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► To cite this version:

Marie Weiss, Frédéric Baret, Alexandre Verger, Roselyne Lacaze, Didier Ramon, et al.. Near real time, global, LAI, FAPAR and cover fraction products derived from PROBA-V, at 300m and 1km resolution. Global Vegetation Monitoring and Modeling (GV2M), Feb 2014, Avignon, France. 21 p. hal-01123424

HAL Id: hal-01123424

<https://hal.science/hal-01123424>

Submitted on 5 Jun 2020

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Near real time, global, LAI, FAPAR and cover fraction products derived from PROBA-V, at 300m and 1km resolution

M. Weiss, F. Baret, A. Verger



R. Lacaze, D. Ramon, L. Wandrebeck



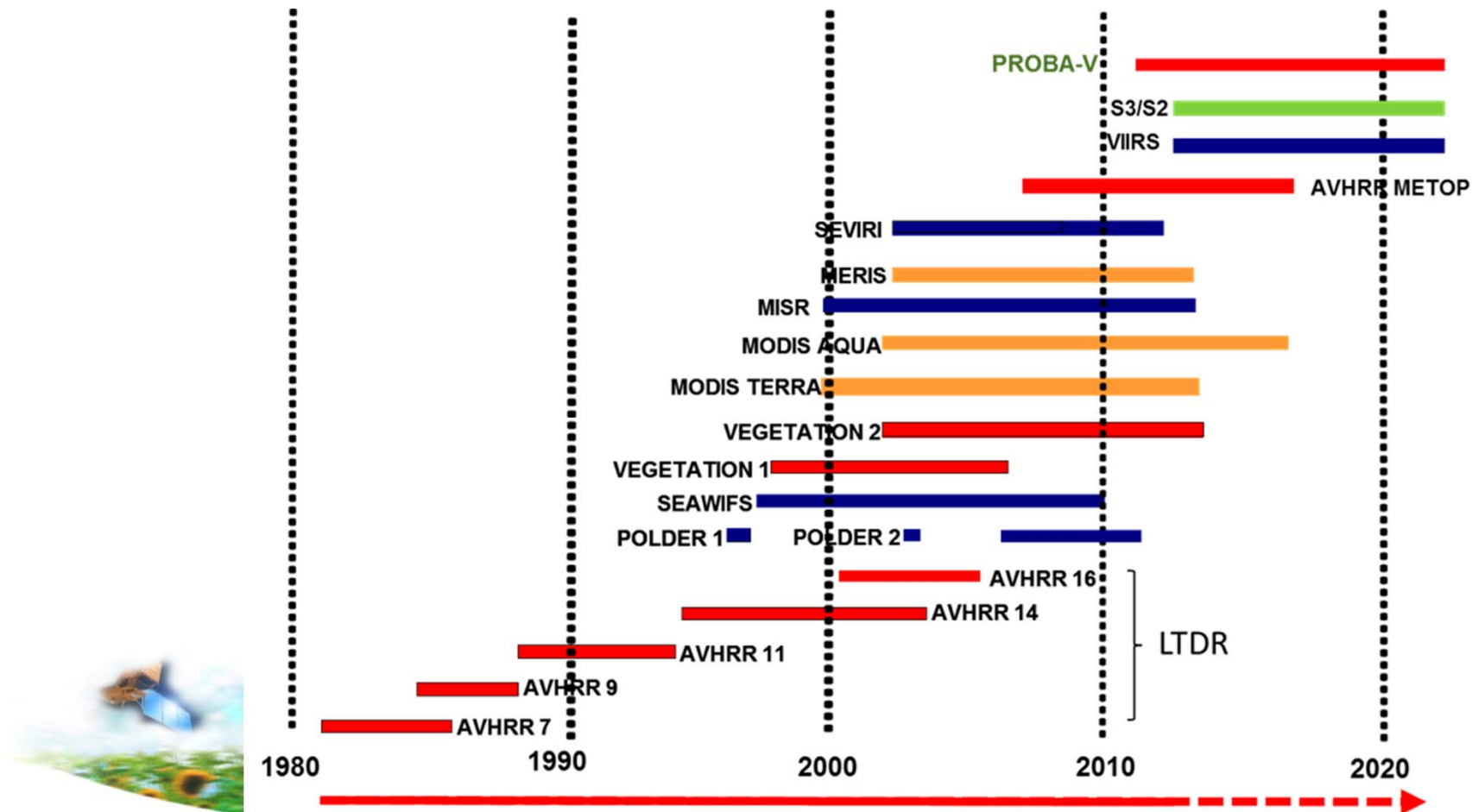
B. Smets



Context

From GEOLAND to IMAGINES:

➔ ensuring AVHRR-VEGETATION-PROBA-V Continuity
From 1981 up to now



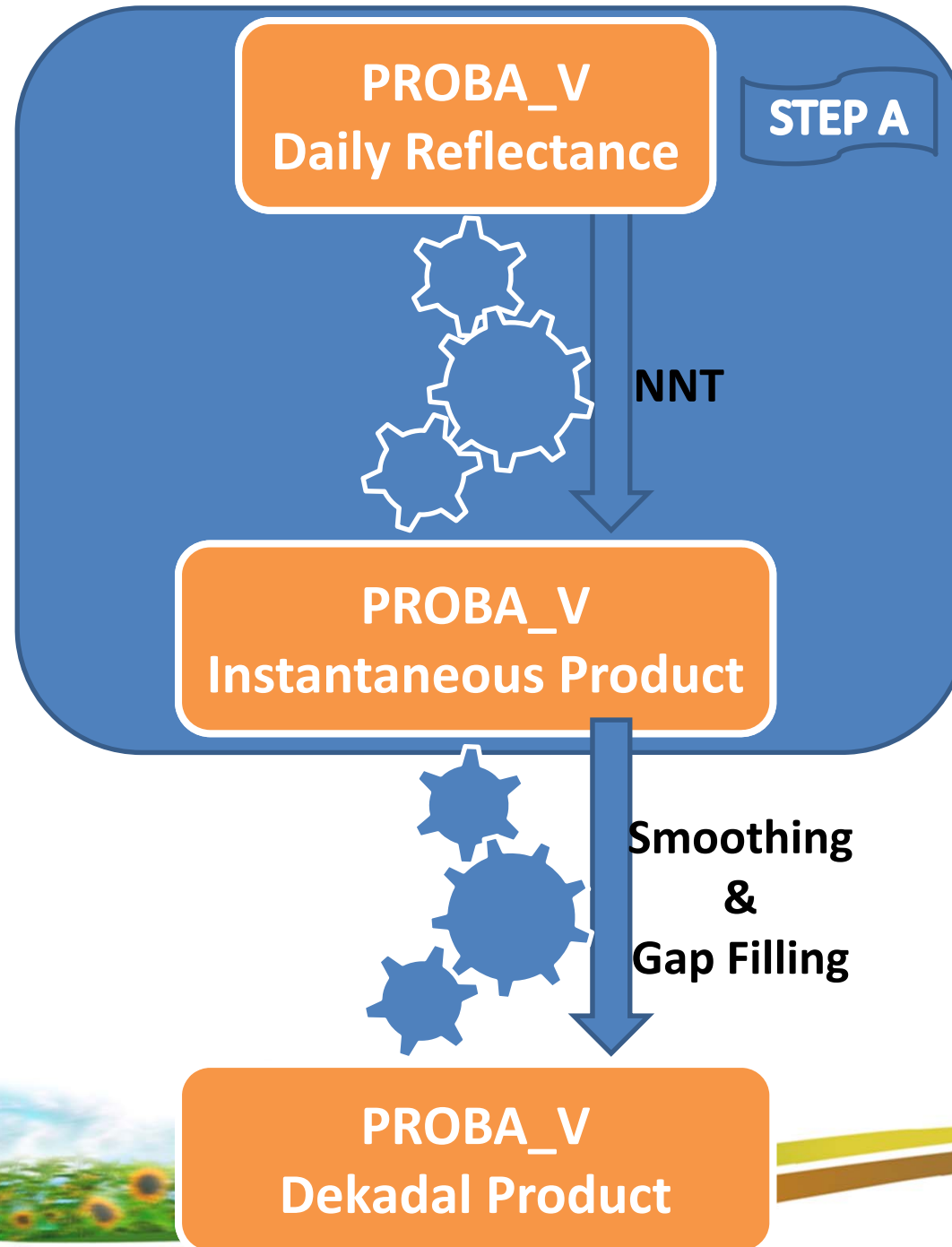
Requirements

- LAI, FAPAR, FCOVER products for PROBA-V
- 10 day frequency
- Near Real Time
- 300m resolution (PROBA-V)

