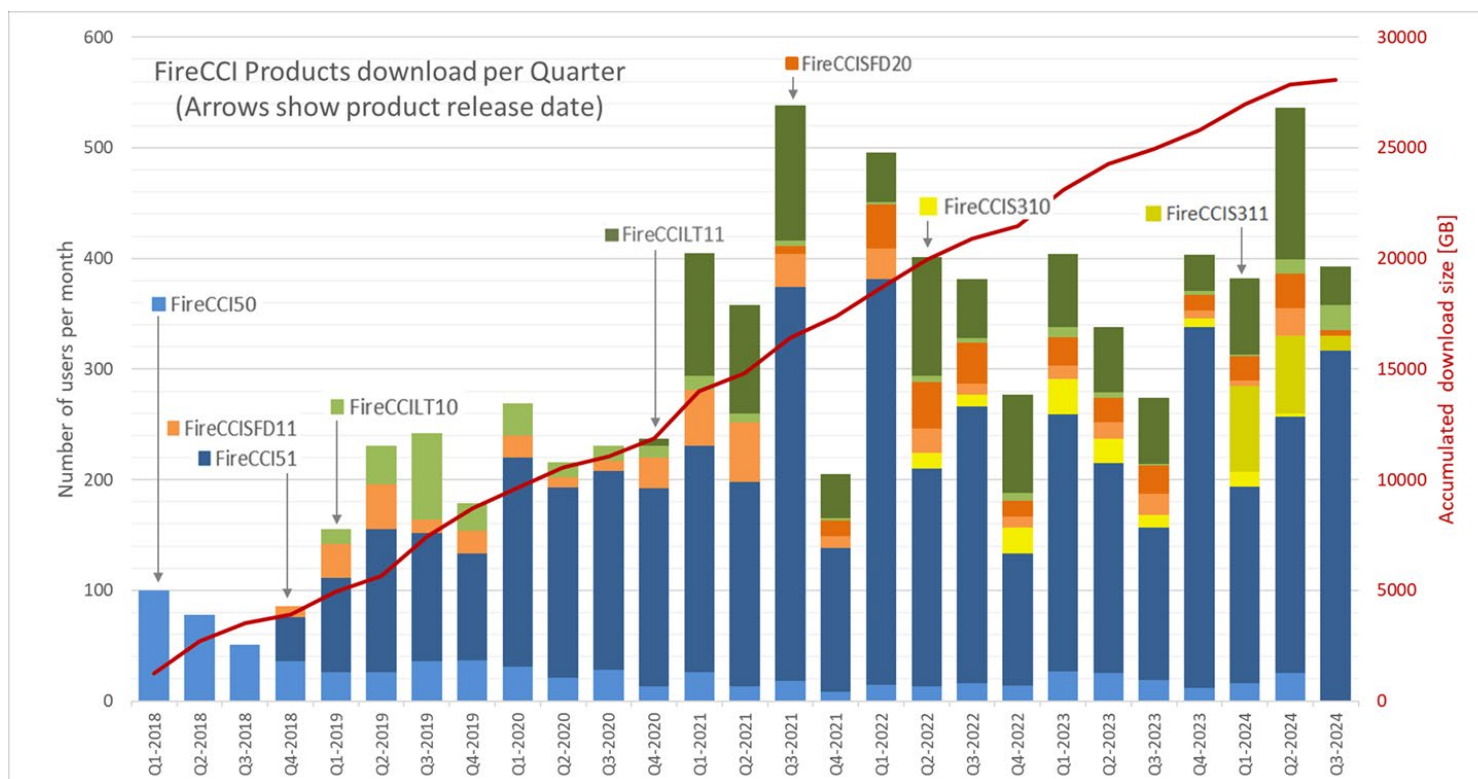
Existing Fire CCI products

Global:

- FireCCI51: 2001-2022, MODIS: 250 m.
- **C3SBA10: 2017-2022, OLCI: 300 m**
- **FireCCIS310: 2019-2022, SYN: 300 m**
- FireCCILT11: 1982-2018: AVHRR: 5 km.

Regional:

- Africa: FireCCISFD 2016 & 2019, Sentinel-2 20m
- Africa, Indonesia, Amazonia: FireCCIS1: 2016, Sentinel-1 40m.
- Africa-Siberia-Amazon: Landsat 1990-2022, 30m

