Quality assessment of several methods to estimate Ultra-Violet from satellite imagery at two ground stations in Uruguay and France

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SoDa solar radiation data

TRANSVALOR

MINES ParisTech

How healthy is your skin?

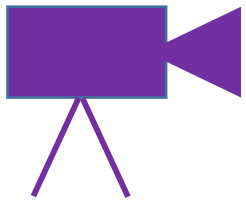
UV camera

Credits:
realites-guadeloupe

An ultraviolet camera can show not-yet-visible changes to your skin, mostly freckles

Everyone’s born with good skin pretty much (baby)

UV camera



… and it ages at different speeds

UV camera

Healthy skin is easy to spot

UV camera

Less healthy as well

Glass blocks UV

UV camera

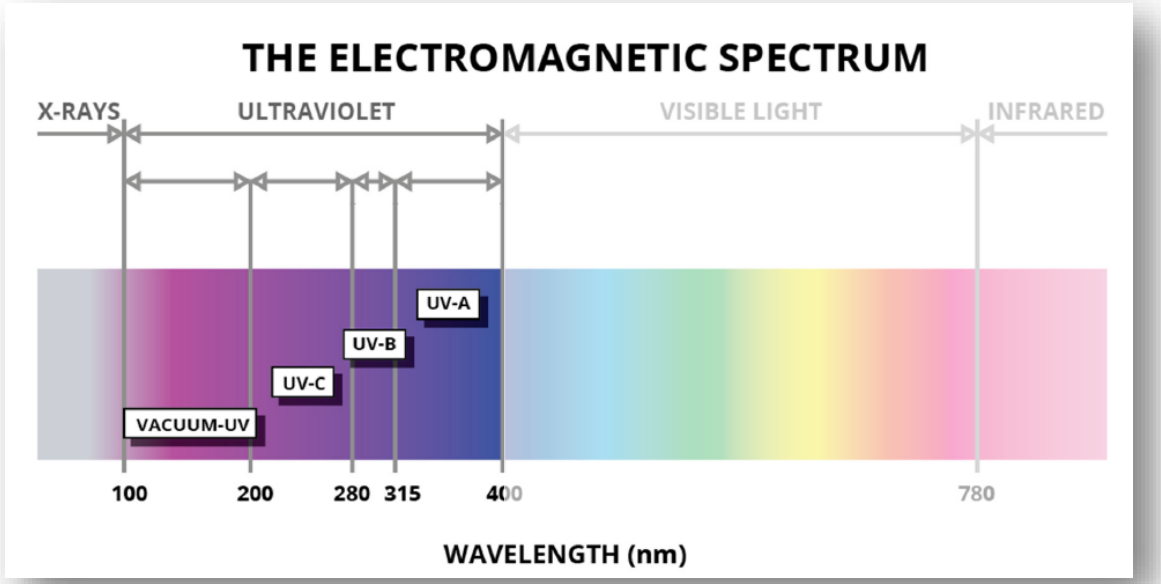
Sun screen as well

These protections can prevent your skin and eyes from severe damages

- Cataract, carcinomas or even melanomas
- UV have numerous adverse but also beneficial effects human health (positive for certain brain diseases)

- Other application fields: material ageing, algal bloom factor, or cosmetic

- UV-B: **280 - 315 nm**
- UV-A: **315 – 400 nm**



(www.soda-is.com) is:

- Approx. 4000 emails every year to access solar radiation data and related products.
- Among these requests: Frenck Ministry of Public Health. *Correlation between the numbers and locations of severe melanomas against intensity of UV exposure before the date of declaration of the desease in the national database.*

⇨ Need a perfect knowledge of archived UV

- Other Request: French start-up, solar phone app

⇨ Real time for wired beauty solar app

Question: how can we provide the most accurate service?

TRANSVALOR

SoDa
solar radiation data

UNIVERSIDAD DE LA REPÚBLICA URUGUAY

ARMINES

Deutscher Wetterdienst
Wetter und Klima aus einer Hand
DWD

FMI

University of Kishinev
Moldova

MINES ParisTech

University of Reading

Recapitulative scheme of this analysis

Methods to assess UV-B and UV-A from satellite

Wald | Weighted_Kato | Discretized_Kato

HelioClim-3 version 5 (HC3v5)

CAMS Radiation Service (CAMS Rad)

DWD SARAH-3

FMI CAMS UV

Ground measurements

Their quality is assessed against:

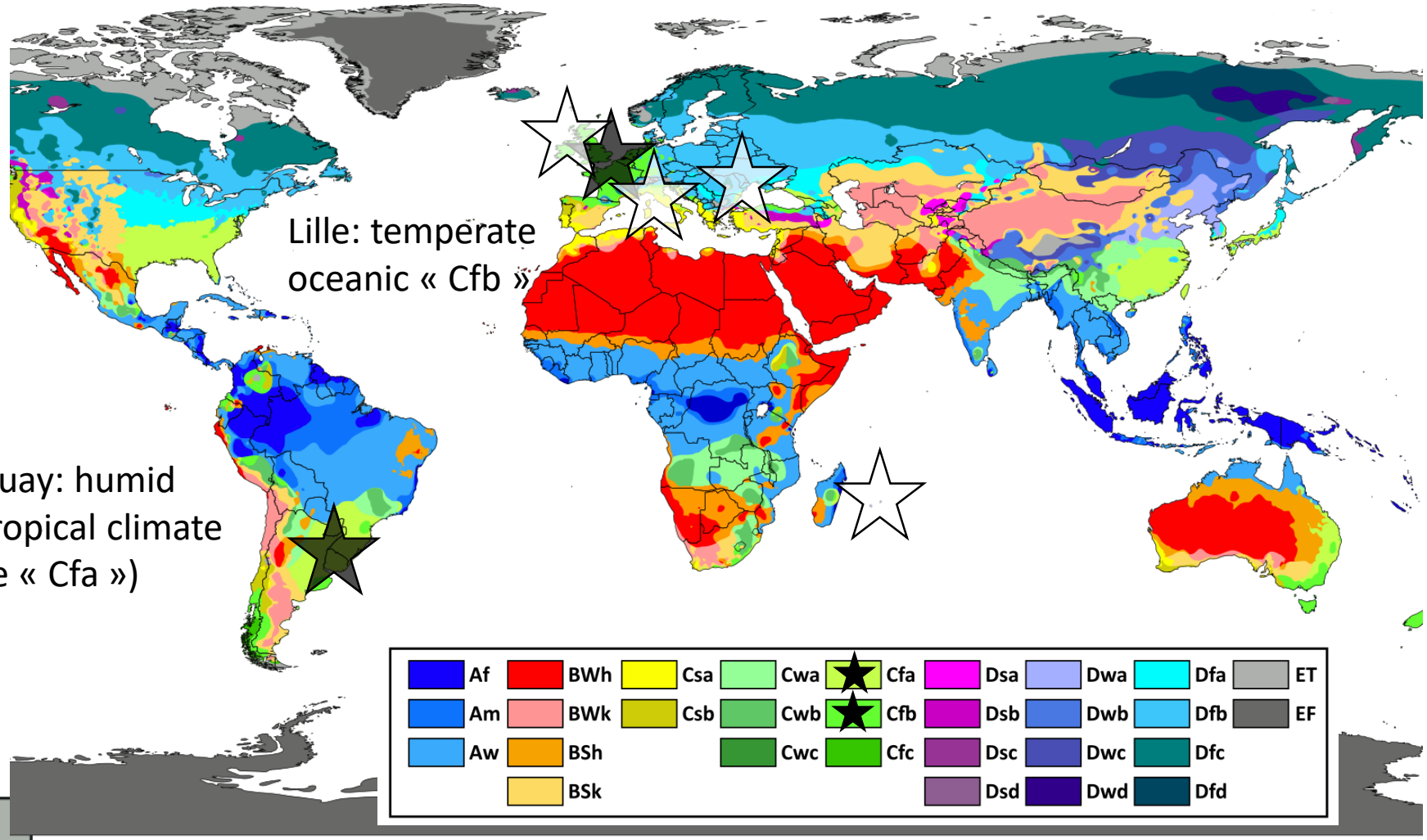
Montevideo
- Uruguay-

Kipp & Zonen UV-B and UV-A radiometers with controlled temperature

Lille
- France -

Spectrometer 280-450 nm => 15 min UV-B and UV-A

Climates of the two sites



Reading University, UK

Observatoire de Haute Provence

University of Kishinev, Moldova

Reunion Island

+ FLUXNET and SURFRAD stations

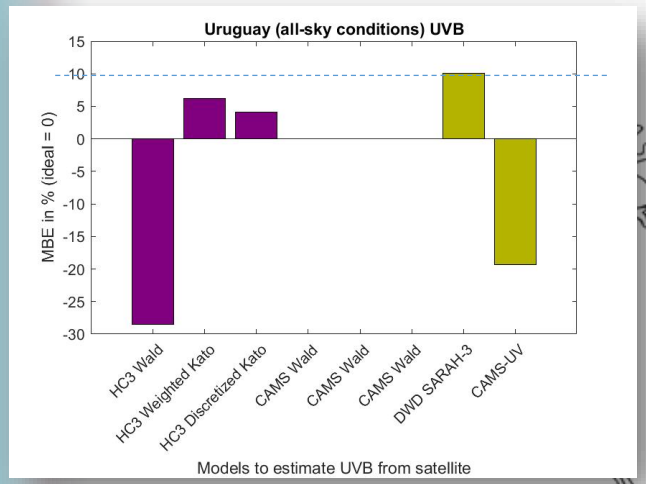
Köppen-Geiger climate classification Peel et al., 2007