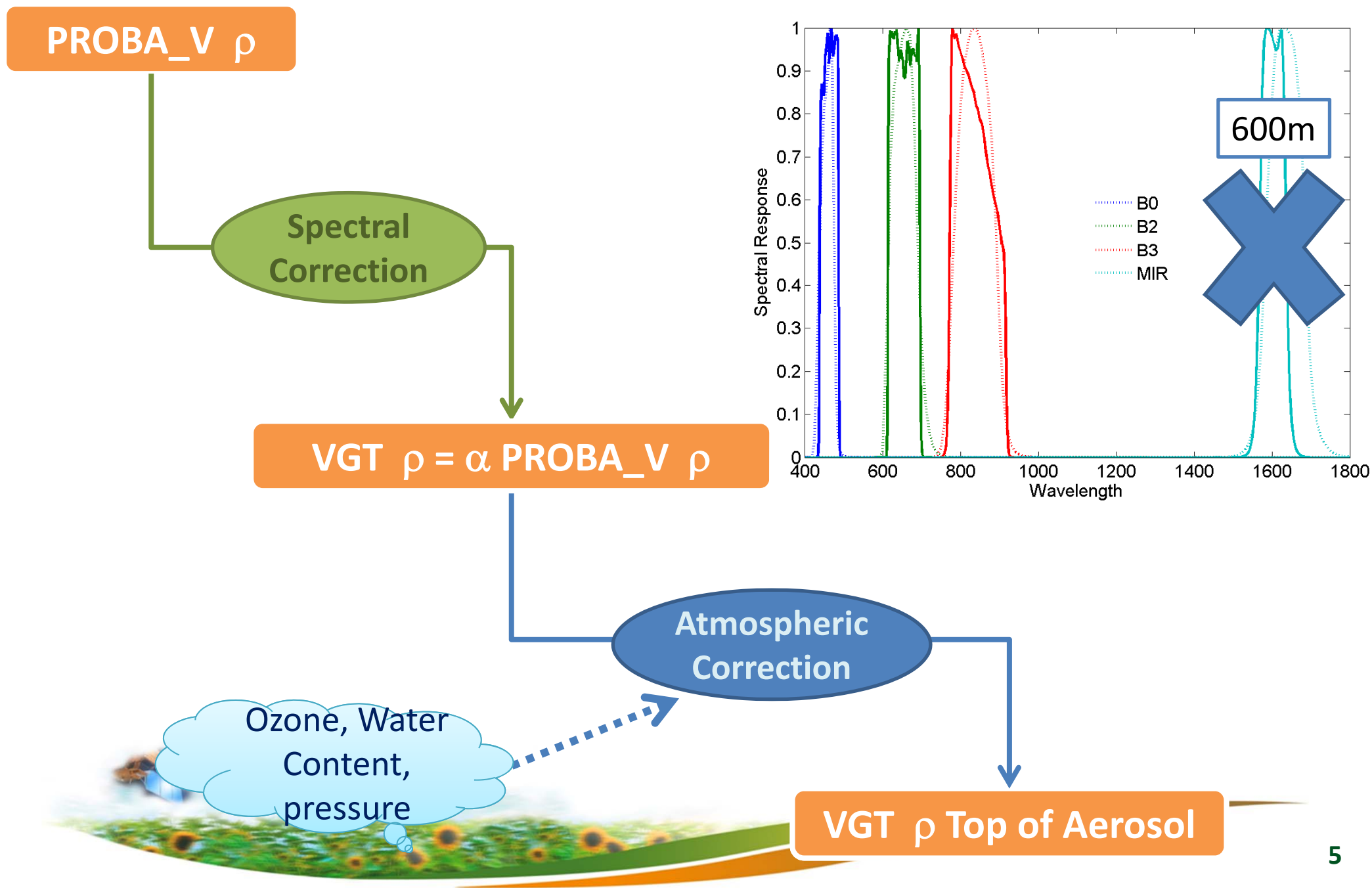
Consistent with GEOLAND (GEOV2 products) !!!



General principle

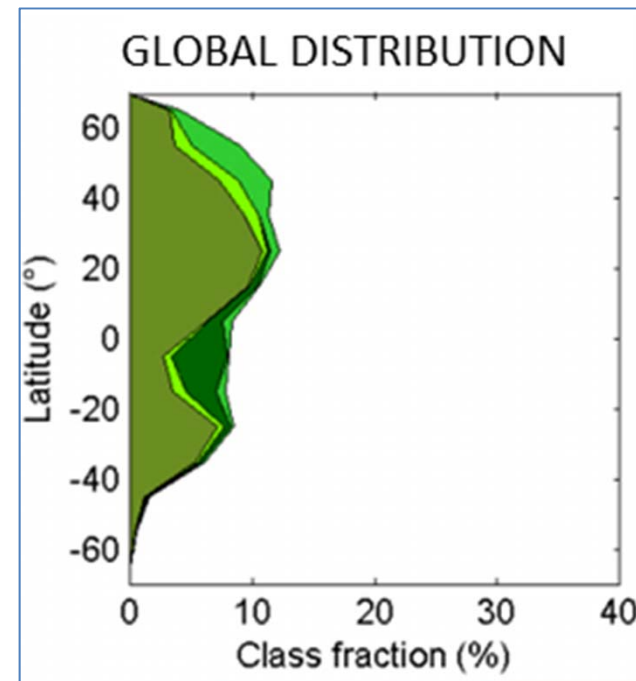
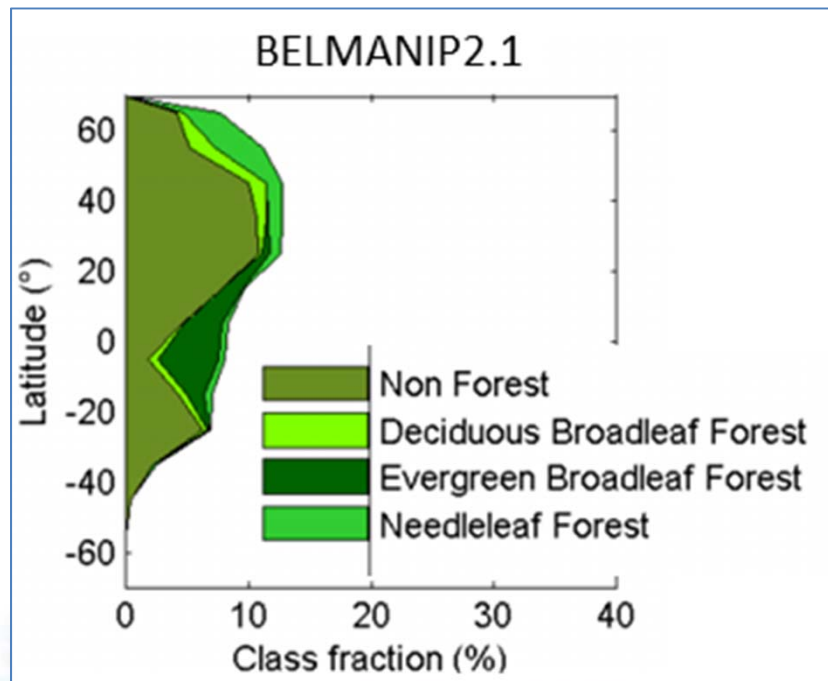