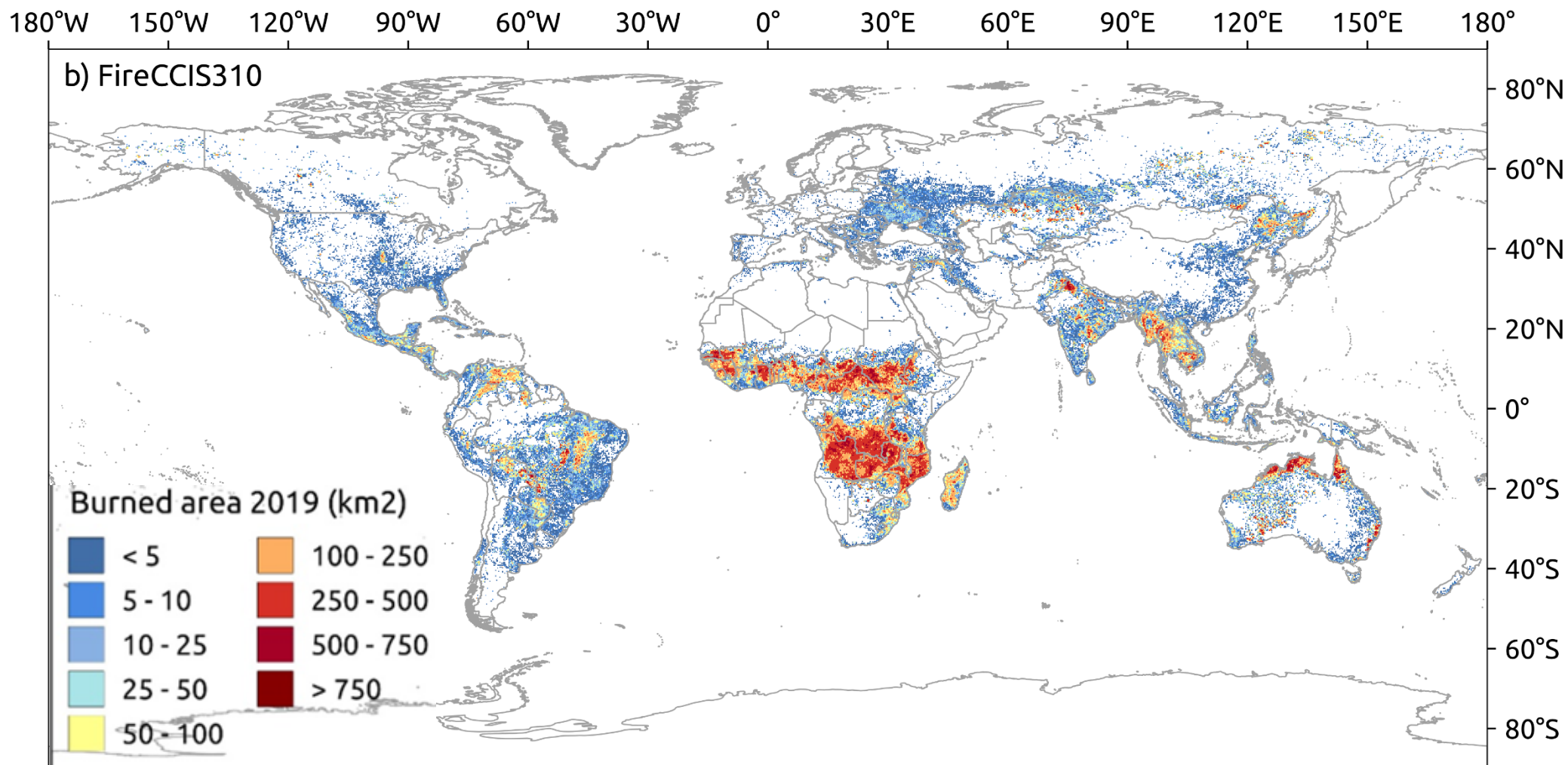


Accumulated downloads:

- 28 Tb accumulated
- > 1700 users



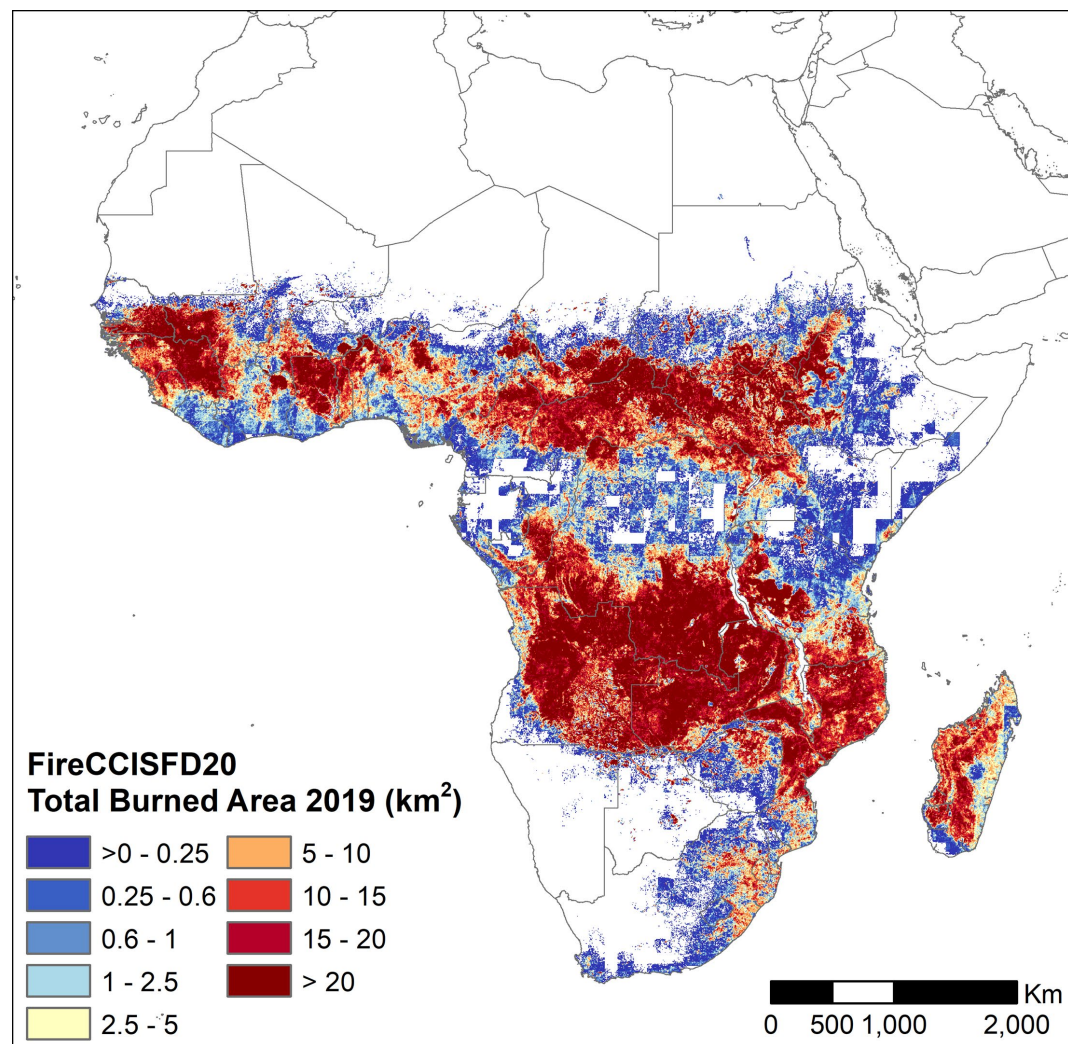
FIRECCIS310 (SYN 300m + VIIRS)



Lizundia-Loiola et al., 2022, RSE

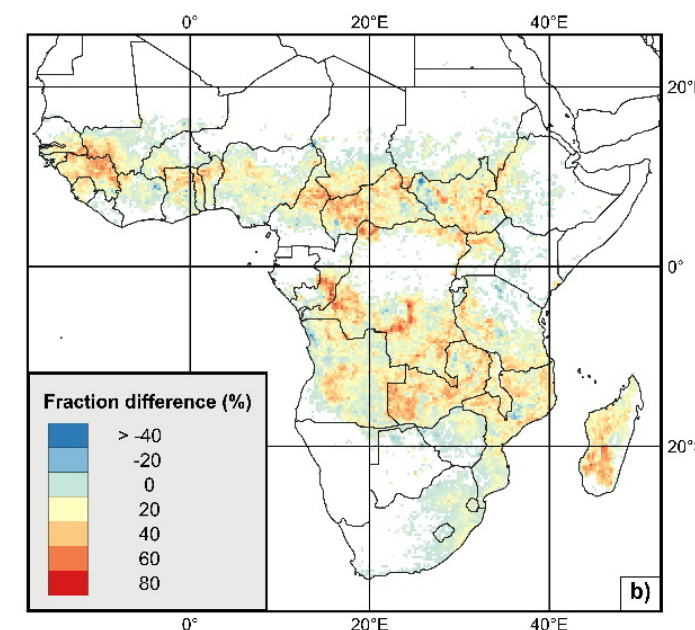
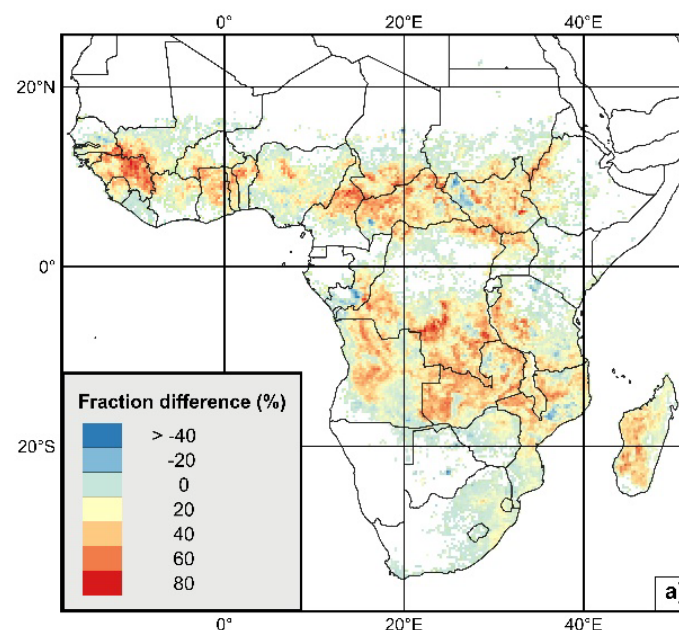