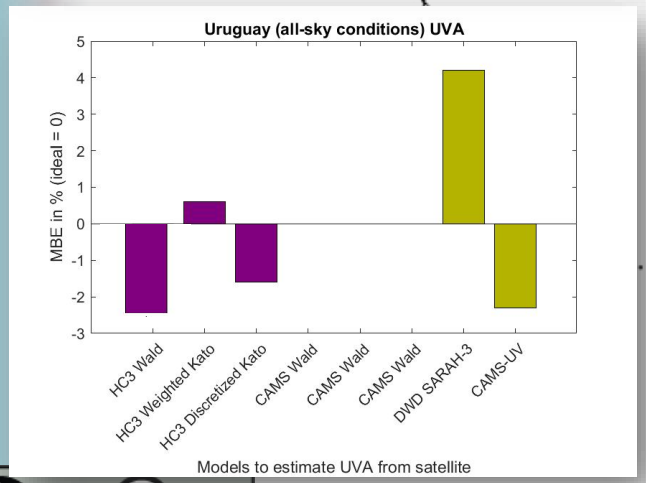
Presentation of the results

- => Note that in the UV-B range values are very low, and consequently small discrepancies can cause high relative biases and standard deviation in percent

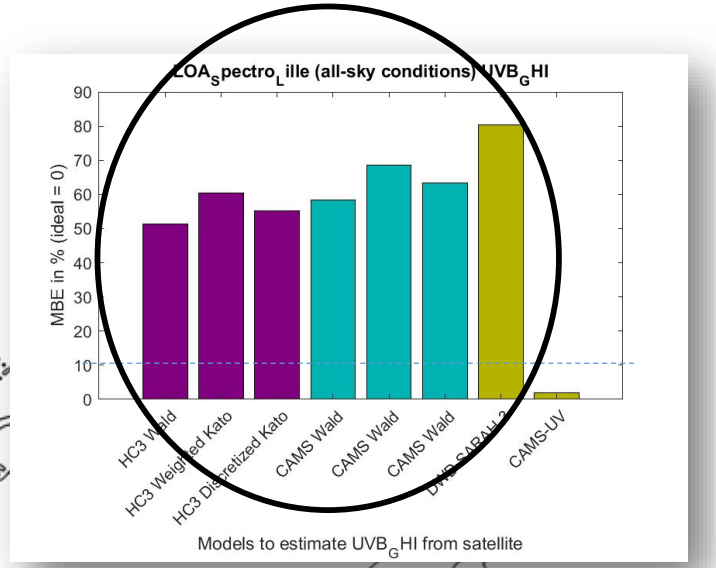
Biases

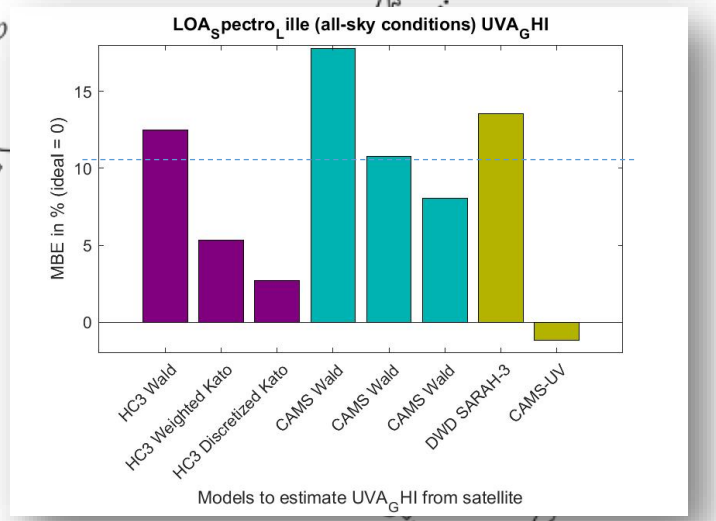
=> Better results for both ranges for the Uruguayan location, all methods except CAMS-UV





