



Photosynthetically Active Radiation estimated from satellite imagery: quality assessment of several methods against the measurements at several locations in Europe



Speaker: Dr Claire THOMAS, SoDa Support team (www.soda-pro.com) - OSA 2.2

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EMS

European Meteorological Society



Which factors impact plant growth?

First, let me introduce you Elowan

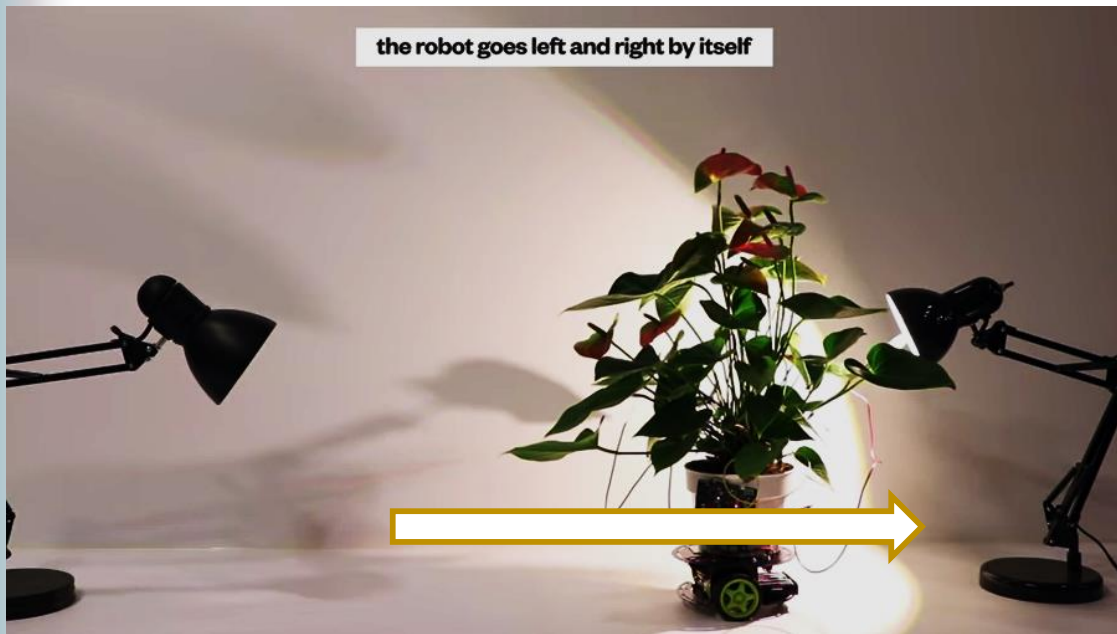


Credit:
Harpreet Sareen

They put lamps on either direction of the plant robot



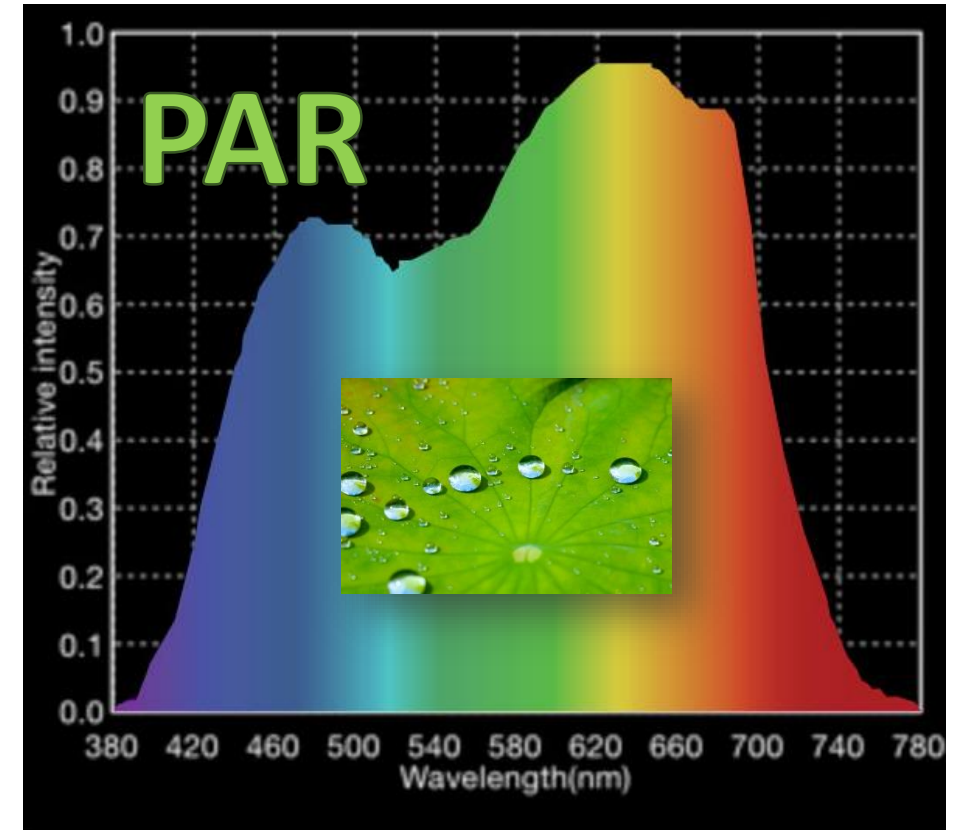
Robot plant moves toward the light, simply driven by its natural signal



<https://www.media.mit.edu/projects/elowan-a-plant-robot-hybrid/overview/>

This experience demonstrates that

- Light is one of the most important factors that trigger a response in the plant, and in particular the portion of the solar spectrum responsible for **photosynthesis processes**, that ranges in **400 – 700 nm**



PAR = Photosynthetically Active Radiation



(www.soda-is.com) is:

- Approx. 4000 emails every year to access solar radiation data and related products.

- Among these requests:



A solution is



Need a perfect knowledge of PAR, in the past and in real time

Question: how can we provide the most accurate service?



Recapitulative scheme of this analysis

methods to assess PAR
from satellite

2 Surface Solar
Irradiances

4 Skye SKP 2015 PAR
Quantum sensors

Group 1

Jacovides
(2004)

Udo et Aro
(1999)

Szeicz
(1974)

Wald
(2018)

Group 2

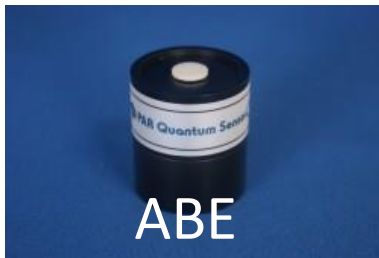
Weighted_Kato
(2014, 2018)

Discretized_Kato
(2014, 2018)

DWD SARAH-3
2019

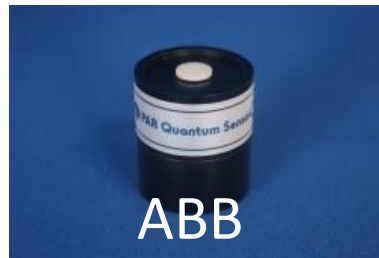
HelioClim-3 version 5 (HC3v5)

CAMS Radiation Service (CAMS Rad)



