Royal Netherlands
Meteorological Institute
Ministry of Infrastructure
and Water Management

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Twelve years of SIFTER

Sun-Induced Fluorescence retrievals from GOME-2 as an independent constraint on photosynthesis across continents and biomes

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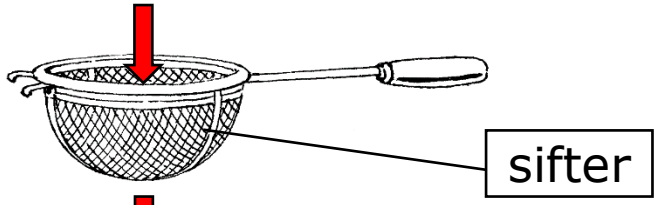
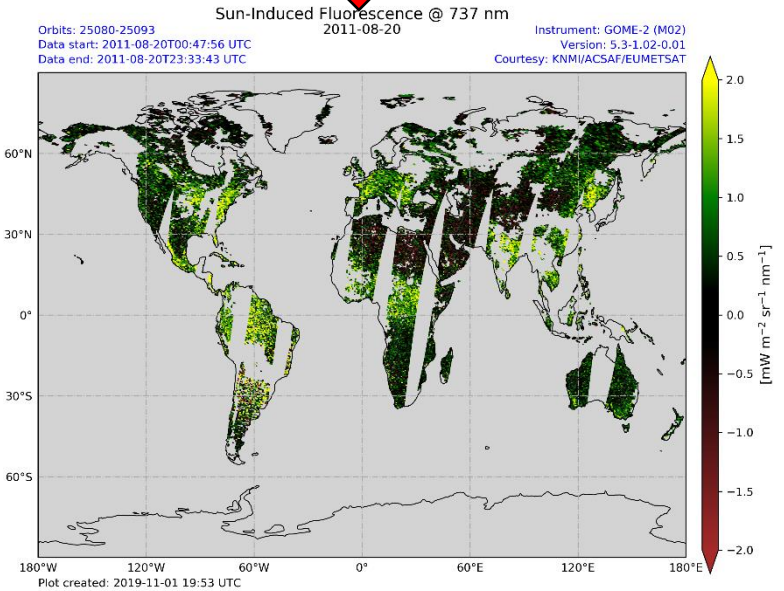
The SIFTER retrieval

What is the SIFTER product?

Sun-Induced Fluorescence of Terrestrial Ecosystem Retrieval

- Based on Joiner et al. (2013)
- Developed by Sanders et al. (2016)
- Improved by van Schaik et al. (2020)
- Validated by Mengistu et al. (2020)