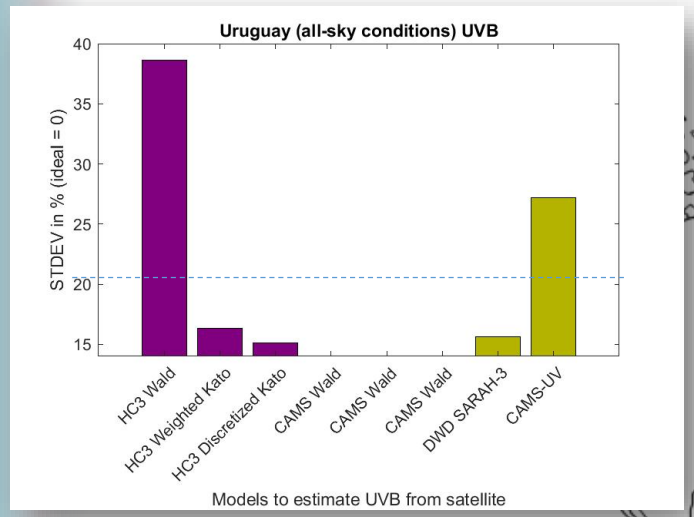
10 % of relative bias

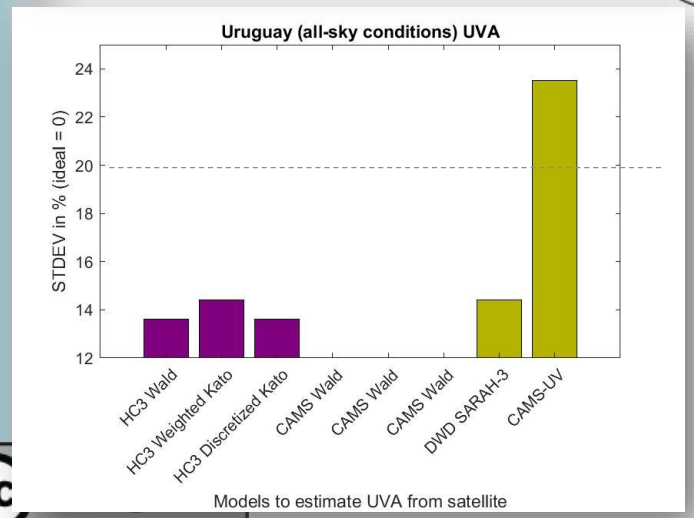


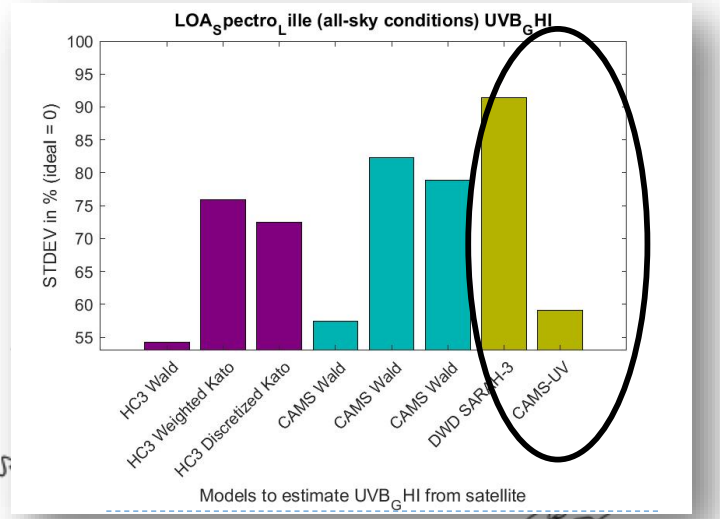


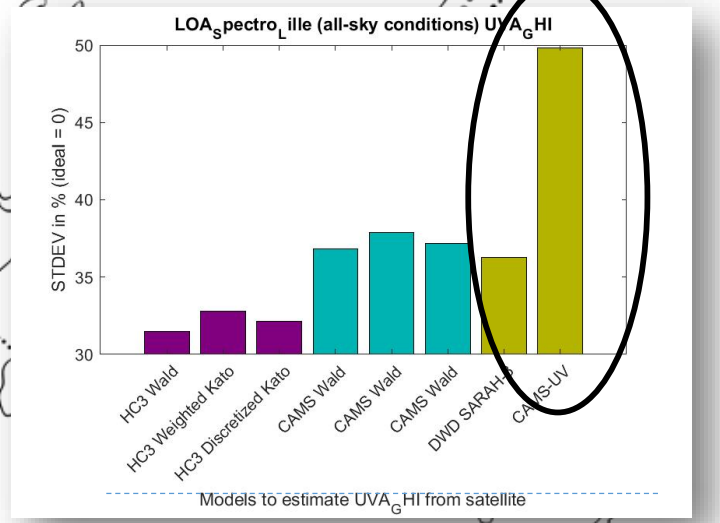
Lille: Overestimation for almost all methods but CAMS-UV, in particular for UV-B