Regional products: Africa (2019) Sentinel 2A & 2B



(Chuvieco et al., 2022, STOTEN)

4.8 Mkm² just for Africa. More BA in all months
80% more BA than FireCCI51 (MODIS 250 m)
120% more BA than MCD64A1 (MODIS 500 m)

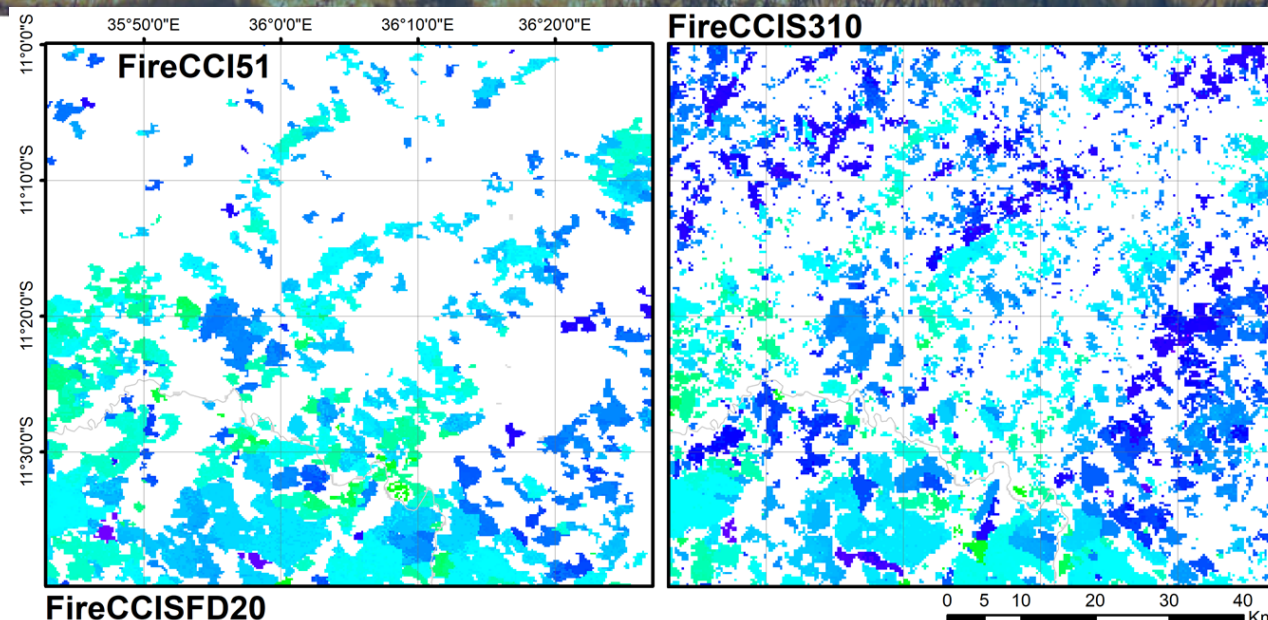


Difference in BA proportion between FireCCISFD20 and
a) MCD64A1 and b) FireCCI51



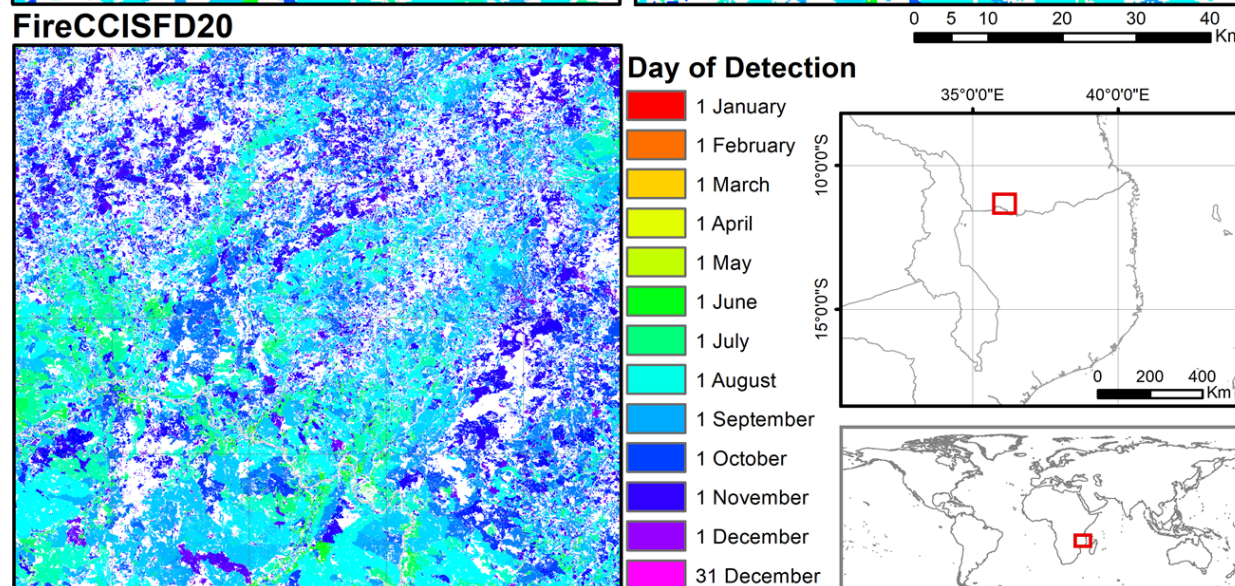
Differences with existing global BA products