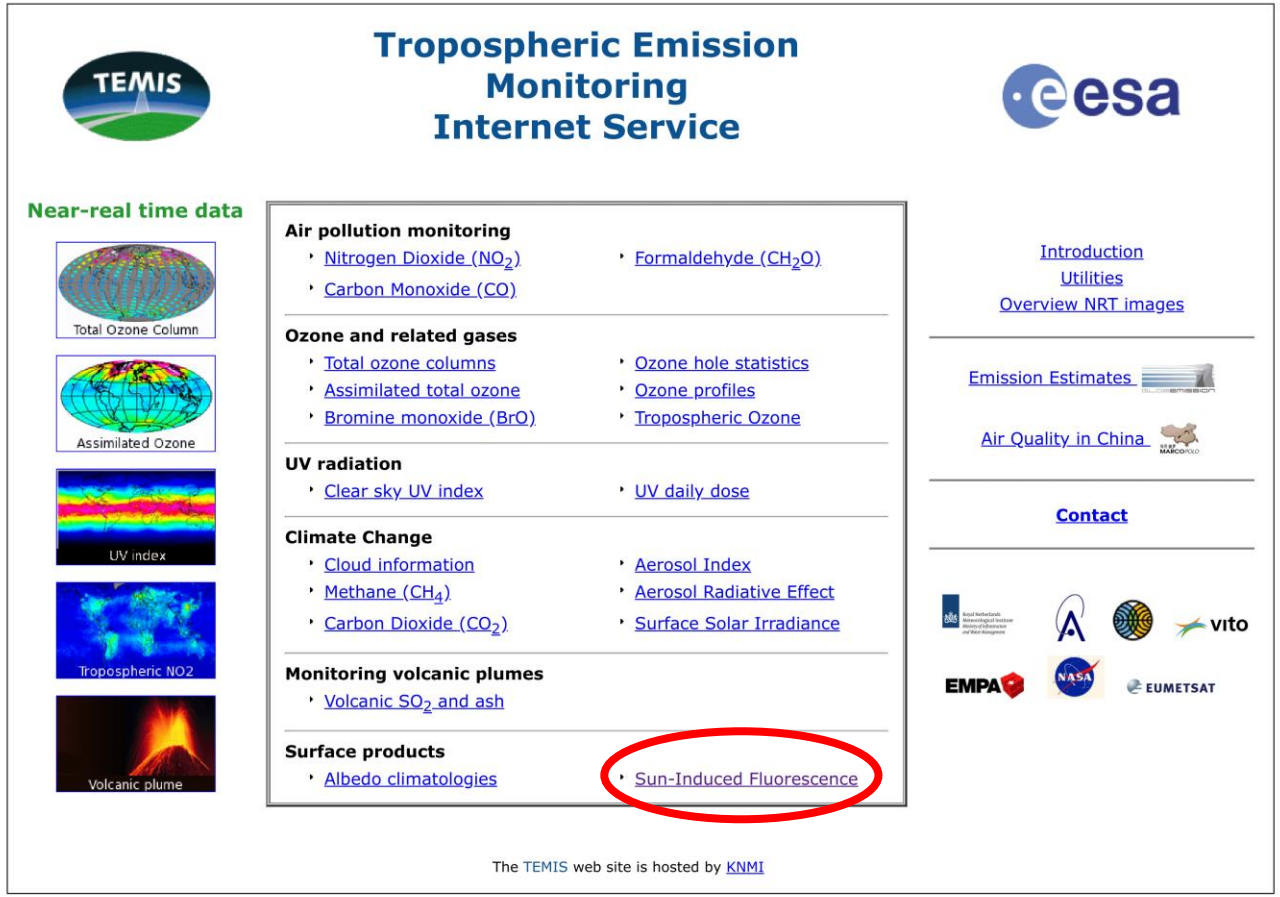


SIF daily GOME-2 dataset 2007-2018

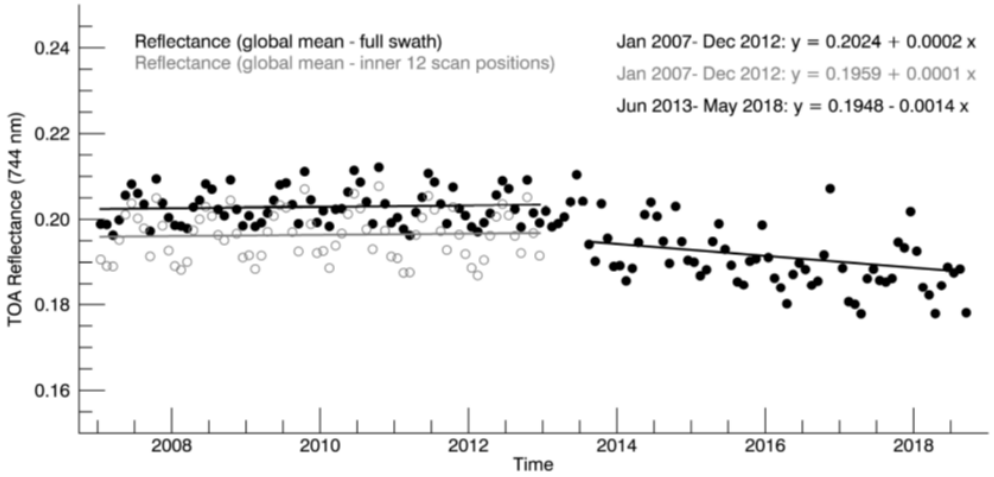
- 12 years of data available
- Daily measurements on GOME-2 grid
- The dataset and detailed information is available at