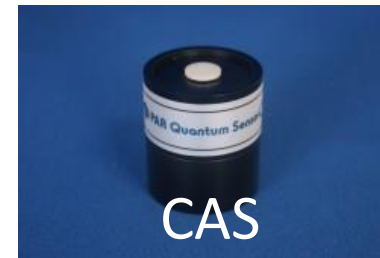
ABE

Aberystwyth University
- Wales -



ABB

Abbotts Hall
- UK -



CAS

Cartmel Sands
- UK -

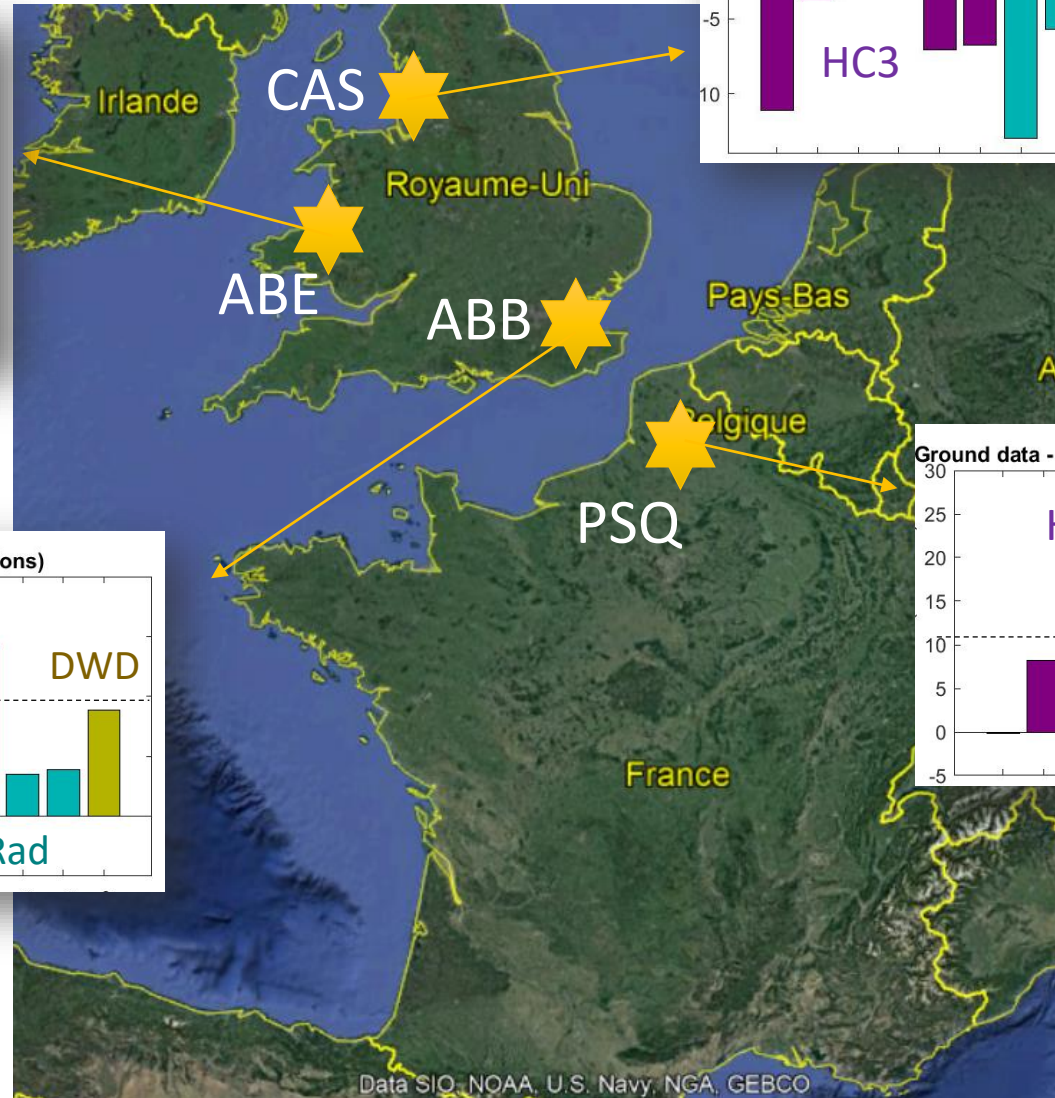