MODIS 250 m
+ AF 1000 m



SYN 300 m +
AF 375 m

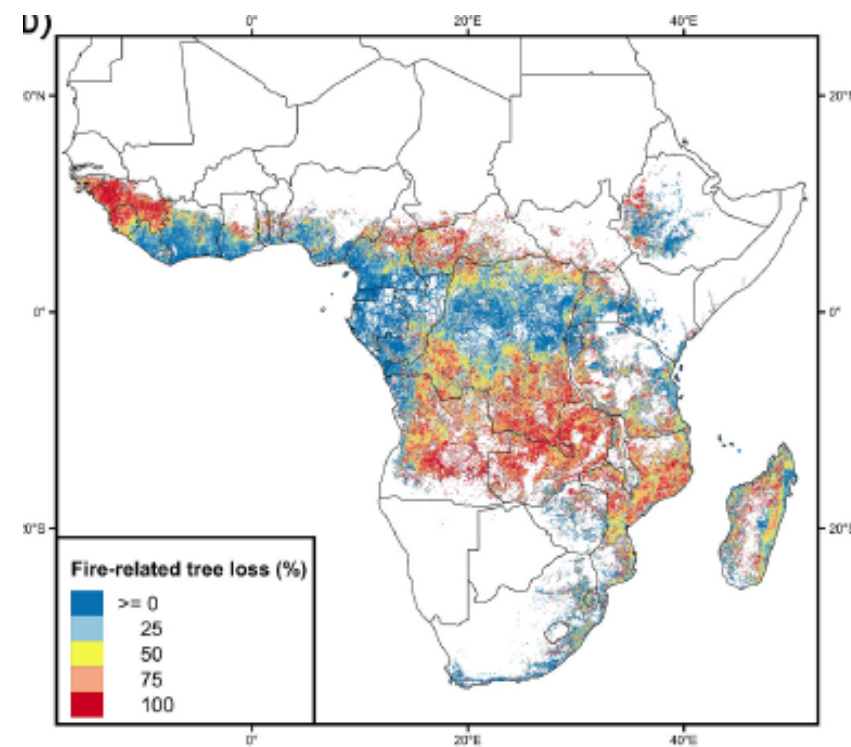
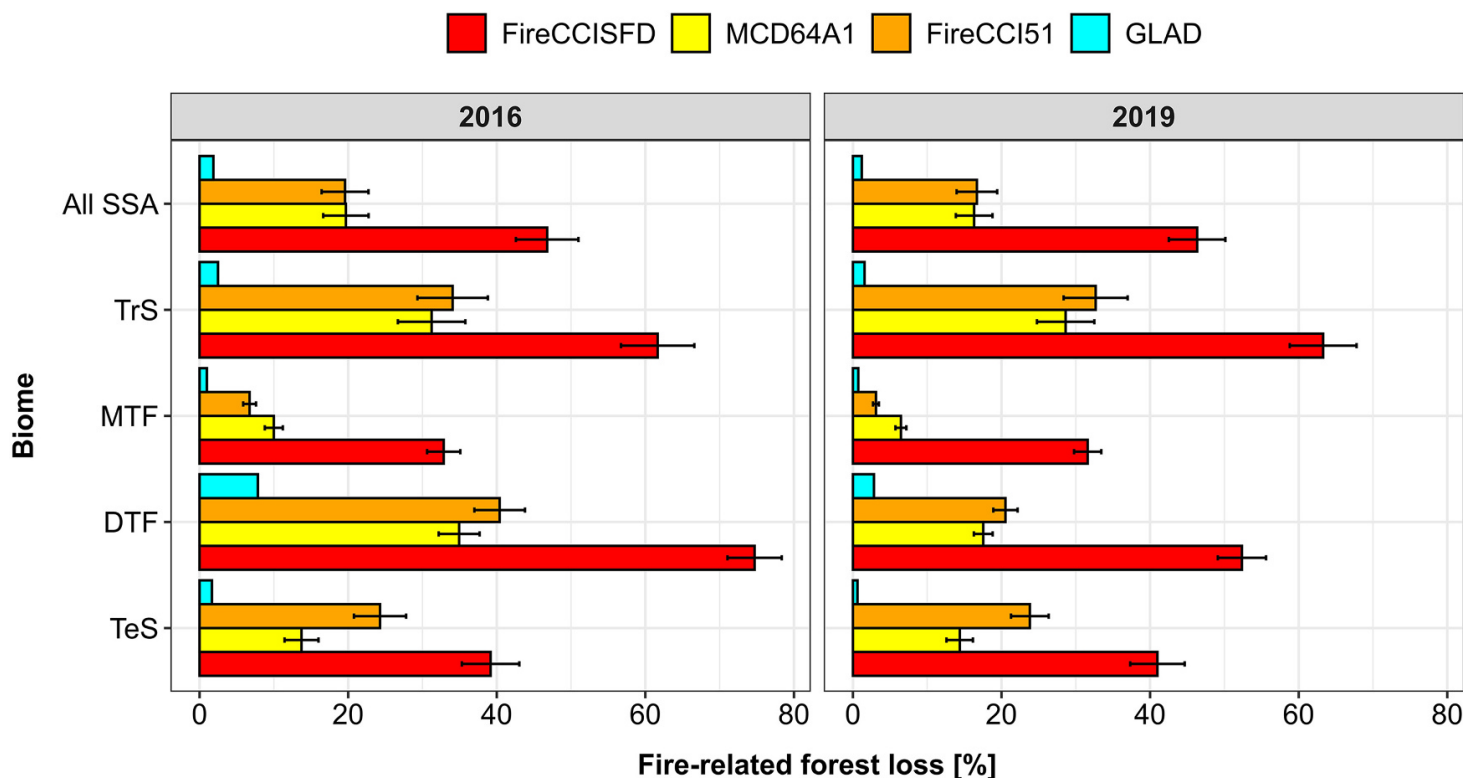
S2 MSI 20 m
+ AF 375 m





