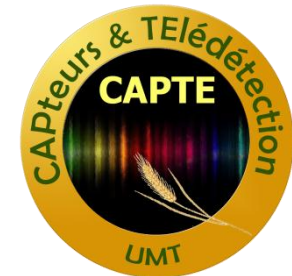


CES variables biophysiques

F. Baret, M. weiss, A. Verger, B. de Solan
W. Li, Liu S.



Plan

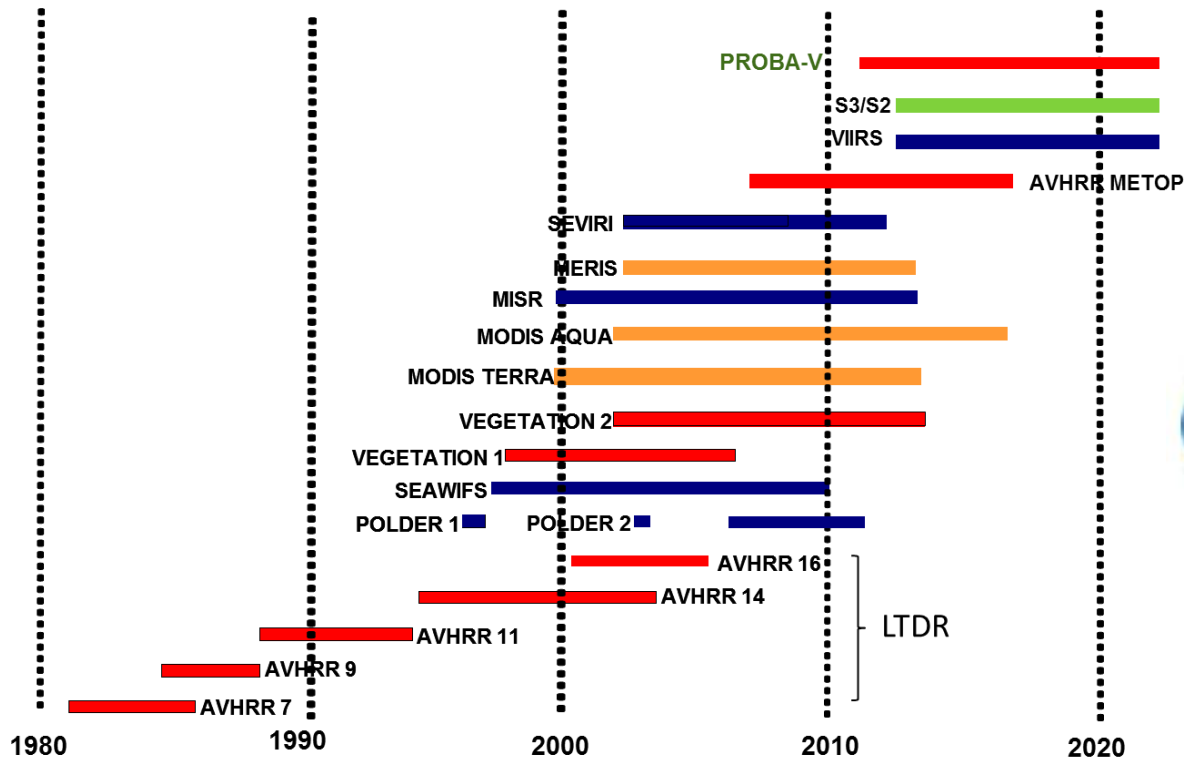
- **Développement de produits globaux**
- Utilisation de modèles de culture
- Utilisation d'observations spatiales
- Combinaison modèles et observations spatiales: Assimilation
- **CONCLUSION**