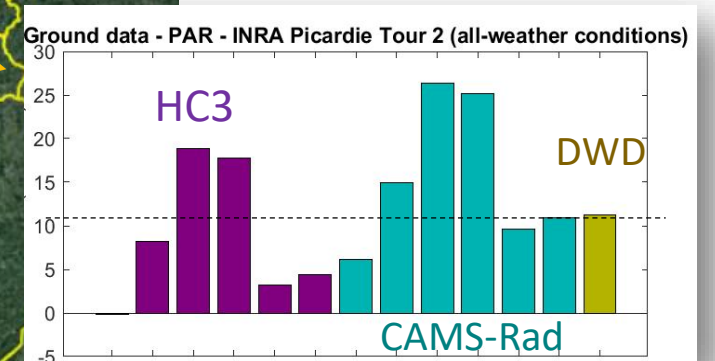
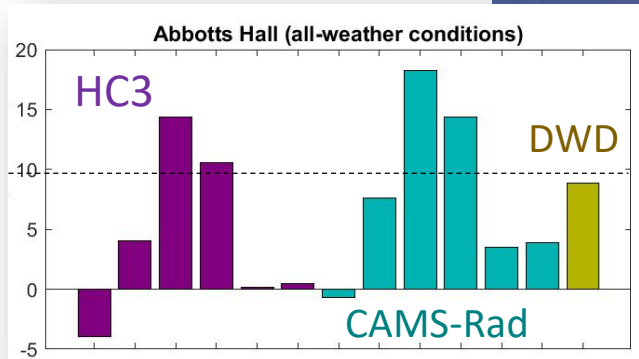
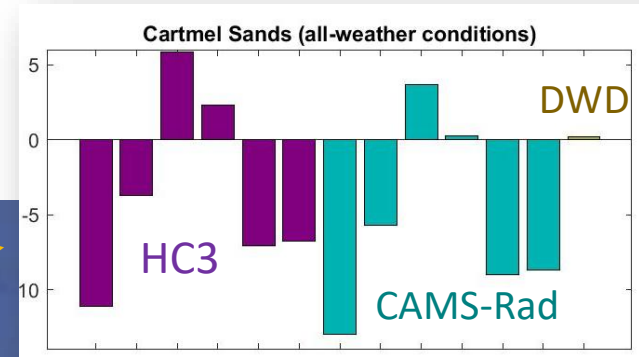
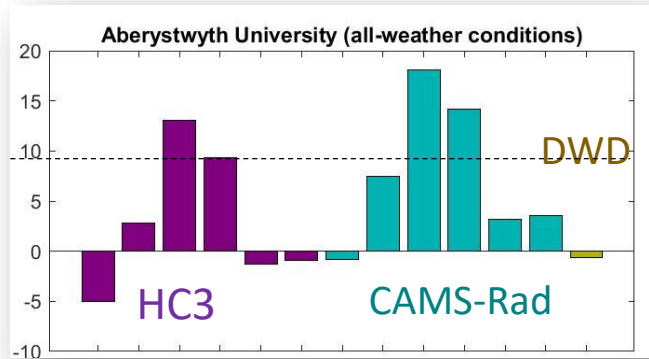