Standard deviation







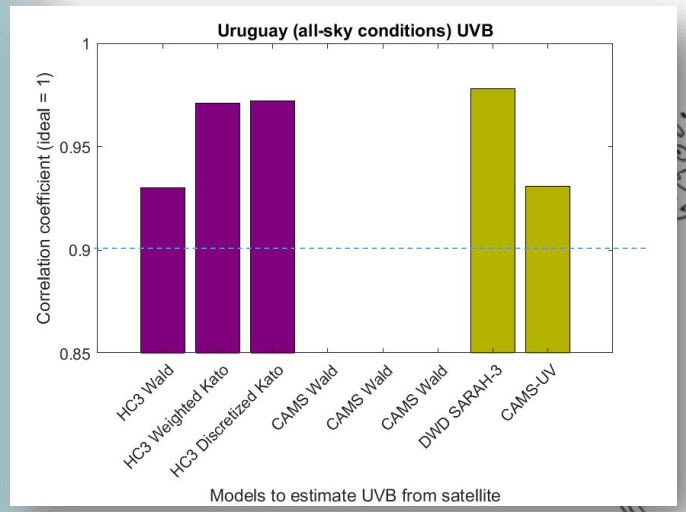


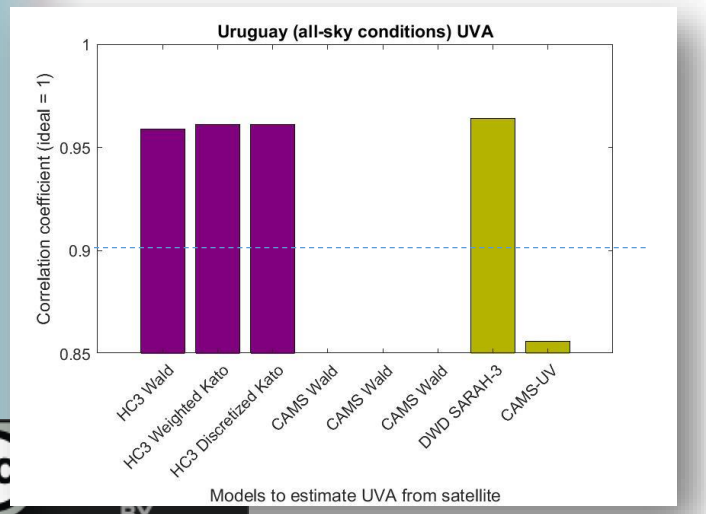
20 % of relative standard deviation

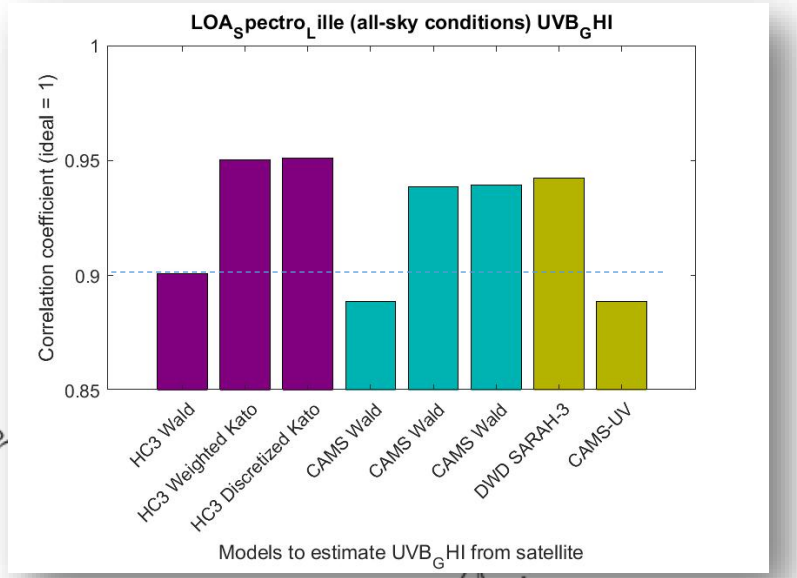
⇒ Almost all standard deviation values in the UV-A range are double at Lille compared to Uruguay