  www.temis.nl/surface/sif.html

http://www.temis.nl

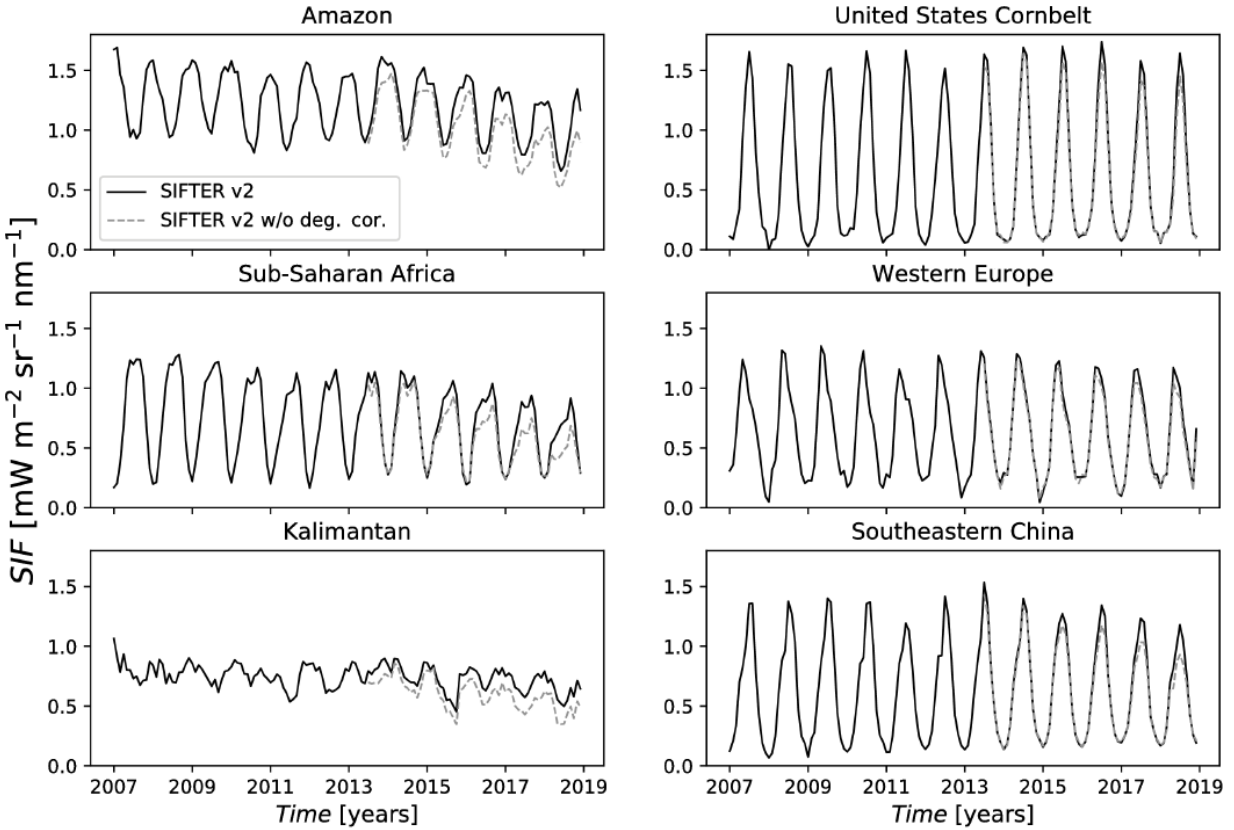


Retrieval improvements (1)