STEP A: Instantaneous Product



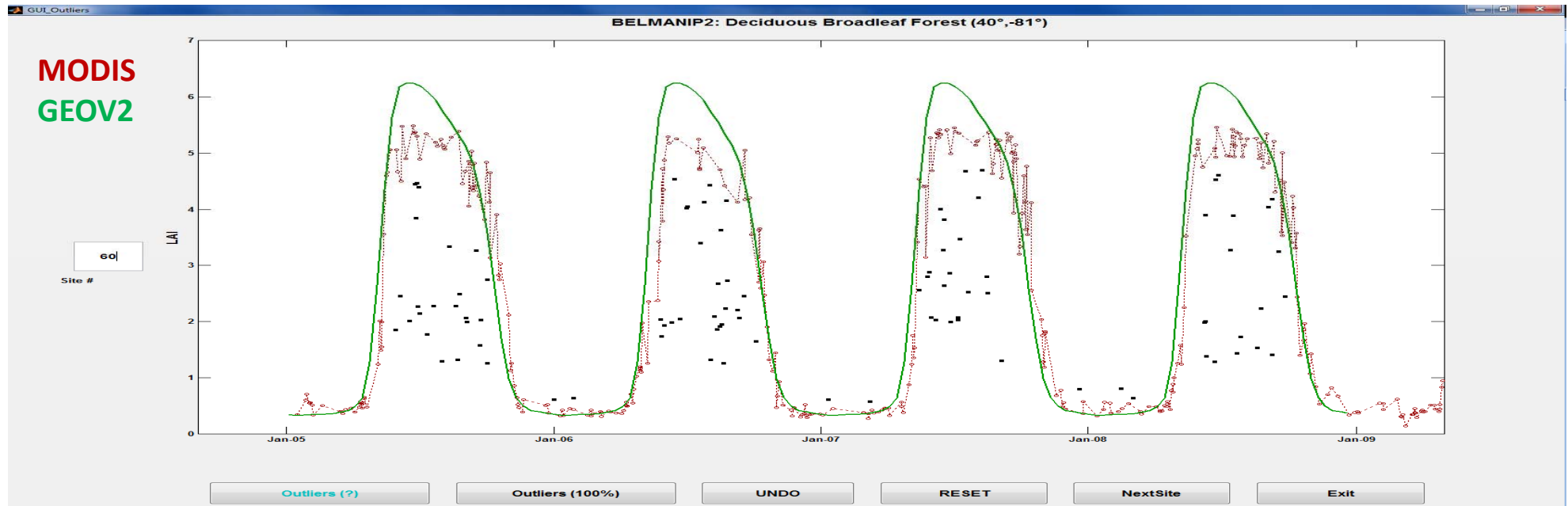
STEP A: Instantaneous Product

- Neural Networks
 - Inputs: VEGETATION Top of Atmosphere data
 - Outputs: product
 - Trained BELMANIP2.1 sites (445-3x3km²)

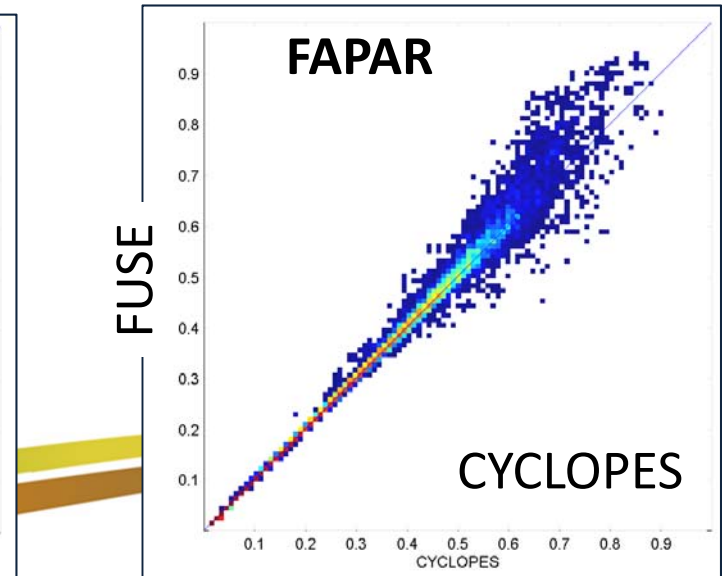
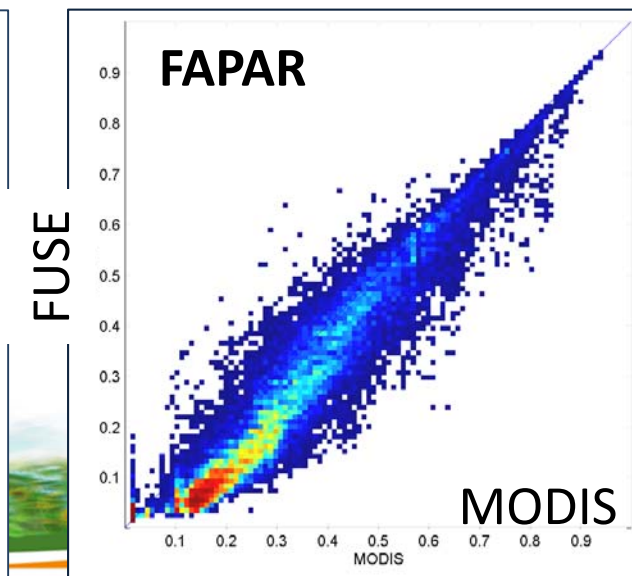
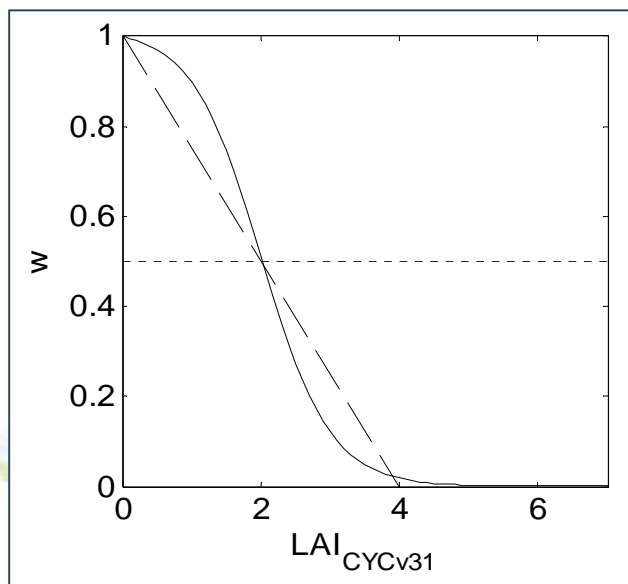