PSQ

Peronne Saint-Quentin
- FR -

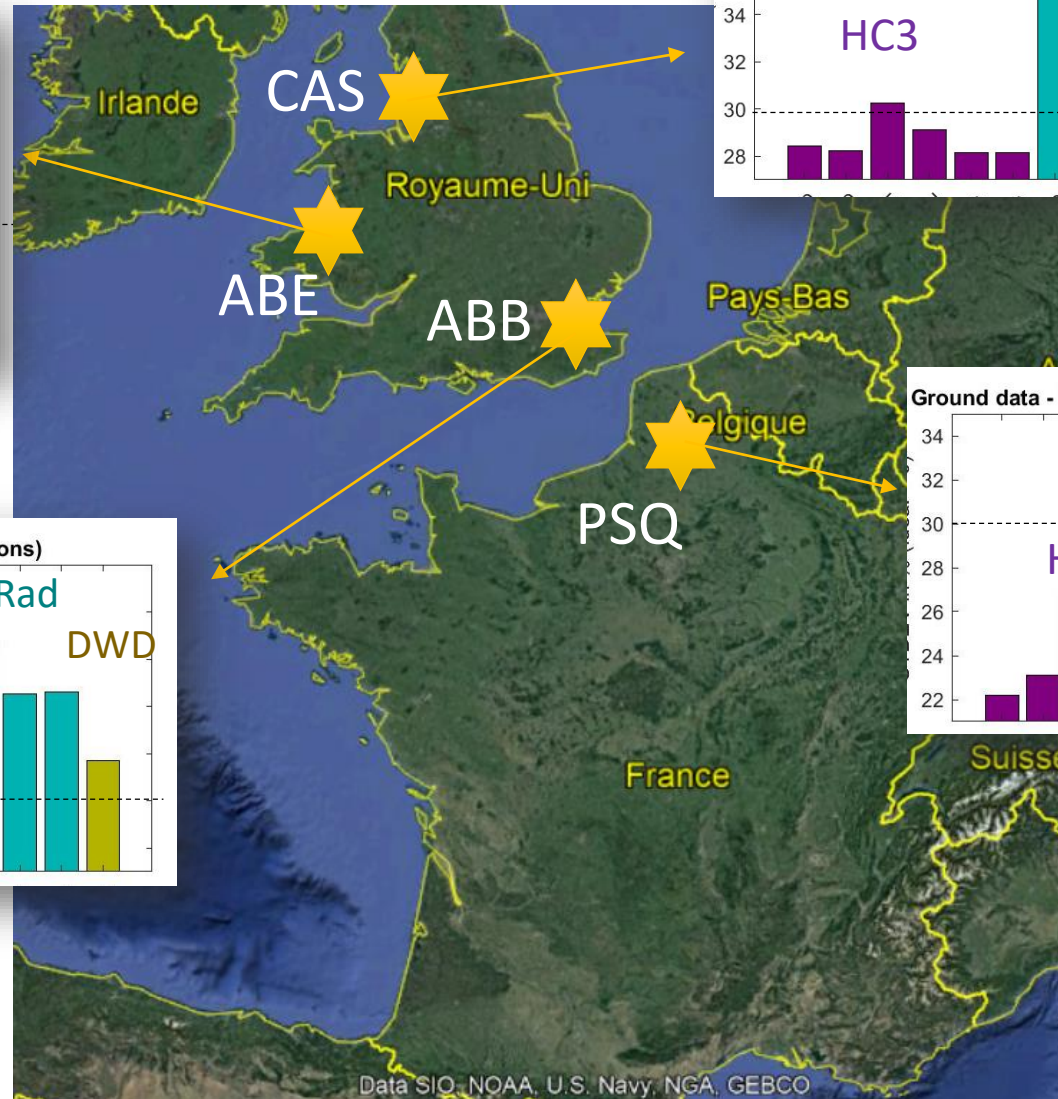
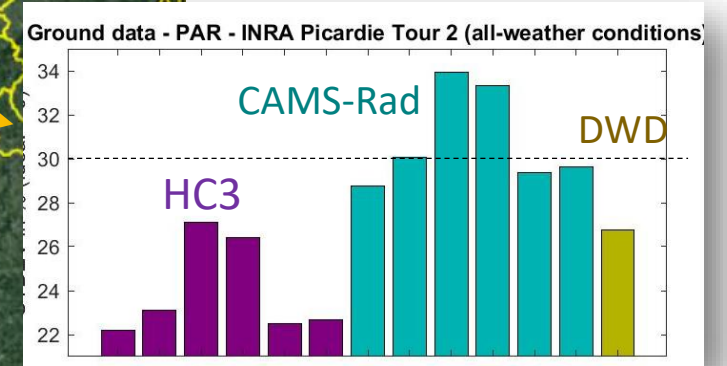
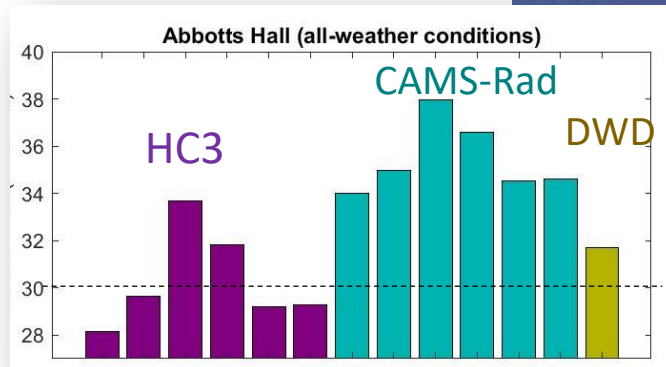