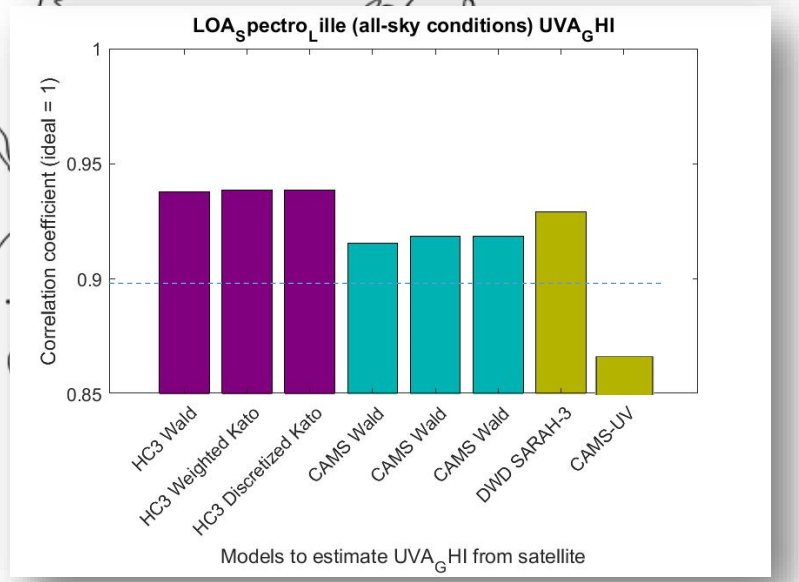
⇒ Even more significant for UV-B

Correlation coefficients





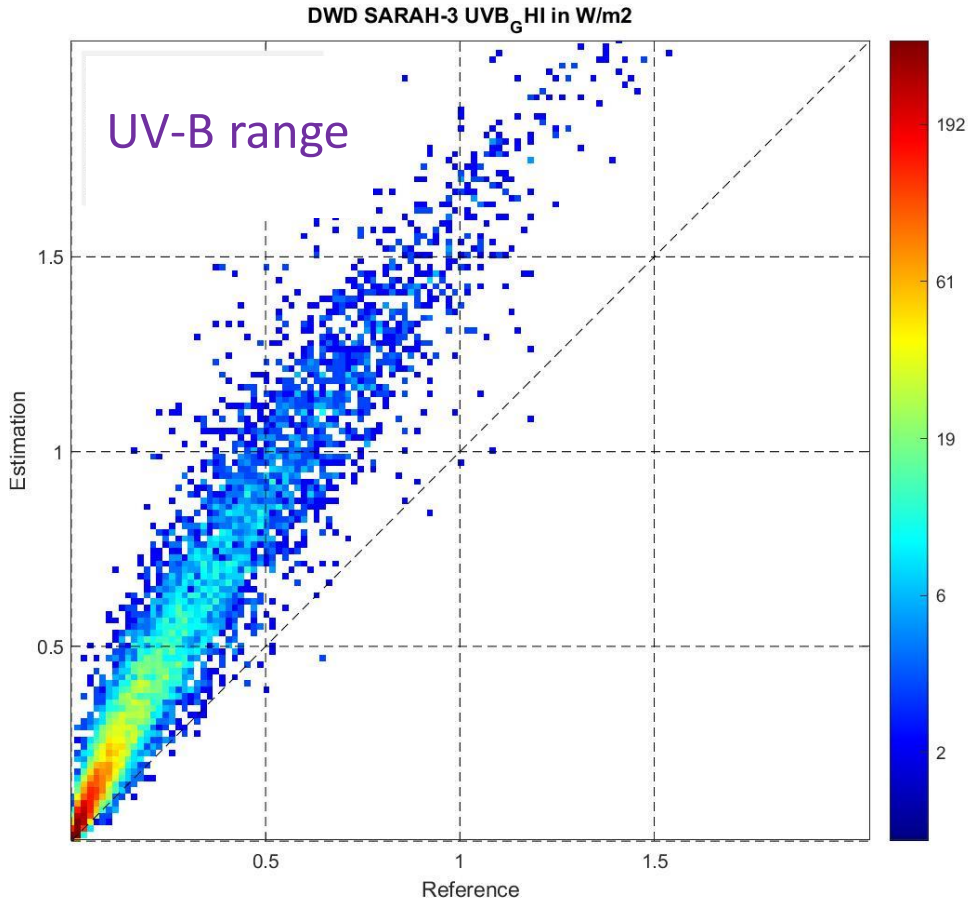


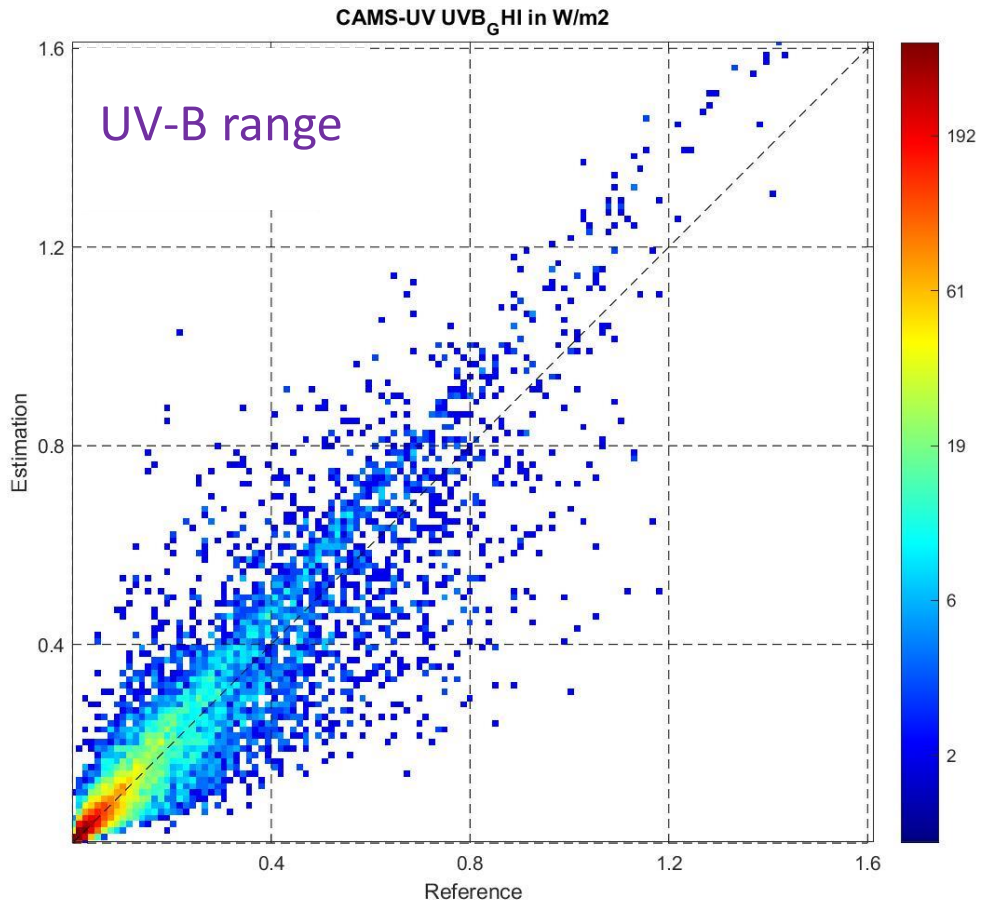