And in estimation of fire-related deforestation

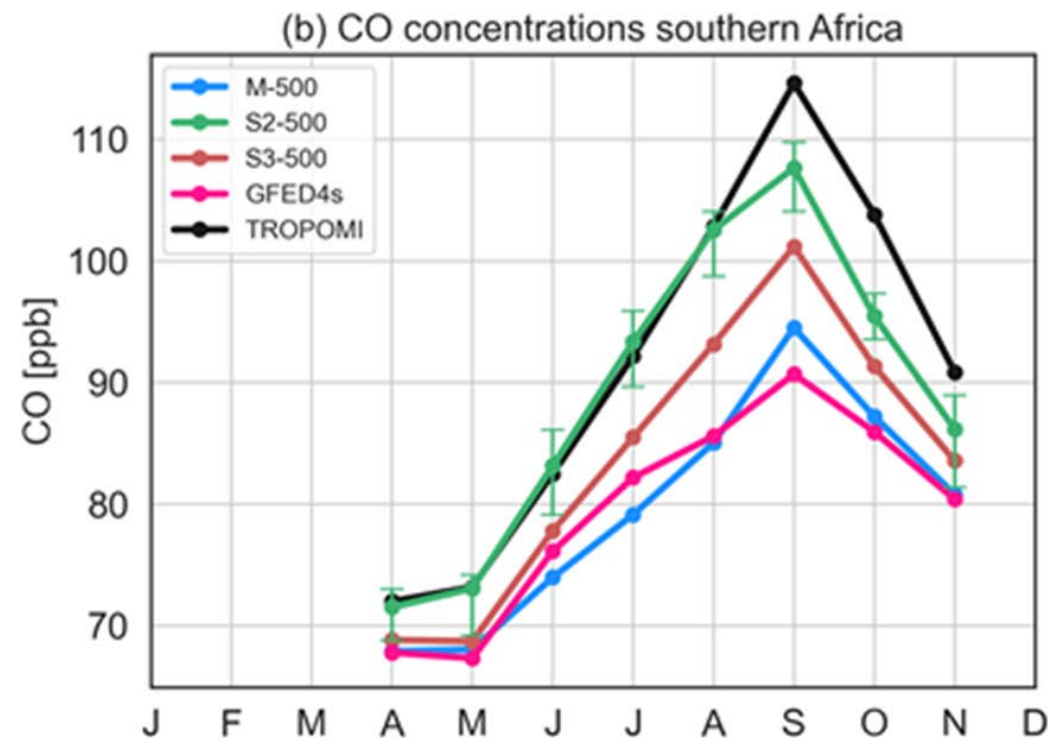
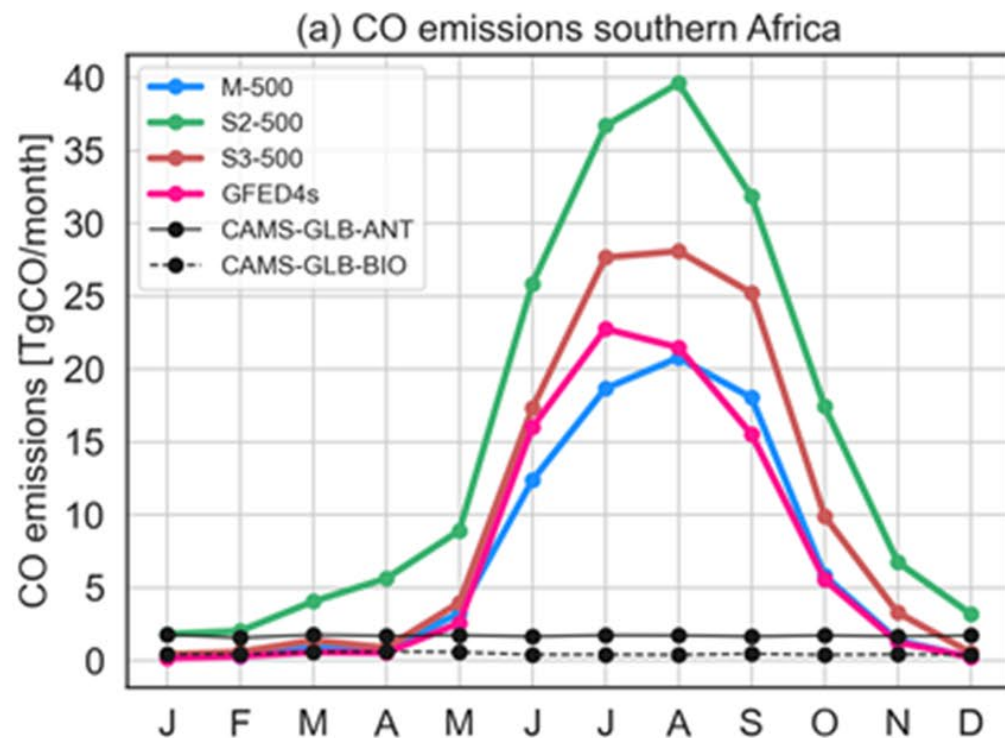
- Fires contribute to >46 % of total forest losses over SSA (double than previous estimates).
- BA showed more than twofold likelihood of subsequent loss compared to unburned ones.



Khairoun et al, 2024 STOTEN



Emissions from SFD and coarse BA products



M-500: emissions derived from MCD64A1C6. S2-500: emissions derived from FireCCISFD20. S3-500: emissions derived from FireCCIS311.