DEGRADATION CORRECTION

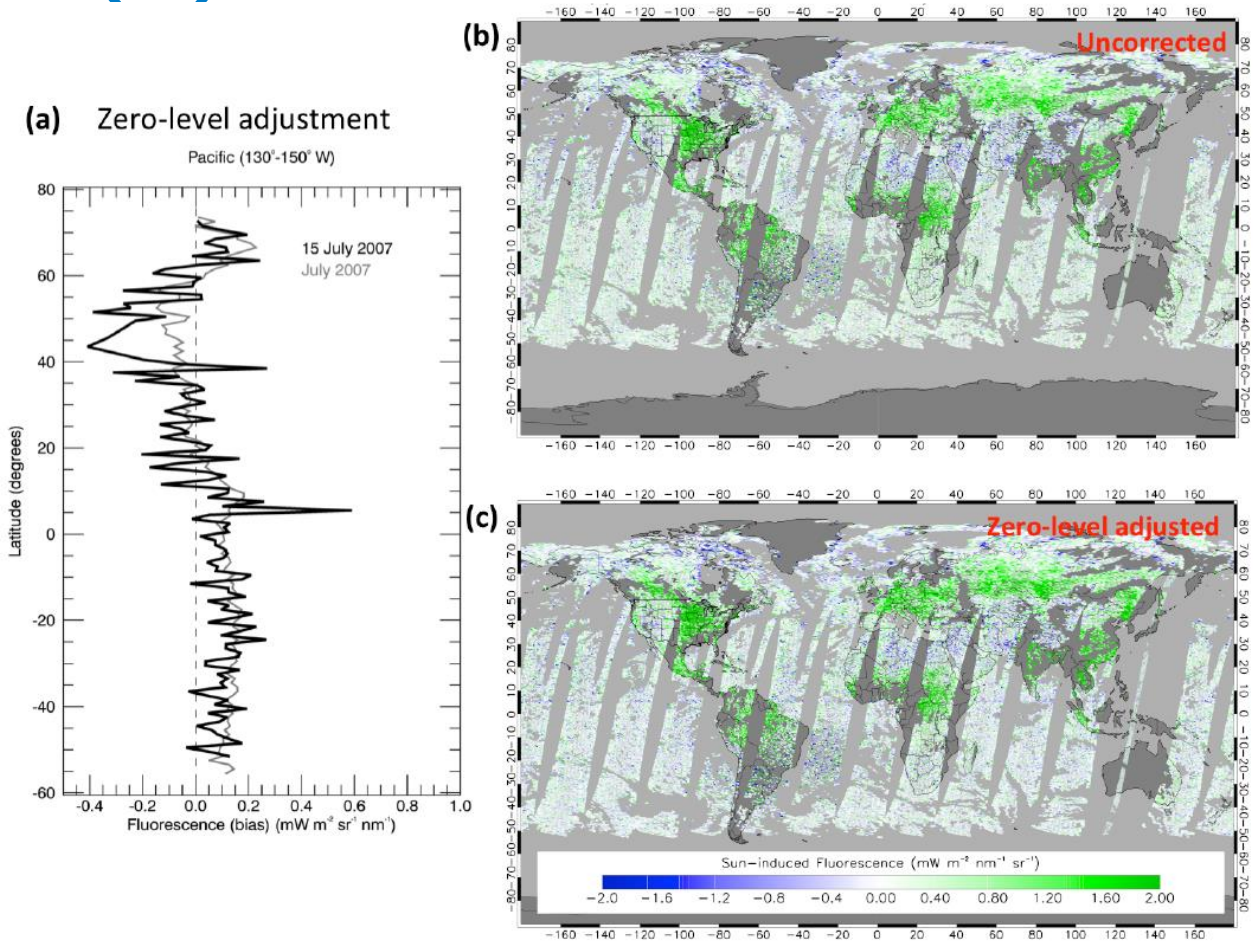
- A degradation is found in the GOME-2A reflectance data after July 2013 when observing reference site Lybia4 (upper figure)
- This degradation propagates into the SIF signal, resulting in a downward trend (lower figure)
- We apply an empirical correction based on the reference reflectances calculated over Lybia4 and use these to correct global reflectance before retrieval.
- This method results in a decrease of the degradation as can be seen from the solid black line in the lower figure
- The degradation is most prominent in (sub-)tropical environments. For details on other regions, please refer to van Schaik et al. (AMTD, 2020)



Retrieval improvements (2)

LATITUDE BIAS CORRECTION

- A latitude bias is observed, likely related to instrument warming when passing over the sunlit side of the earth and associated Focal Plane Array temperature variations, resulting in slitfunction variability
- This anomaly is propagated into the SIF signal resulting in an underestimation of SIF at Northern latitudes, and an overestimation at Southern latitudes
- A correction is applied by sampling ocean measurements (zero-level) in 1 degree latitude bins, fitting their SIF-to-reflectance relation, and using this linear fit to determine the offset for all retrievals in that 1 degree latitude bin
- This results in a better representation of across-globe relative SIF signals. With especially higher signals in at the Northern latitudes.