STEP A: Instantaneous Product

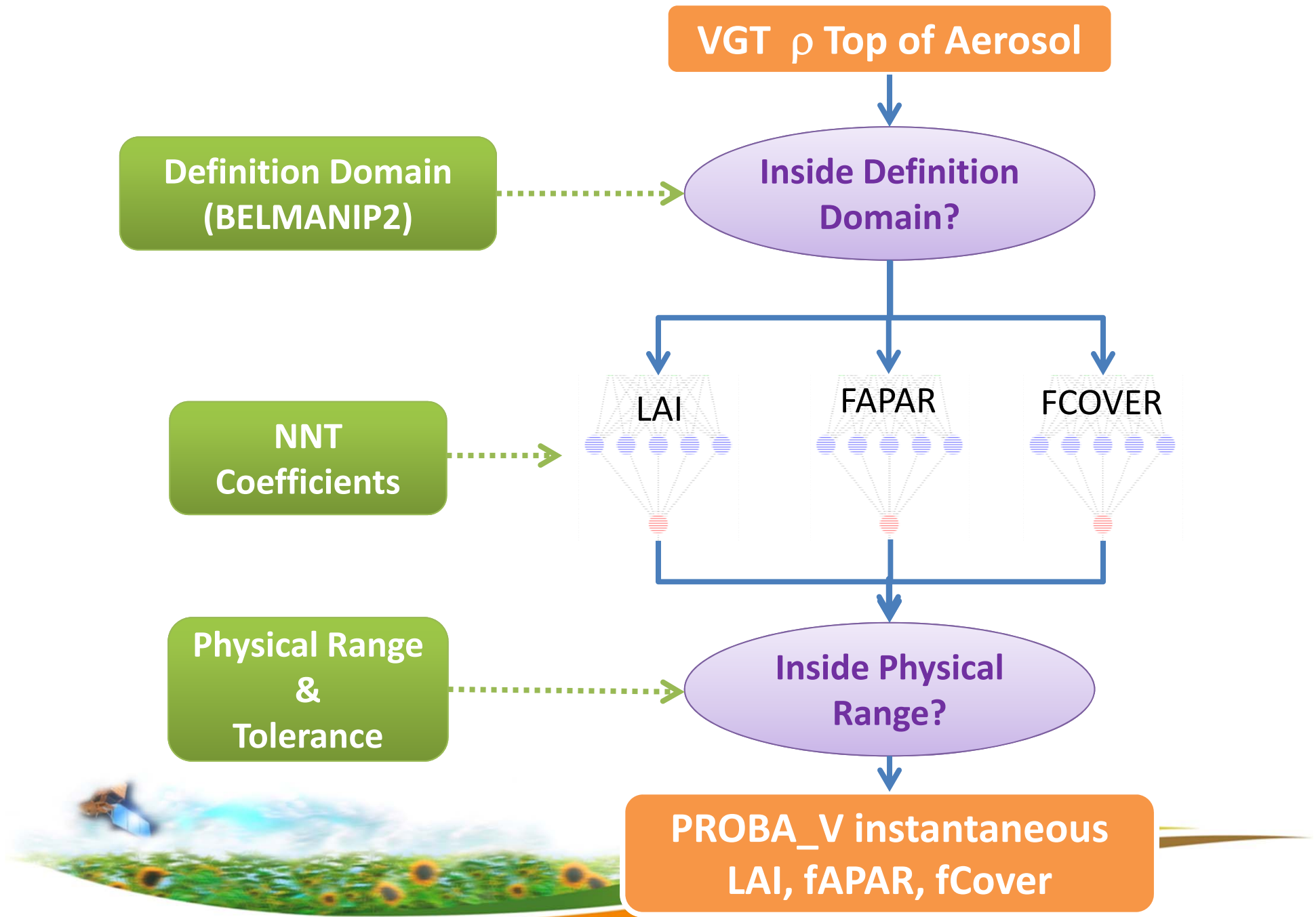
- Filtered VEGETATION data (2005-2008)



- Fused MODIS+CYCLOPES LAI, FAPAR

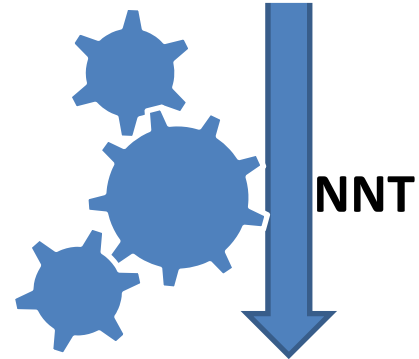


STEP A: Instantaneous Product

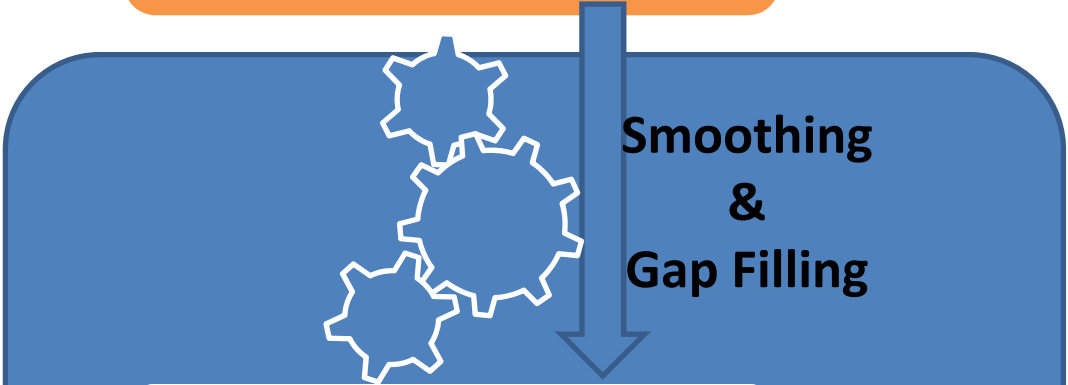


General principle

PROBA_V
Daily Reflectance



PROBA_V
Instantaneous Product



PROBA_V
Dekadal Product

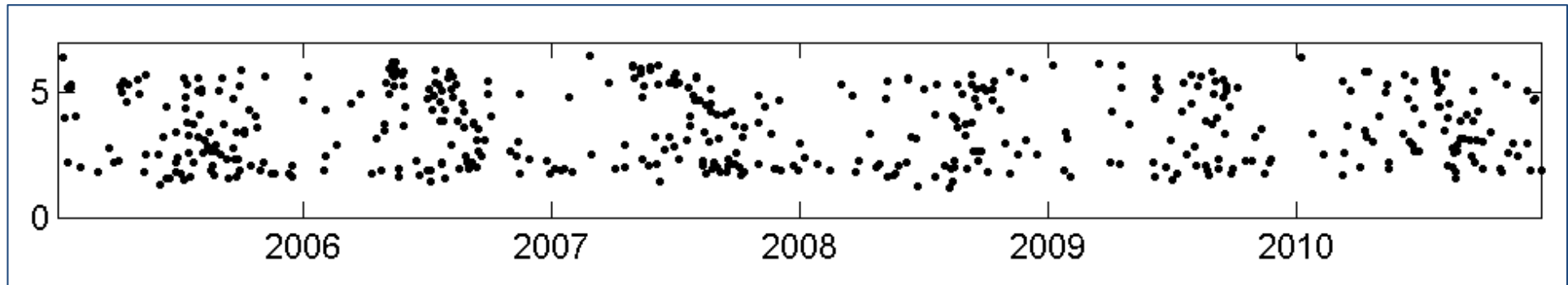
STEP B



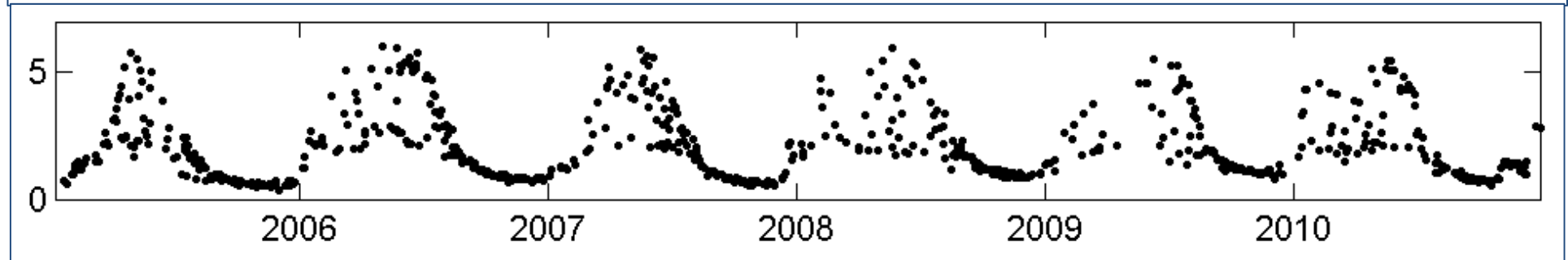
STEP B: Compositing

- Different behaviour for EBF (Noise) vs Non_EBF
 - Limited seasonality
 - Large amount of noise

EBF



NF



STEP B: Compositing

PROBA_V Instant. Product

25 parameters
to control step B

Temporal Smoothing
Evergreen Broadleaf
Forest (EBF)

Temporal smoothing
Non Evergreen Broadleaf
Forest (No EBF)

EBF ?

