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/surface/sif.html)
Retrieval improvements (1)

DEGRADATION CORRECTION

- A degradation is found in the GOME-2A reflectance data after July 2013 when observing reference site Libya4 (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 Libya4 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 slit function 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.

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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

> SIFTER* = SIFTER at NIRy 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](http://temis.nl/surface/sif.html) and try out the GOME-2 SIFTER product!

Feedback is very welcome. Thank you.