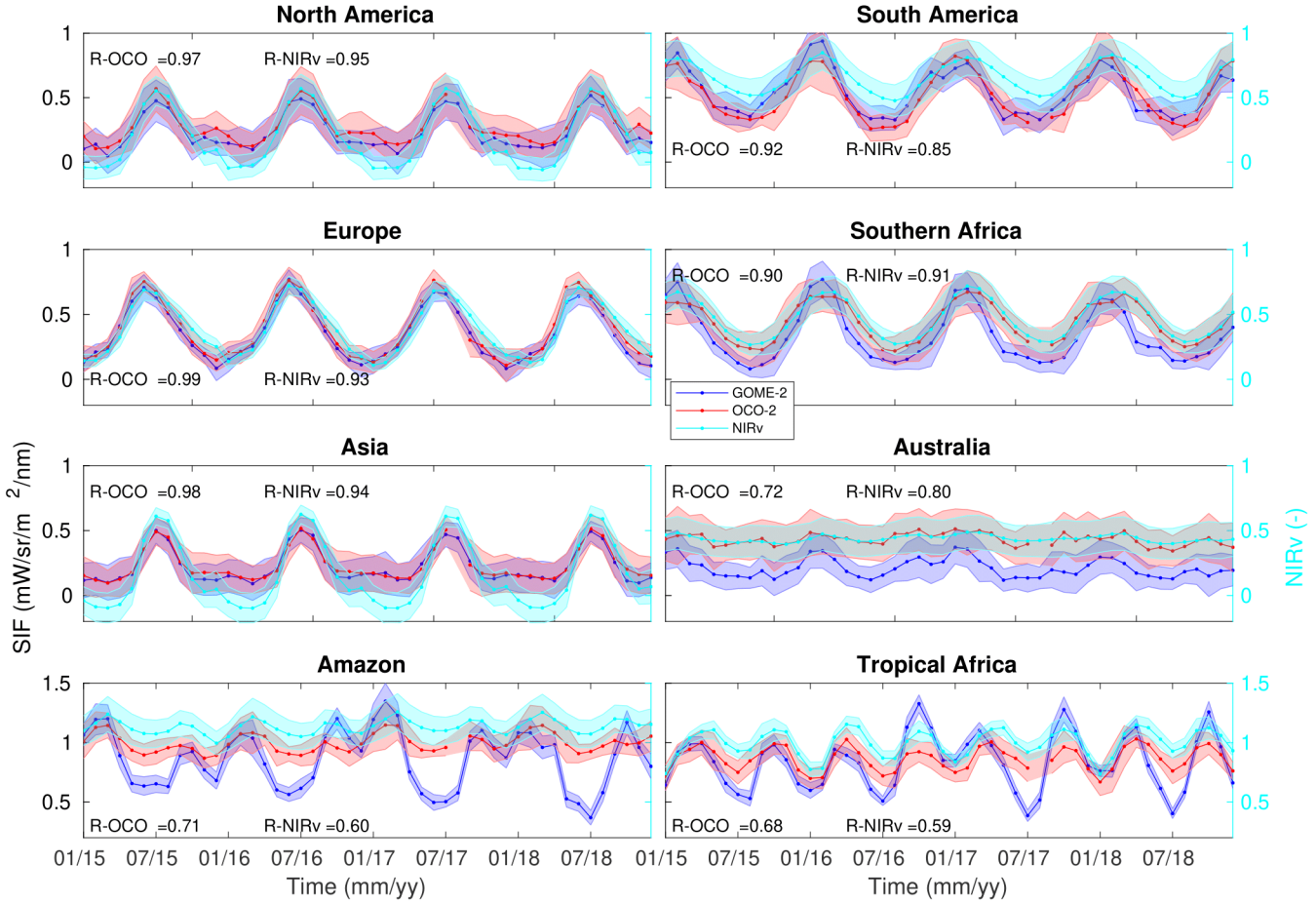


Intersatellite comparison

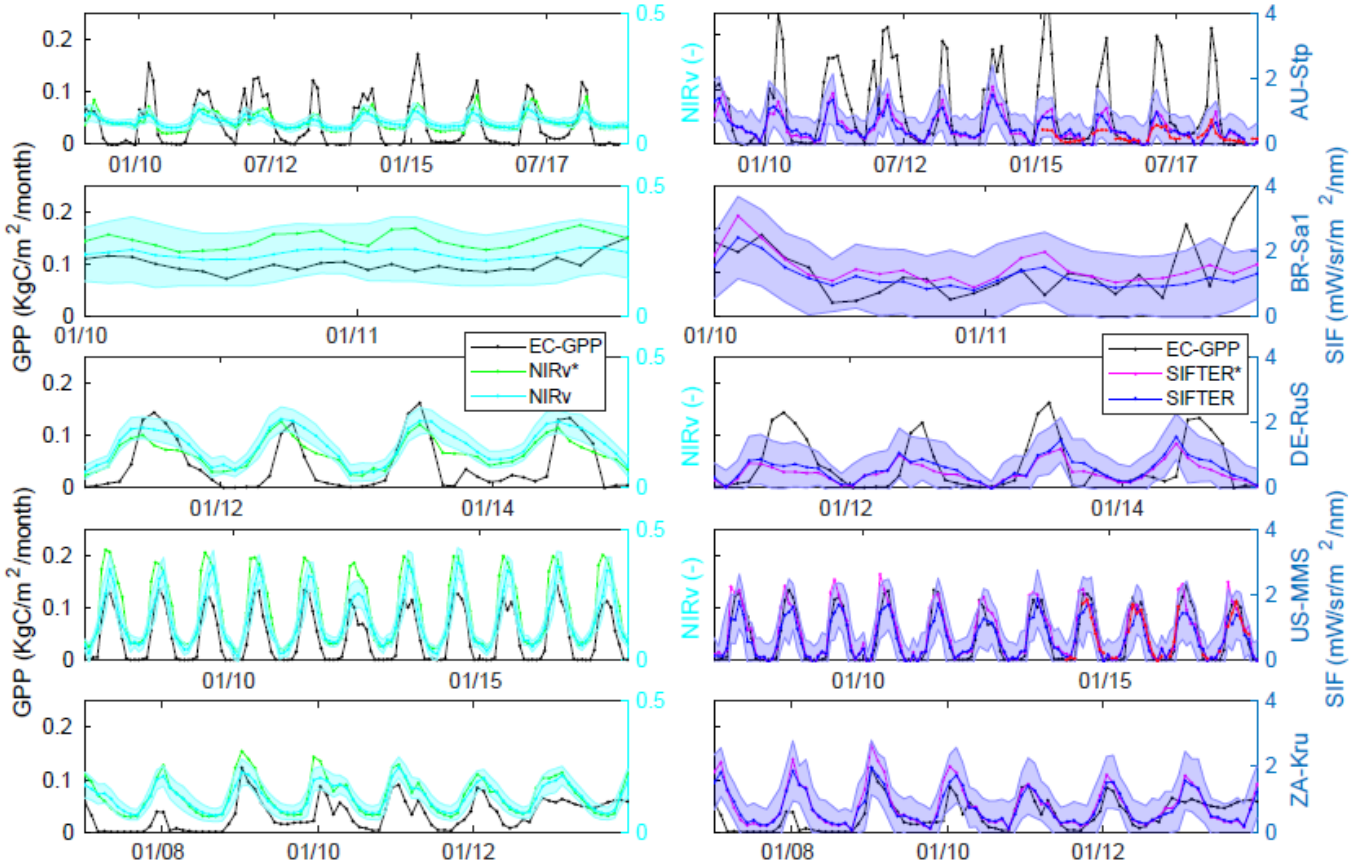
SIFTER IS COMPARED AGAINST

- OCO-2 SIF, recalculated to 737nm
- MODIS NIRv (MCDC43C4v006)
- MPI-BGC GPP
- In three regions
  - Americas
  - Europe and Africa
  - Asia and Oceania