GLOBCOVER

LATITUDE

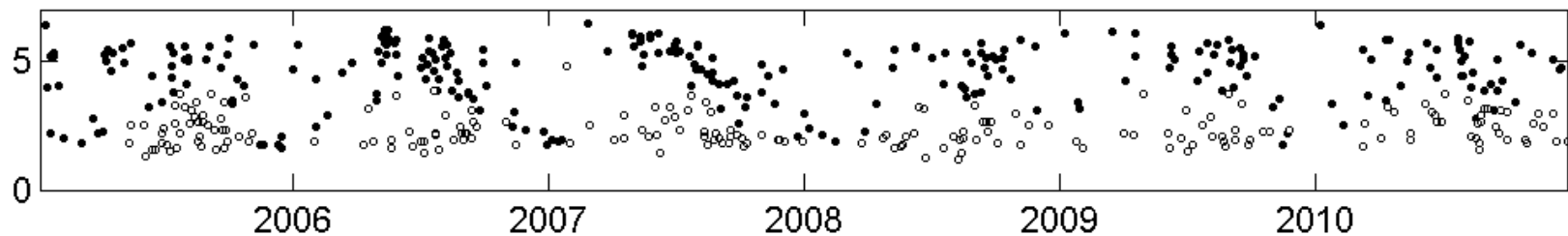
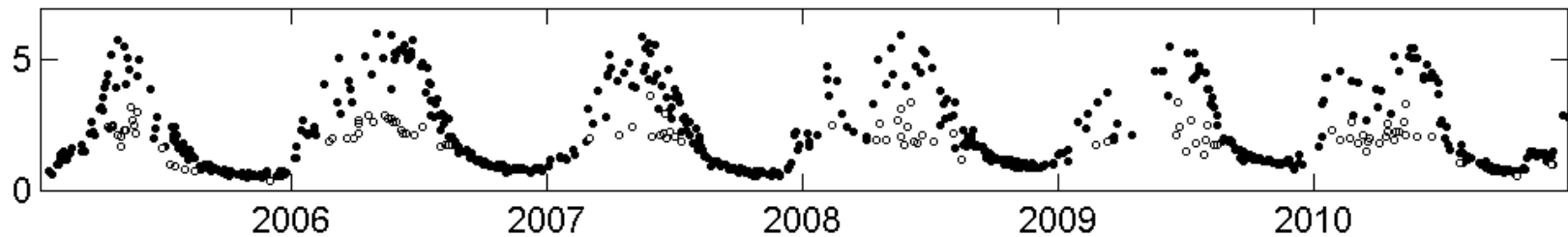
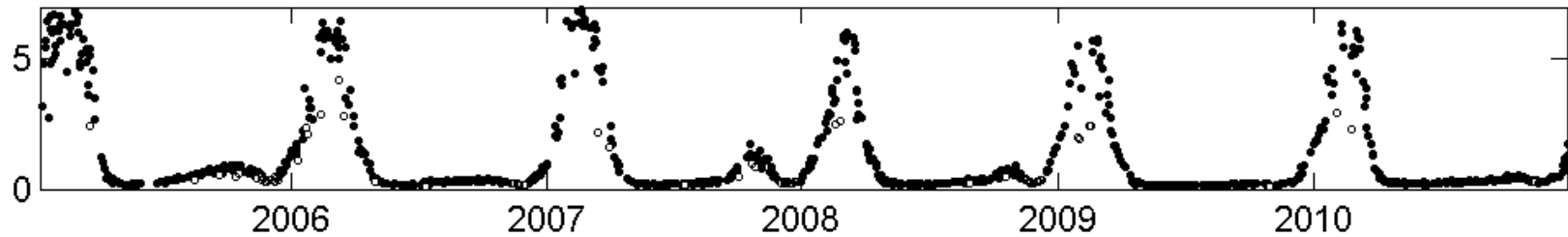
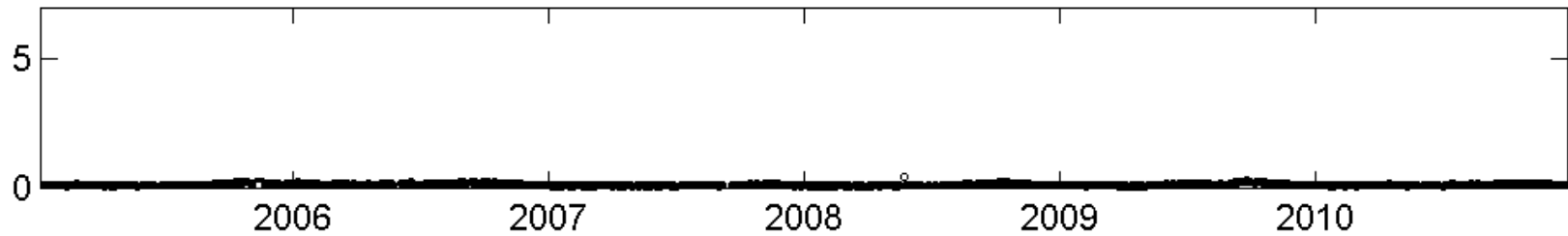
No