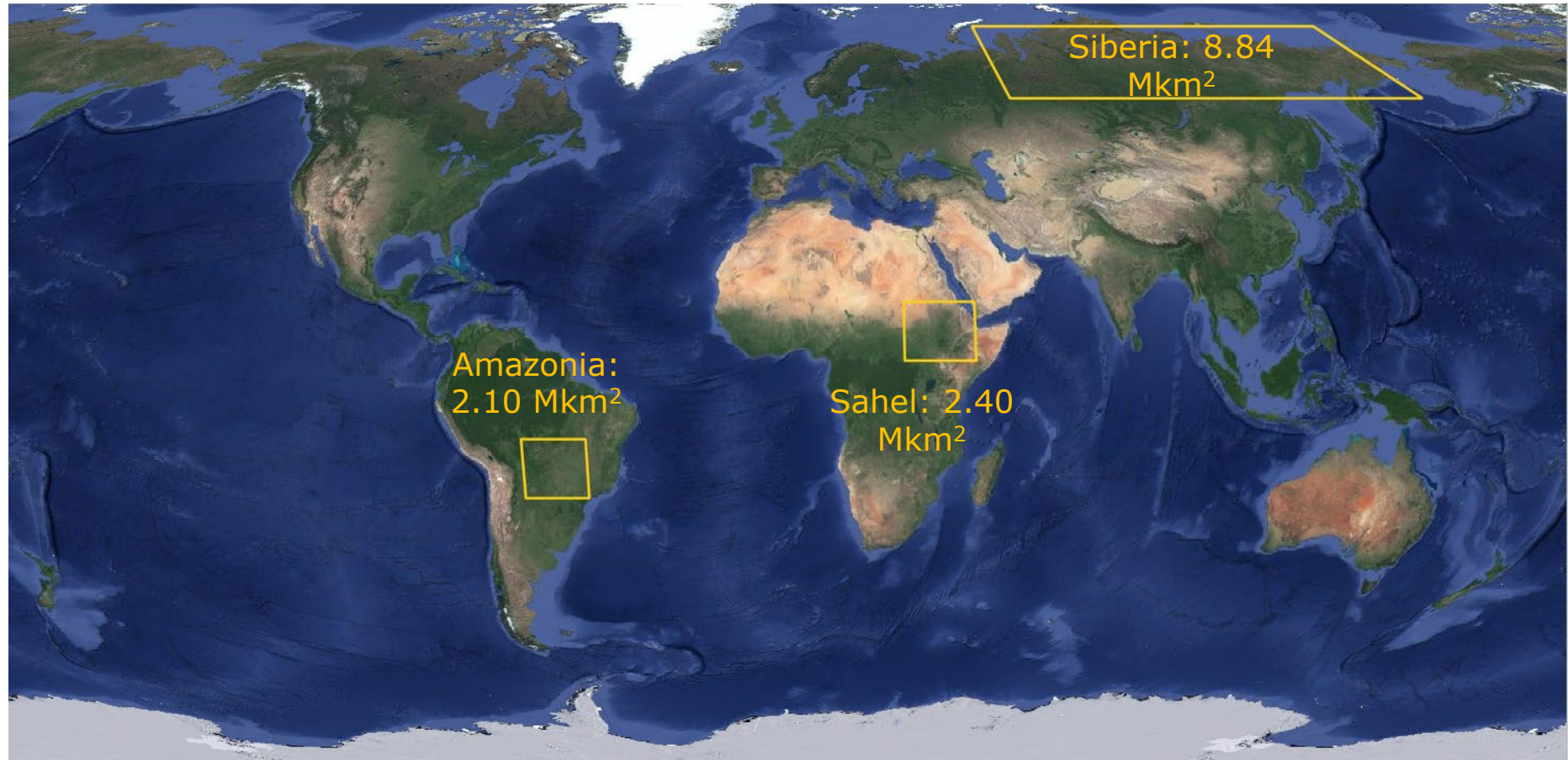
Van der Welde et al, 2024, JGRL,



Landsat time series



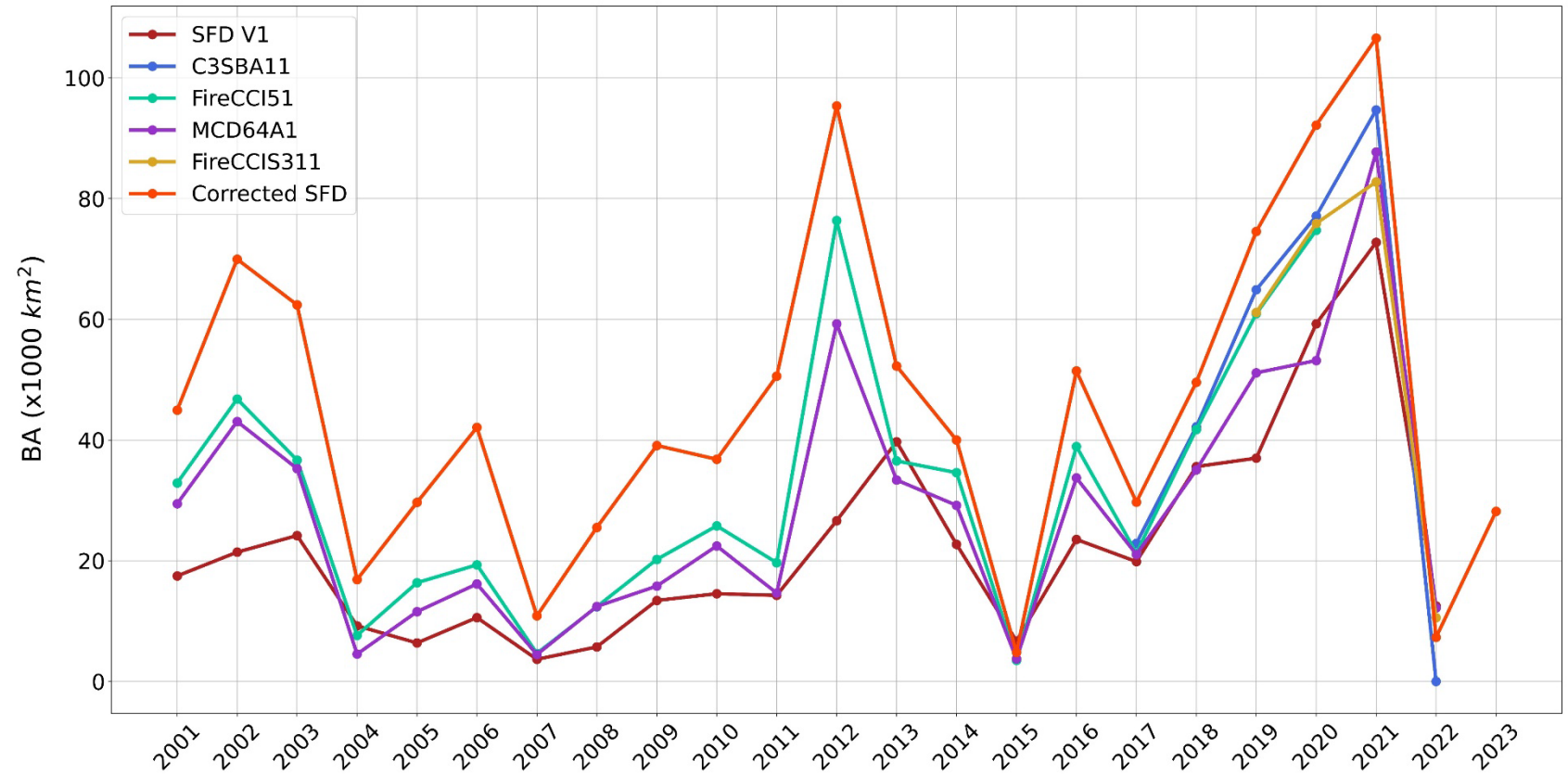
- Amazonia: tropical ecosystems (wetlands, tropical forests and savanna)
- Sahel: tropical and temperate savanna and drylands
- Siberia: peatlands and boreal forests





Peat fires (Landsat versus global BA datasets)

- The corrected version gives an improved fire detection: significant increase in the years with low high image availability.
- Significant increase in 2017-2021 and drop in 2022.