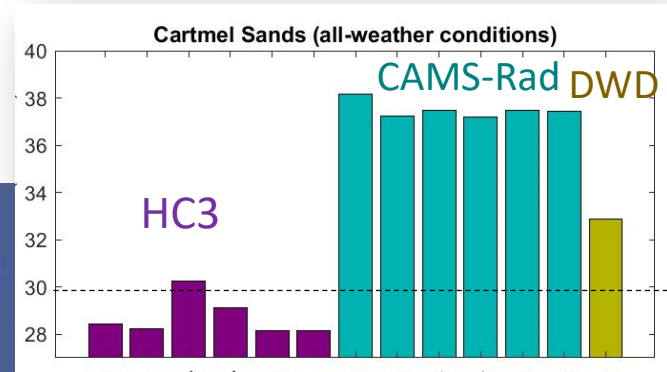
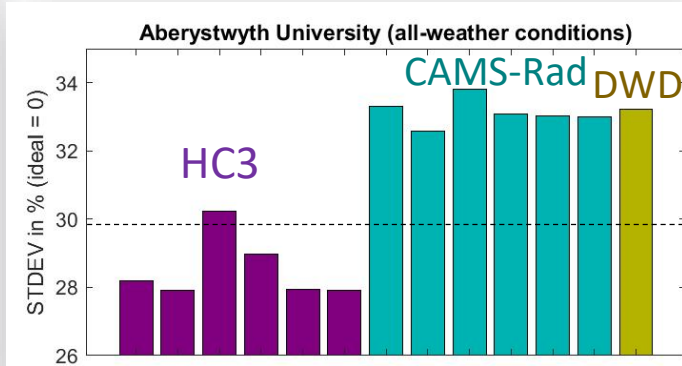
Soon also: CEDER and PSA from CIEMAT (ES), and more than 10 time series in Czech Rep.