Yes

Gap Filling
Linear Interpolation

PROBA_V Dekadal Product

STEP B: Outlier Elimination

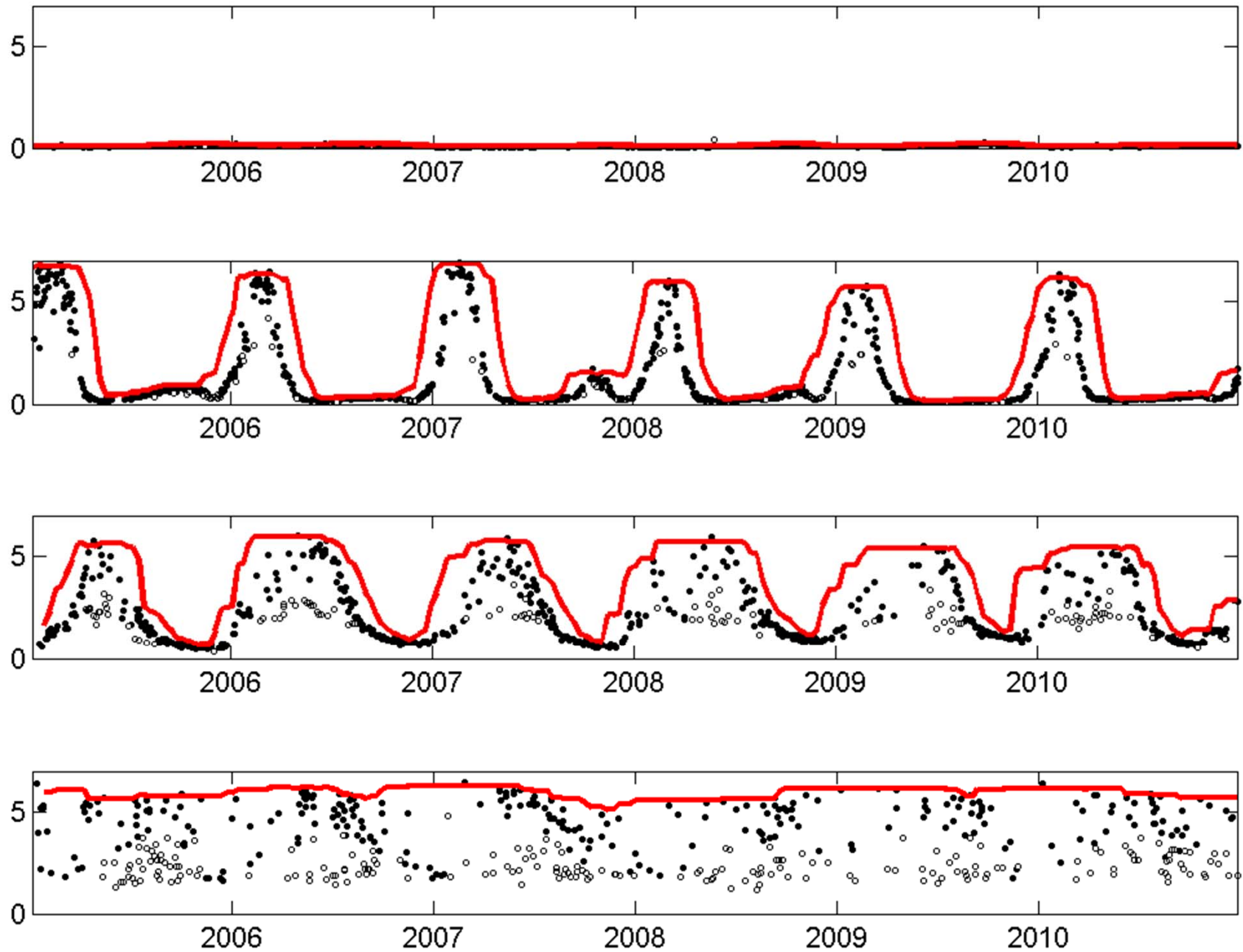


STEP B: EBF

- For EBF pixels
 - If enough data (20) in the compositing window (max: 120 days)
 - $EBF = \text{mean}(\text{product}(LAI > \text{Threshold}))$
 - $\text{Threshold} = \text{percentile}(LAI, 90)$;
 - Else previous value
- Pixel is considered as EBF if
 - $-28.5 < \text{Latitude} < 28.5, LAI > 4$
 - Noise is significant
 - Pixel was majoritarily set as EBF in the 21 previous dekads (completed with GLOBCOVER)

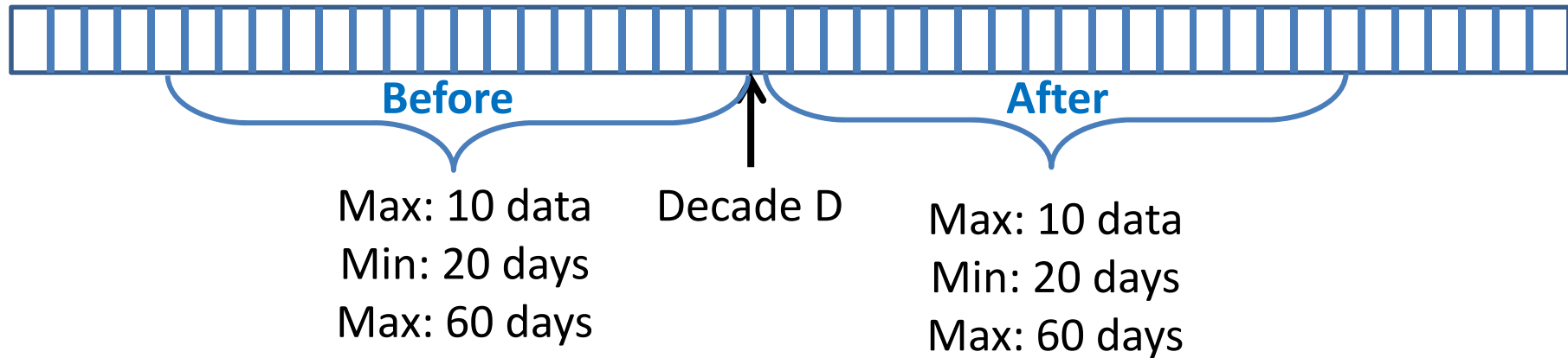


STEP B: EBF case



STEP B: Non EBF

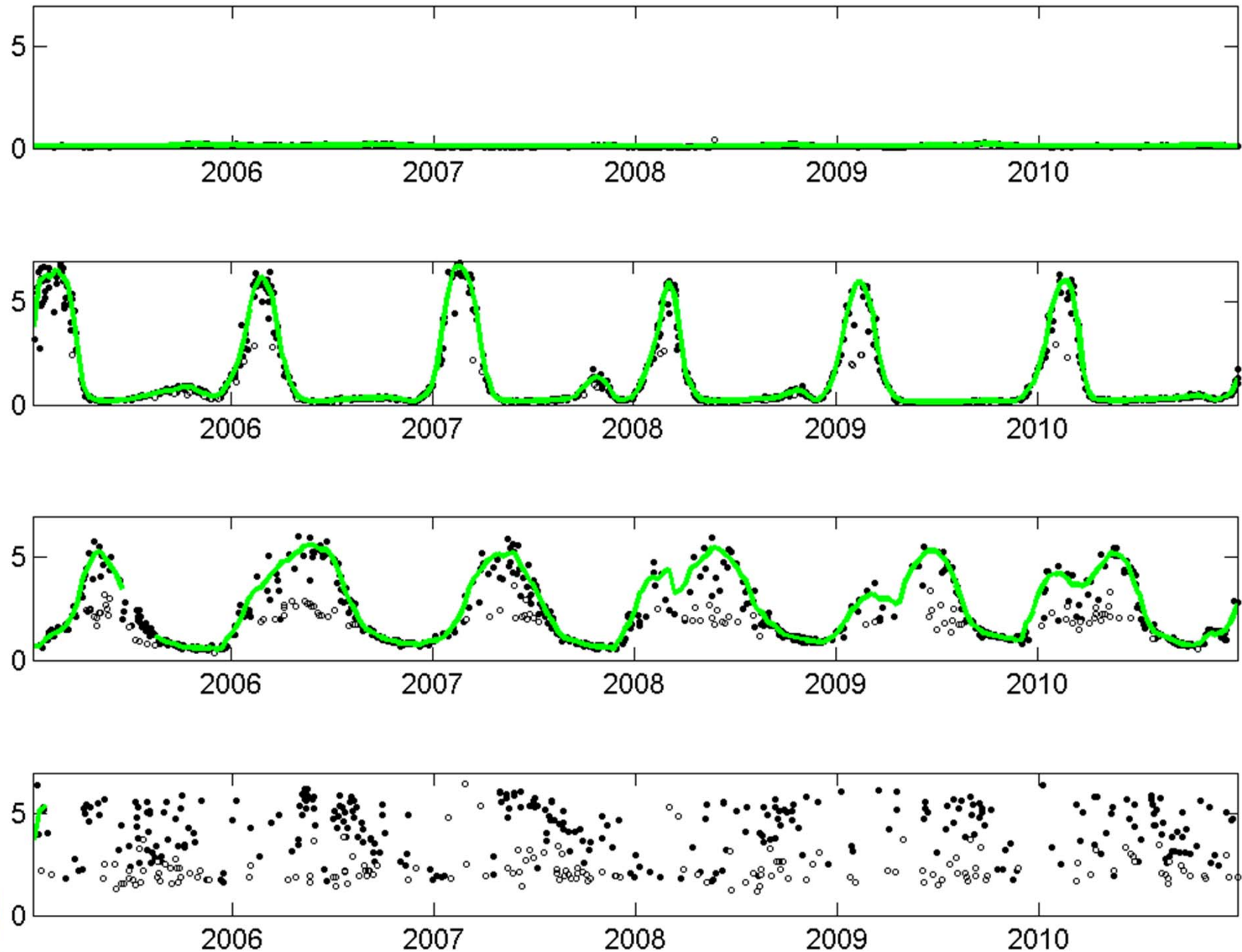
- Variable length of the compositing window:



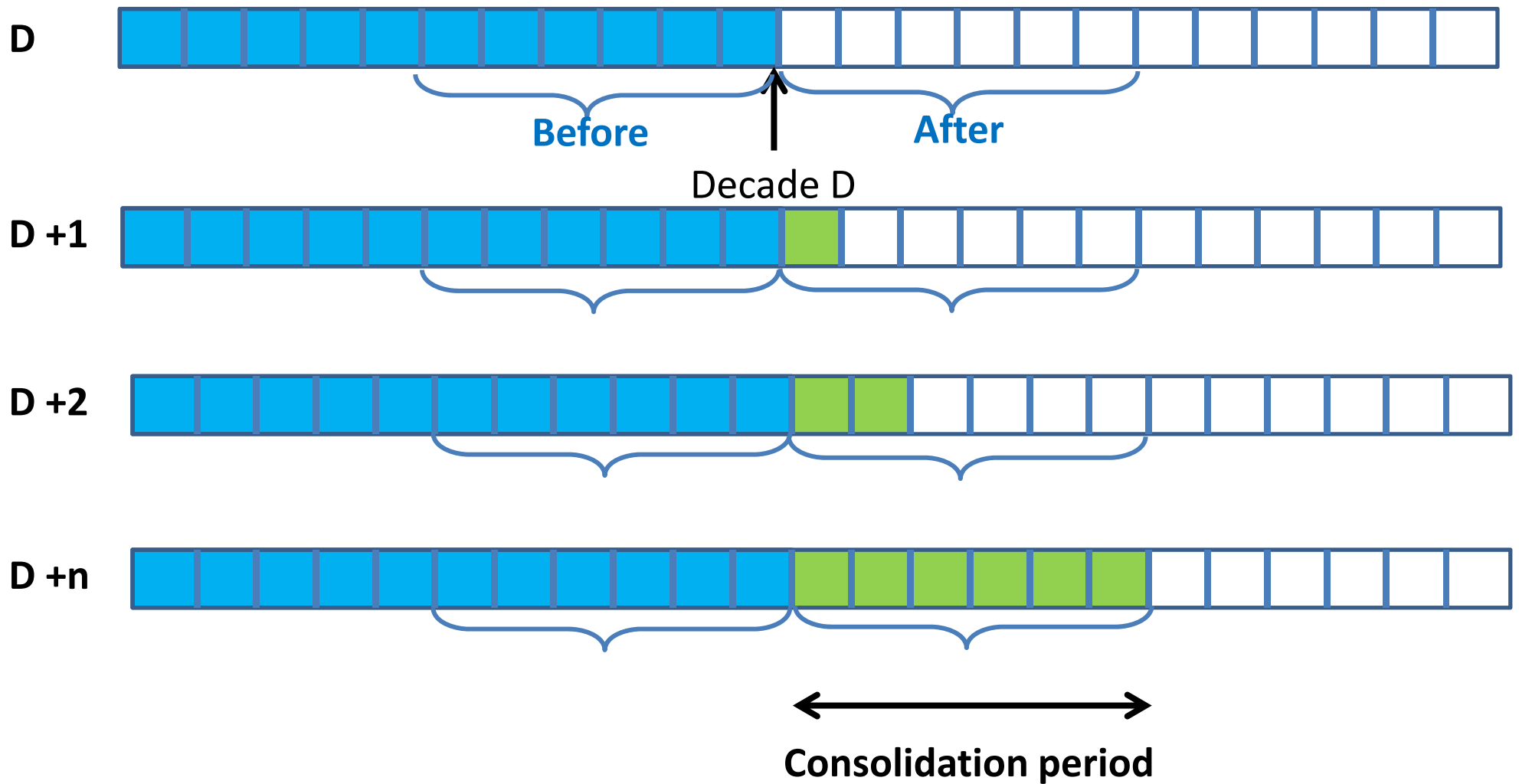
- Temporal smoothing depends on the number of available data
 - Enough data ($N_{\text{before+after}} > 5$): weighted polynomial degree 2
 - $3 < N_{\text{before+after}} < 5$: linear fit
 - Else missing data



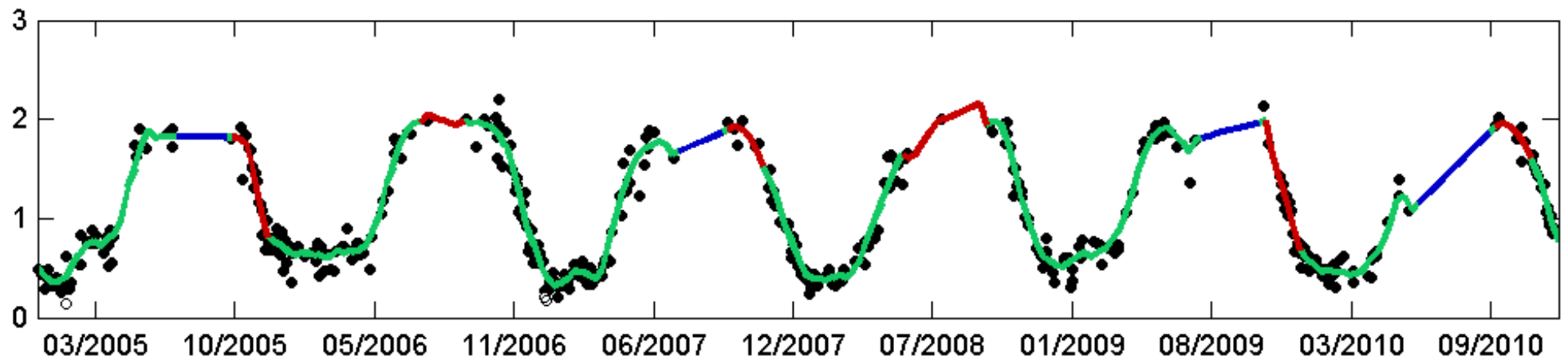
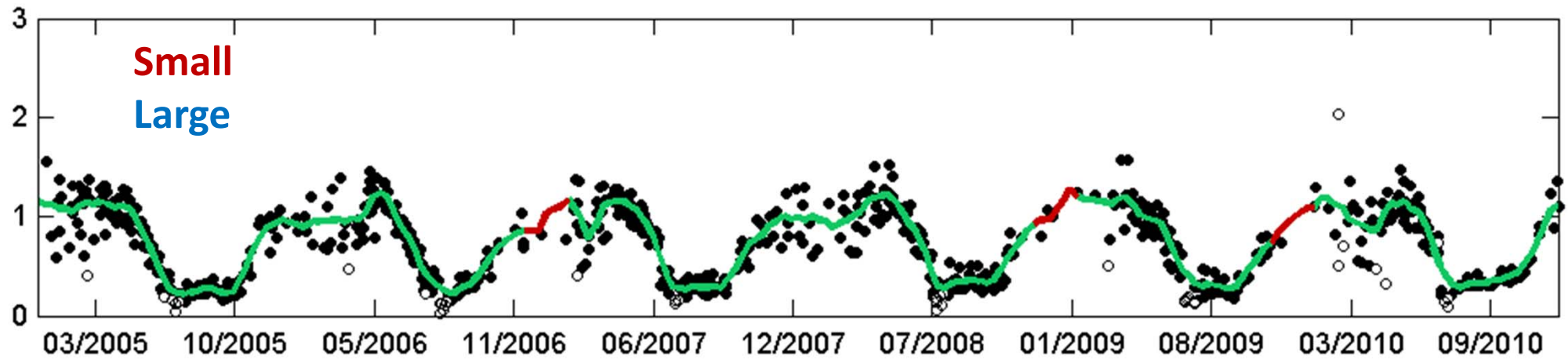
STEP B: Non EBF