CCI+ CCN5: General objectives (2024-26)

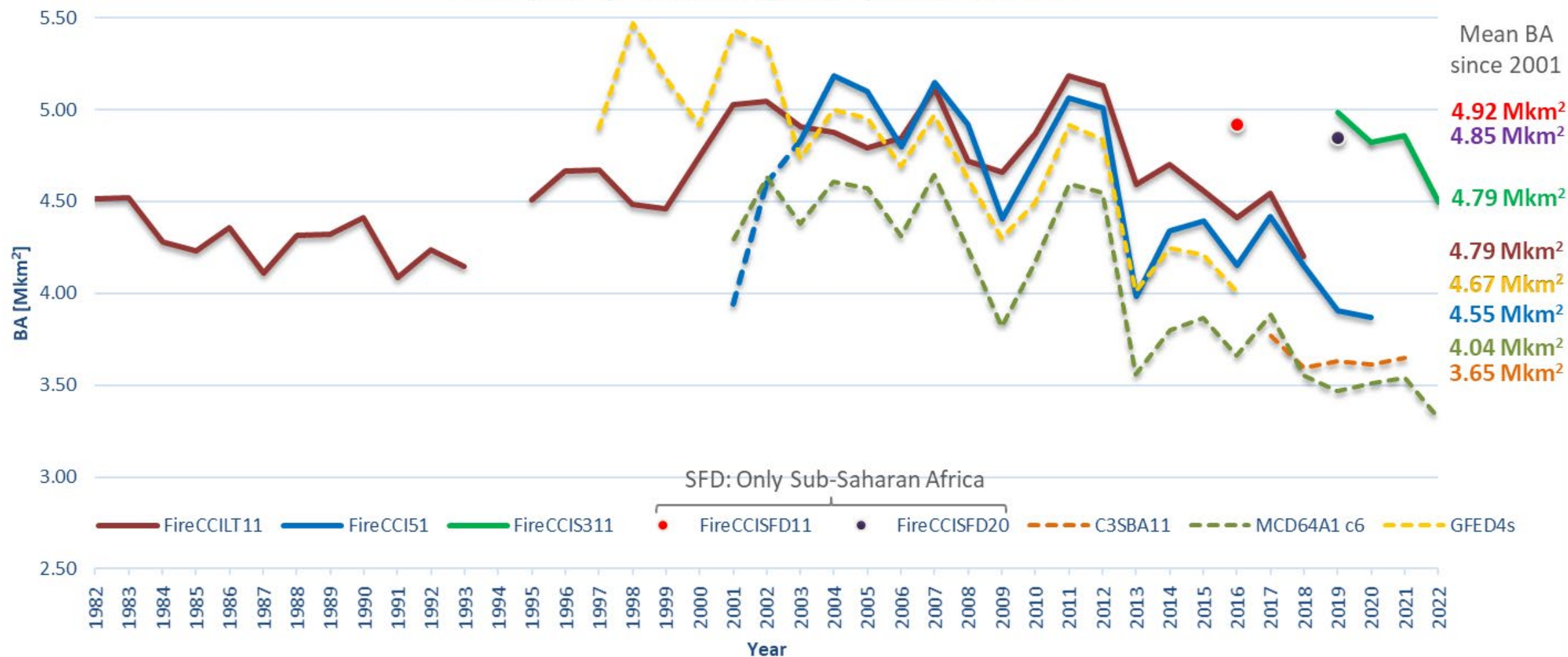


- a) Generation of a single global S-2 BA dataset.
- b) Extension of FireCCIS311 time series 2023-24... and transfer to C3SBA.
- c) **Generation of a harmonized time series of BA, FireCCIS311 and FireCCI51.**
- d) FireCCISFDL (long-term Small Fire Dataset) products by combining S-2 + Landsat data.
- e) Generation of a new version of the FireCCILT11.
- f) Test on combustion completeness methods.
- g) Extending the validation dataset.
- h) Climate Assessment. atmospheric emissions community (GFED, CAMS) and the carbon estimations (through our collaboration with RECCAP2).
- i) Update requirements & use of FireCCI products



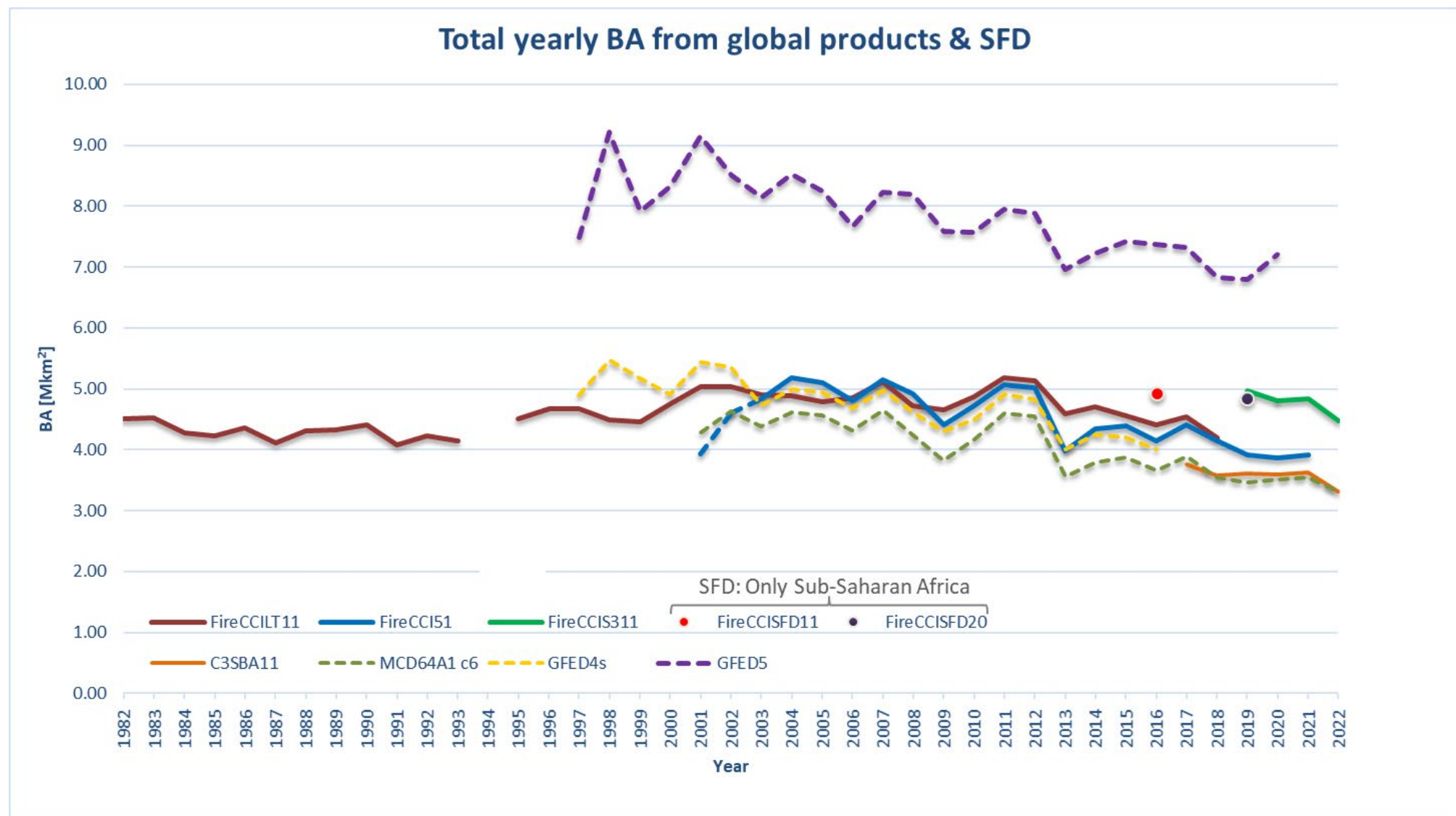
Time series of BA products

Total yearly BA from global products & SFD





Time series of BA products (+GFED5)