Biases



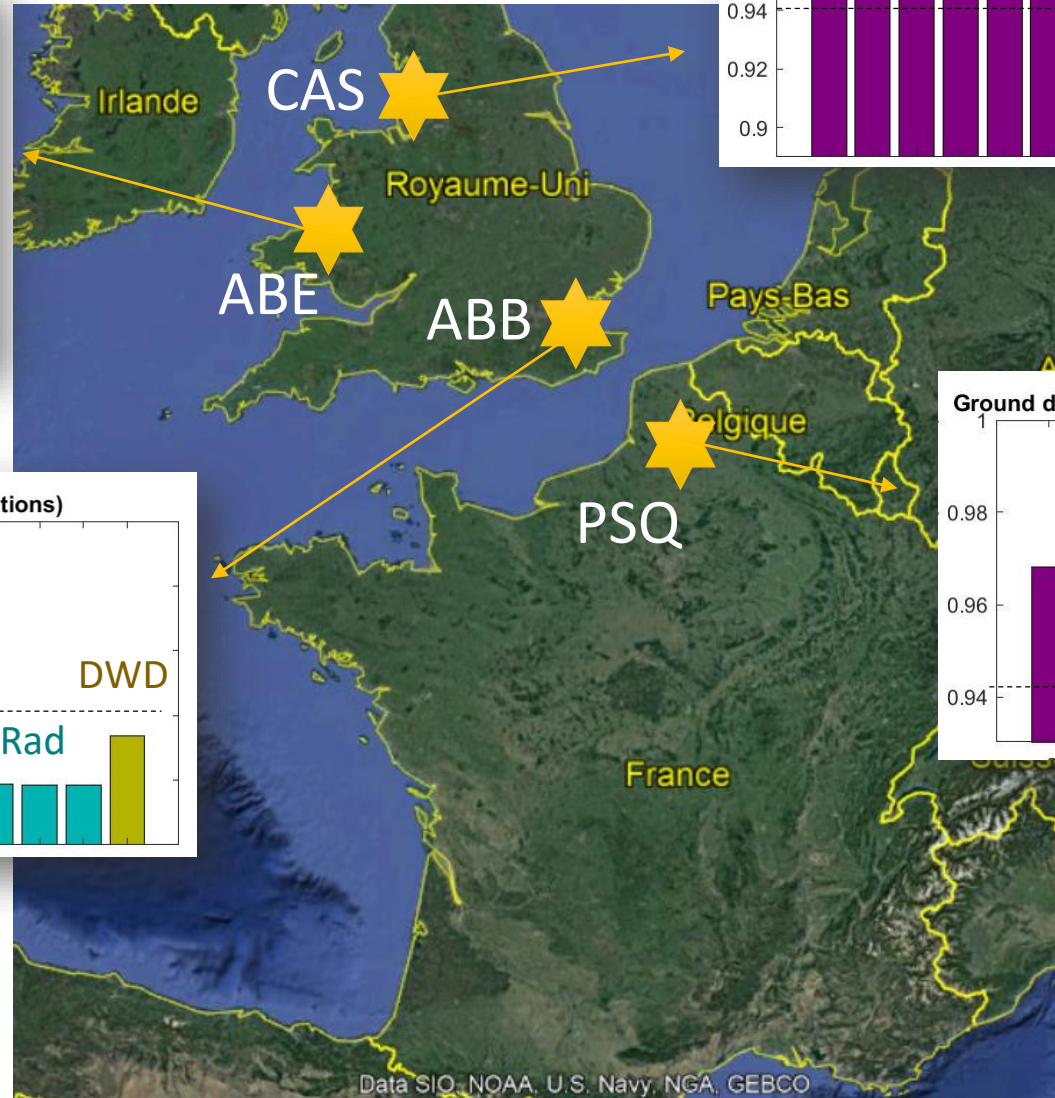
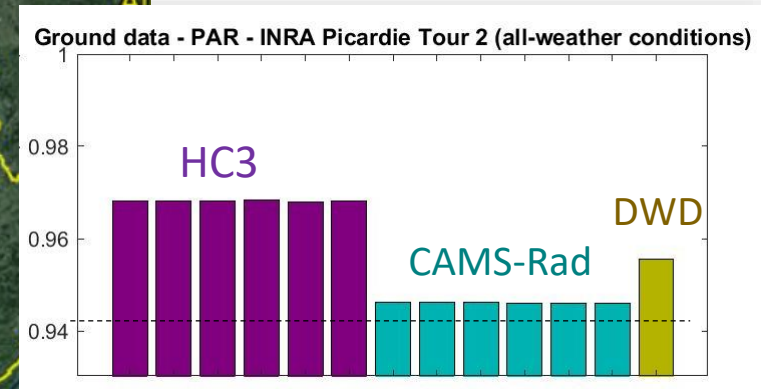
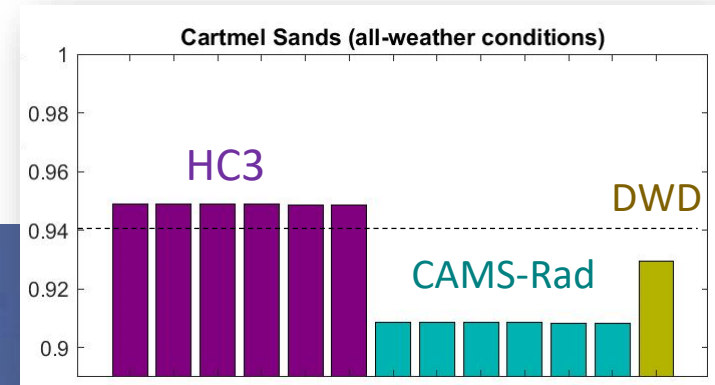