Near Real Time processing



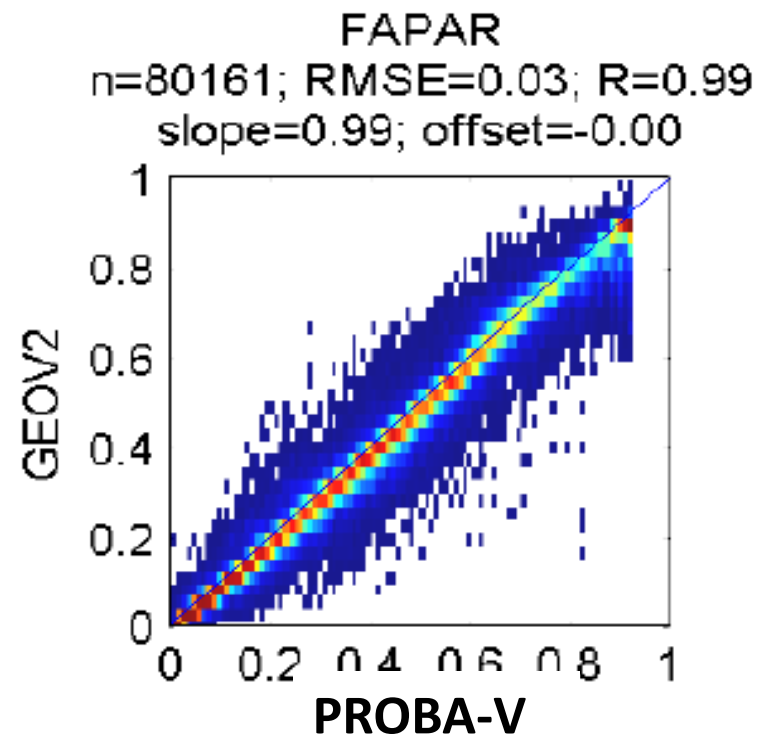
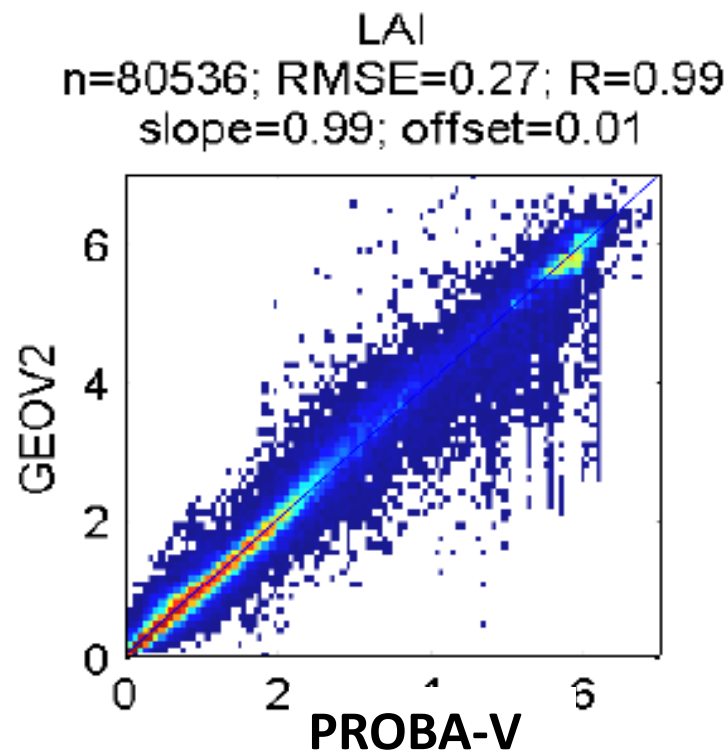
Gap filling



GEOV2 / PROBA-V

- Main differences

- No SWIR in Proba-V
- Refinement of NNET training data base
- Compositing
 - Use of climatology for GEOV2
 - No a priori information for IMAGINES
 - Differences in EBF identification



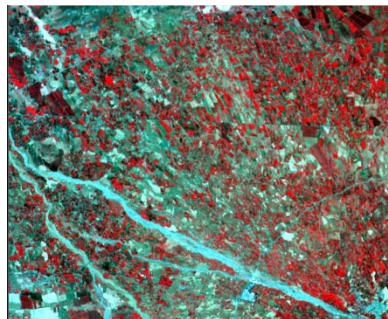
CONCLUSIONS

- **Associated quality indicators**
 - Flag
 - Confidence interval from polynomial fit
- **Consistency between variables**
 - Same selection of observations used (mostly based on LAI)
- **Importance of the compositing step**
 - Without climatology (GEOV2)
 - For short term projection
- **Updating the algorithm when enough actual PROBA-V data will be available**

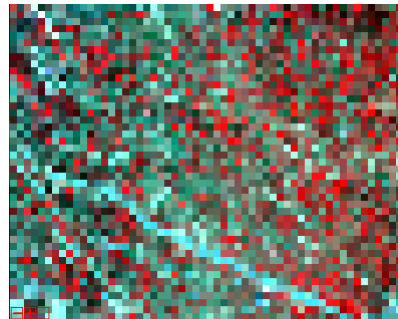


Building a longer time series: process back the MERIS archive?

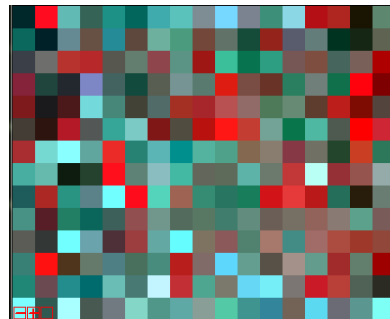
20m



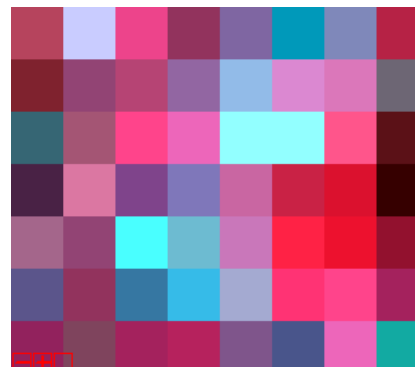
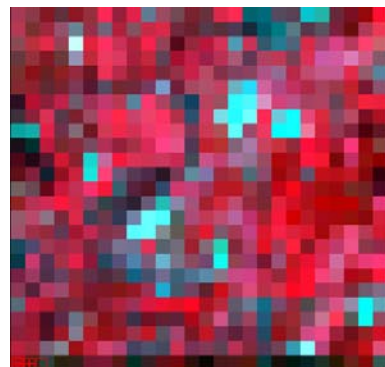
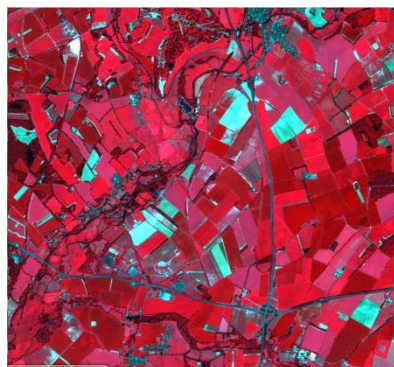
300m



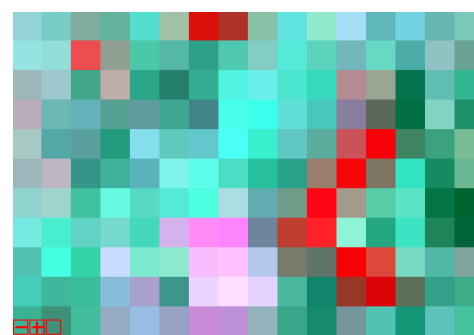
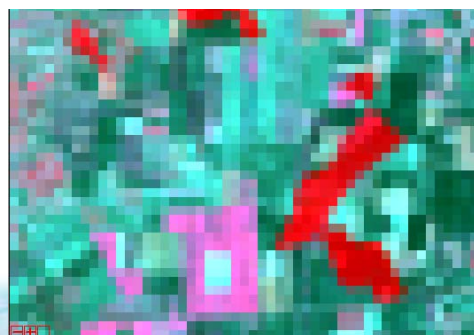
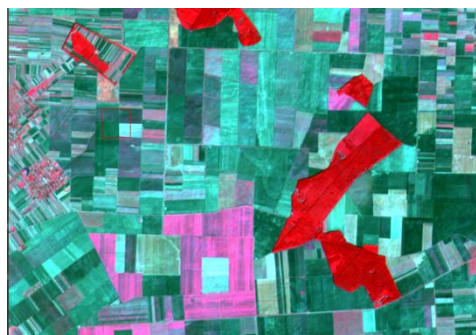
1000m



Marocco, Crops



England, Crops



Romania, Crops