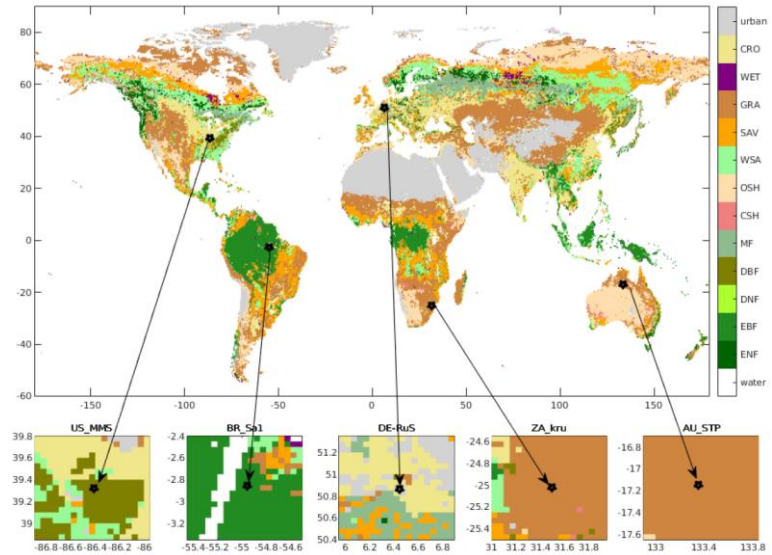
- High degree of correlation between among seasonal cycles
- SIFTER shows a clear double peak in the Amazon
- Discrepancy over e.g. Australia is likely due to the local measurement time (9:30 for GOME2 and 13:30 for OCO-2)