0.9 correlation coefficient

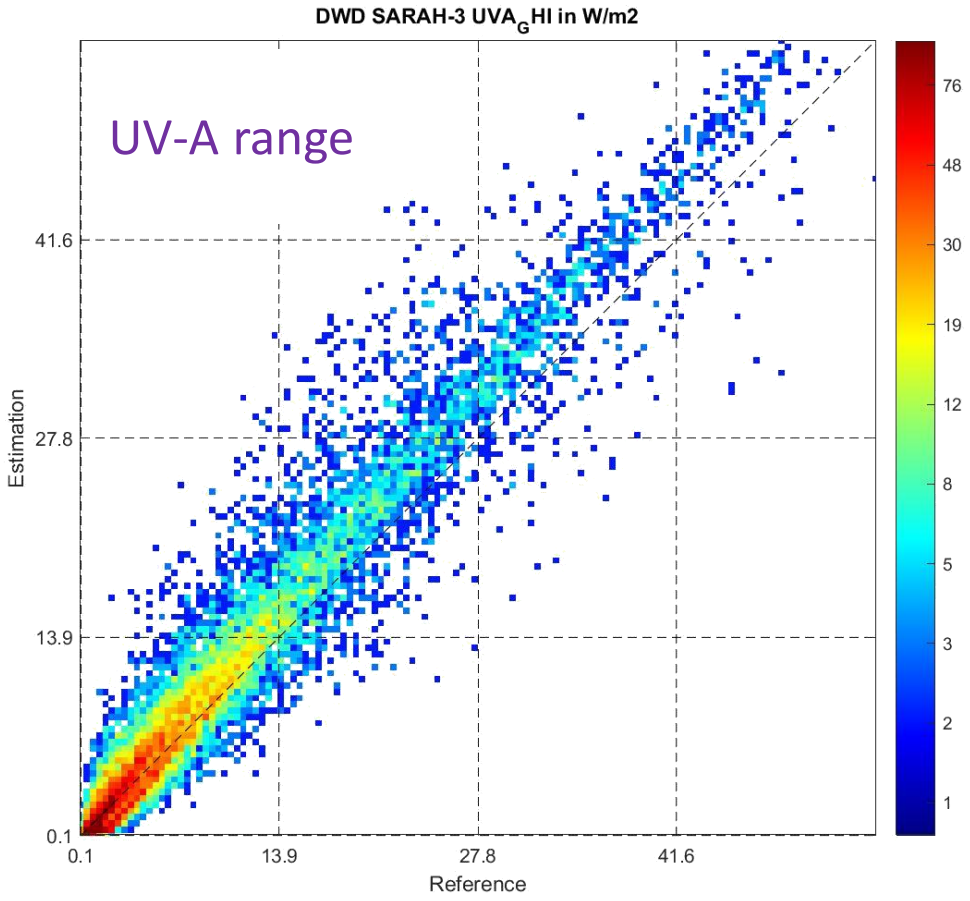
=> Good correlation for both sites, all methods and both spectral ranges (>0.84)