Goals

- Develop a synthetic BA dataset from :
 - FireCCI51 (2001-2021), ESA CCI, MODIS 250m ref+MODIS AF (1000m).
 - FireCCIS311 (2019-2022), ESA CCI, S-3 SYN 300m ref+VIIRS AF (375m).
 - Covering the period 2001-present.
 - Only cell-based: 0.05 d ($\approx 5 \times 5 \text{ km}$)



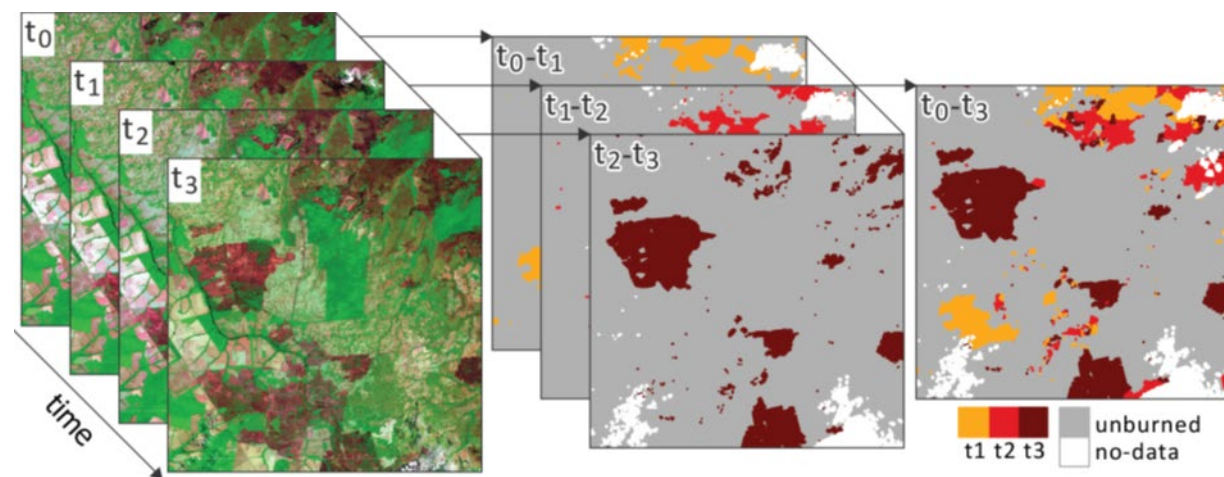
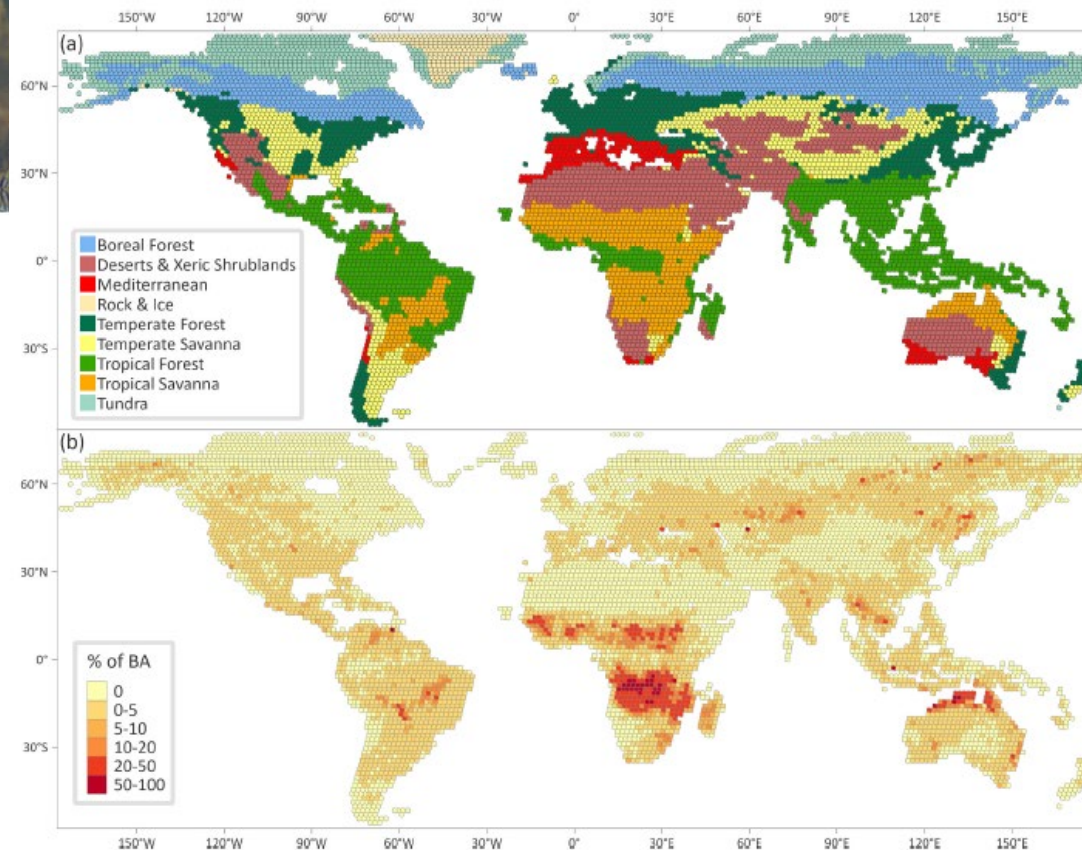
Validation

- Random stratified sampling of TSA (2017-2023)
- Long-term sampling scenes:
 - Global: Franquesa et al., 2022 RSE.

Period	2017–2019		
	C3SBA10	FireCCI51	MCD64C6
<i>DC</i>	62.9 (1.6)	66.7 (1.5)	62.5 (1.8)
<i>Ce</i>	17.2 (1.1)	19.4 (1.1)	18.7 (1.4)
<i>Oe</i>	49.3 (1.9)	43.1 (1.9)	49.3 (2.2)
<i>relB</i>	−38.7 (2.2)	−29.4 (2.1)	−37.6 (2.6)

- Africa: Stroppiana et al., 2022 IJPRS.

Product	OE [%]	CE [%]	DC [%]	RelB [%]
FireCCISFD20	8.5	15.0	87.7	8.4
MCD64C6	56.5	21.1	56.0	−44,9
FireCCI51	52.2	25.1	58.4	−36.2





<https://climate.esa.int/en/projects/fire/>



→ THE EUROPEAN SPACE AGENCY



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Fire

The Fire_cci project aims to improve consistency, using better algorithms for both pre-processing and burned area detection while incorporating error characterisation.

ABOUT

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KEY DOCUMENTS

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