Comparison with flux tower GPP

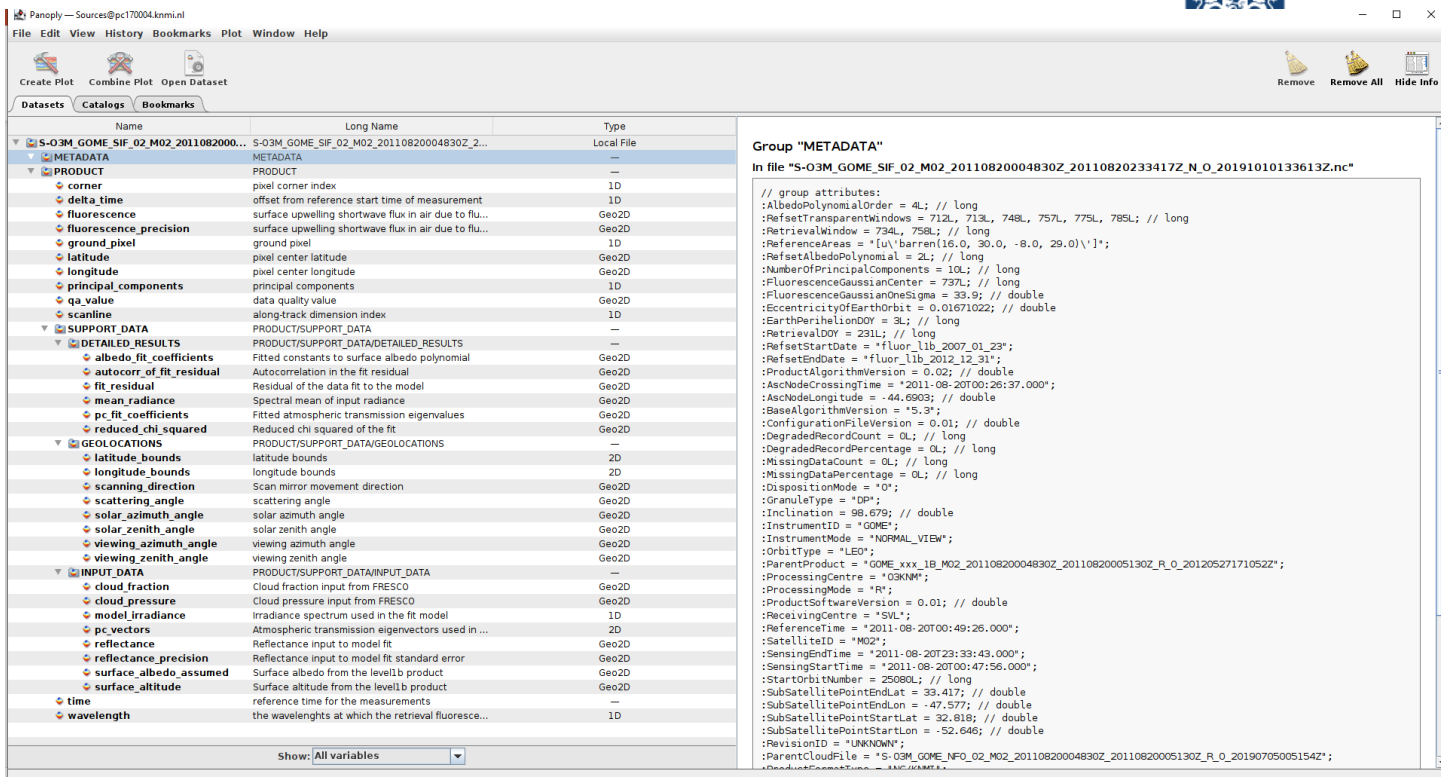


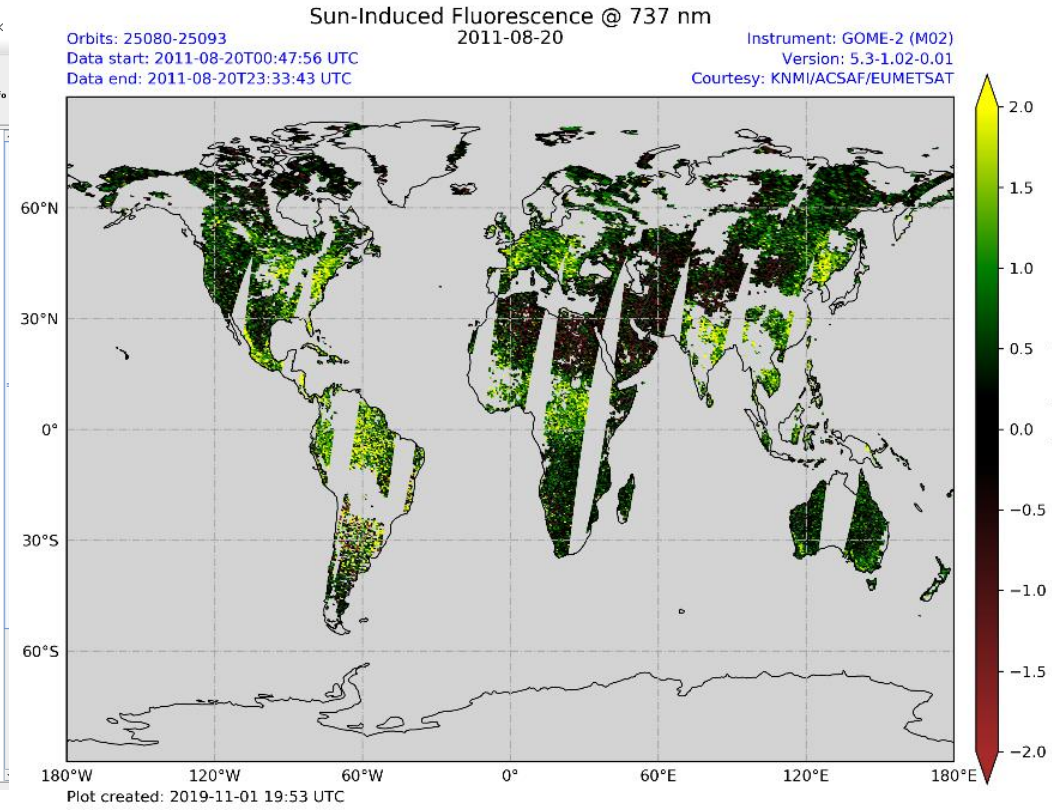
Flux tower locations



Site_ID	Site_Name	Country	Veg. Type	Lat. (°N)	Lon. (°E)	Period
AU-Stp	Sturt Plains	Australia	GRA	-17.15	133.35	01-'08 12-'18
BR-Sa1	Santarem-Km67-Primary For.	Brazil	EBF	-2.86	-54.96	01-'00* 12-'11
DE-RuS	Selhausen Juelich	Germany	CRO	50.87	6.45	01-'11 12-'14
US-MMS	Morgan Monroe State For.	USA	DBF	39.32	-86.41	01-'99* 12-'17
ZA-Kru	Skukuza	South Africa	SAV	-25.02	31.50	01-'00* 12-'13

- SIFTER* = SIFTER at NIRv resolution using a NIRv 0.5 to 0.05 degree scaling factor.
- Allows for high spatial resolution comparisons including sub-pixel land cover heterogeneity
- Scaled sub-pixel SIFTER product shows significant better relation with the Flux tower GPP.





Please visit ***http://temis.nl/surface/sif.html*** and try out the GOME-2 SIFTER product!

Feedback is very welcome. Thank you.