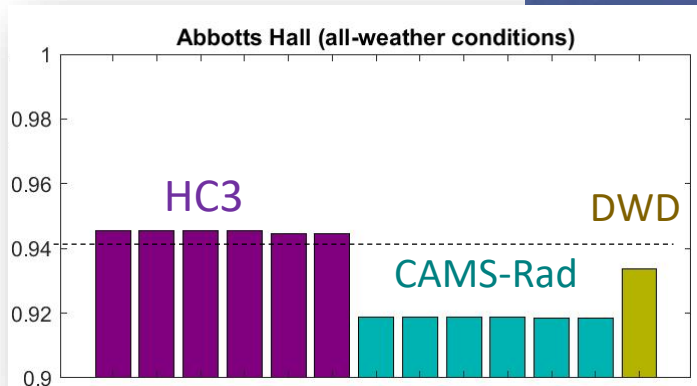
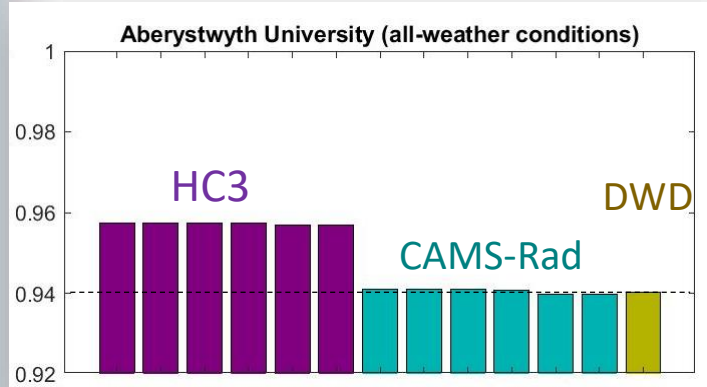
MBE = 10 %