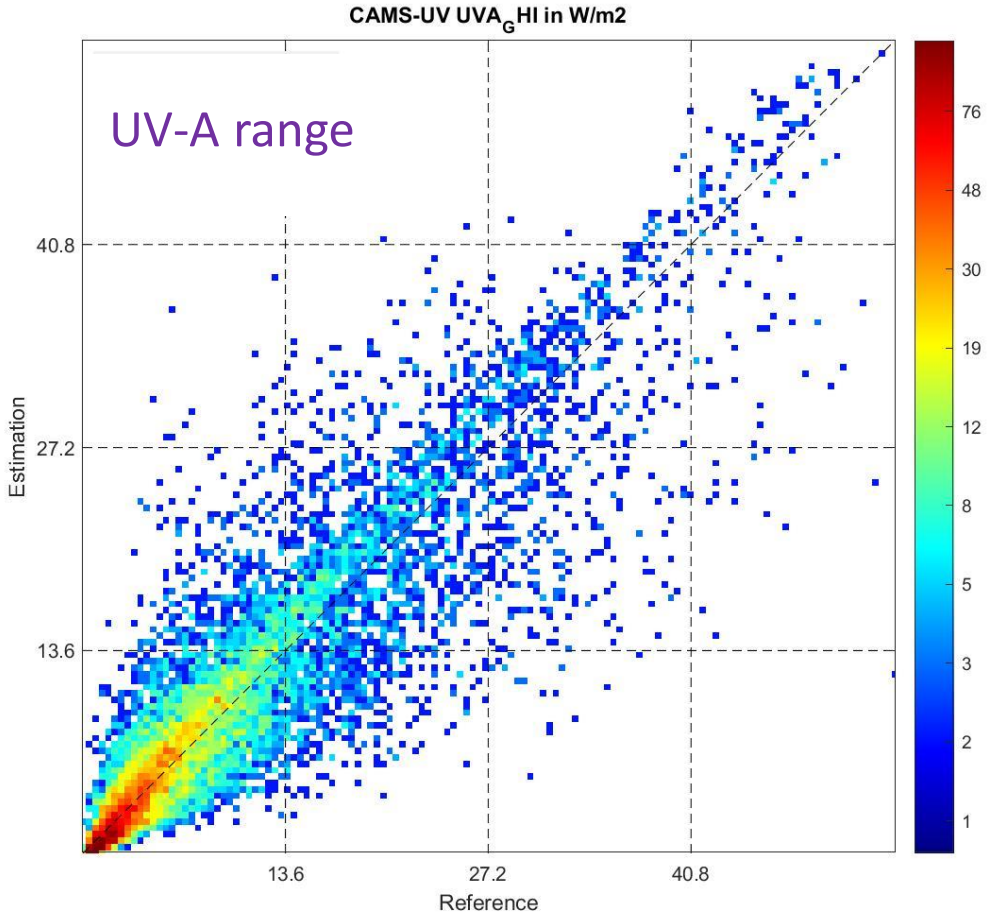
DWD SARAH-3 and CAMS-UV 2D histograms





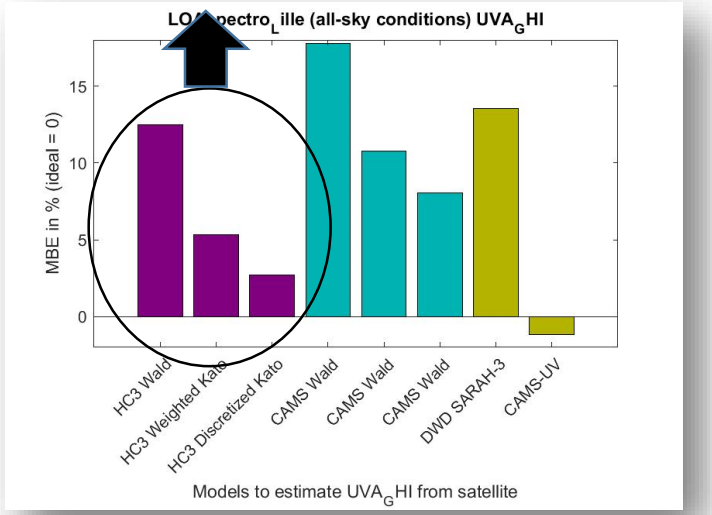
DWD SARAH-3 and CAMS-UV 2D histograms





Additional comments

- Overestimation of CAMS Rad methods compared to HC3 ones. In line with previous publications (potentially corrected with APOLLO-NG)



- Need to process more sites in order to investigate if these observations (overestimation for Lille site – temperate oceanic climate) can be generalized to other similar climates, or if it is just a problem of implementation in my benchmarking architecture.

- If you wish to know the performance of your own method to derive PAR from satellite,
- Or if you have in-situ spectral ground measurements to share to support this activity,

We would be pleased to welcome you on this boat!

Thank you

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