Standard deviation



STDEV = 30 %

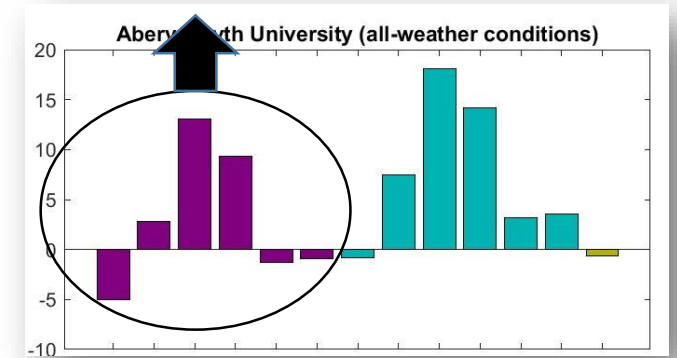
Correlation Coefficient



CC = 0.94

Additional comments

- Overestimation of CAMS Rad methods compared to HC3 ones. In line with previous publications (potentially corrected with APOLLO-NG)
- Despite their simplicity, group 1 methods give good results, and have the advantage to easily meet real time constraints, and should consequently be considered in the future.
- This version of DWD SARAH-3 PAR model shows real improvements compared to previous ones, and could now safely be considered as part of the SARAH-3 product delivery planned for 2021.



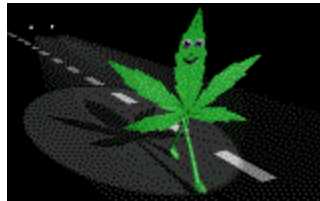
Conclusion

- 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



claire.thomas@transvalor.com