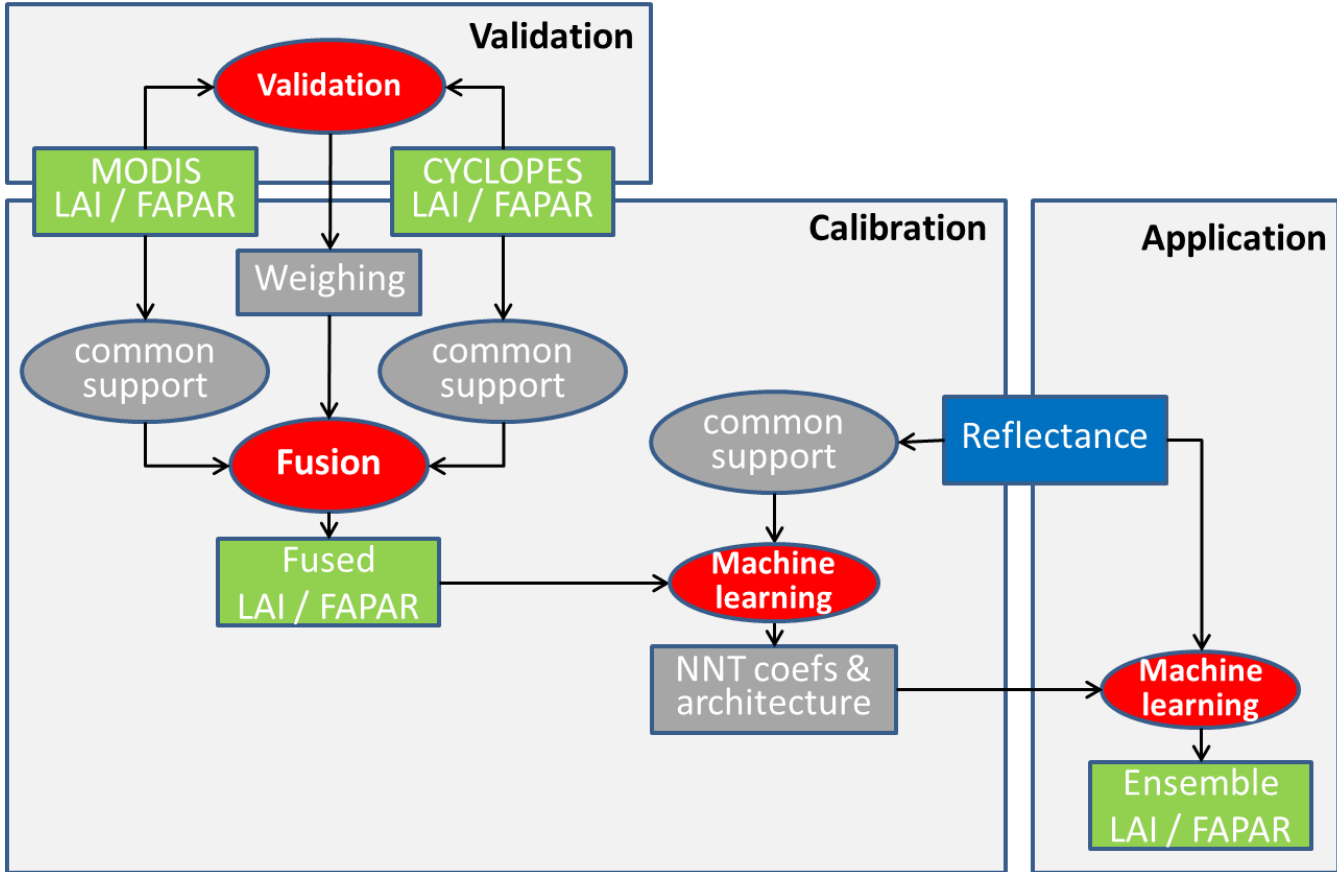
Suivi global sur longues périodes: GEOV1

geoland

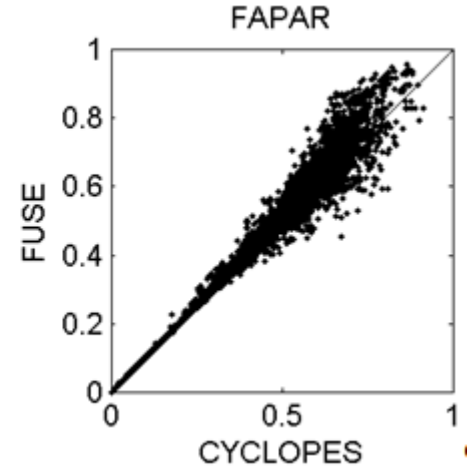
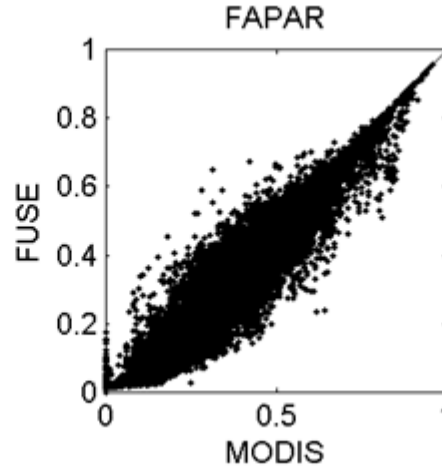
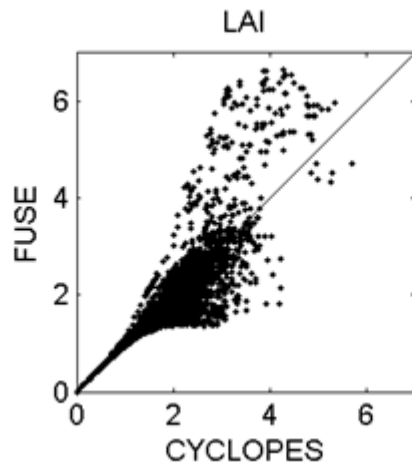
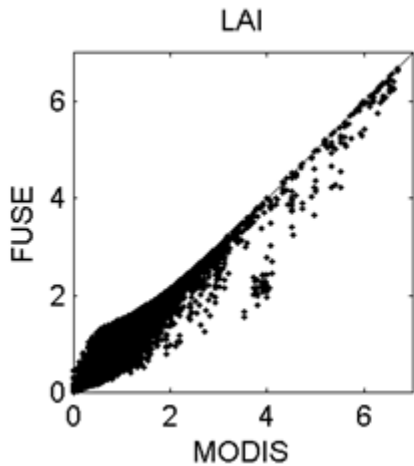
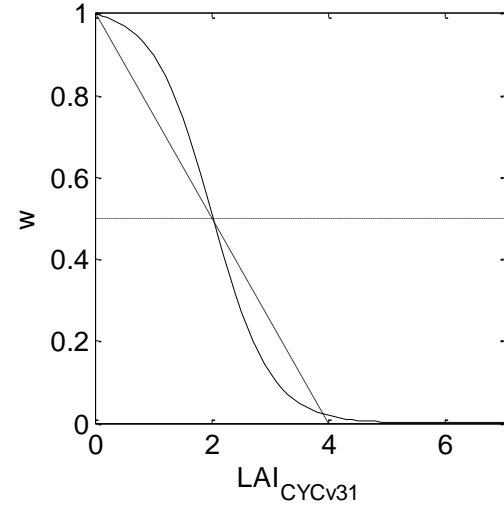
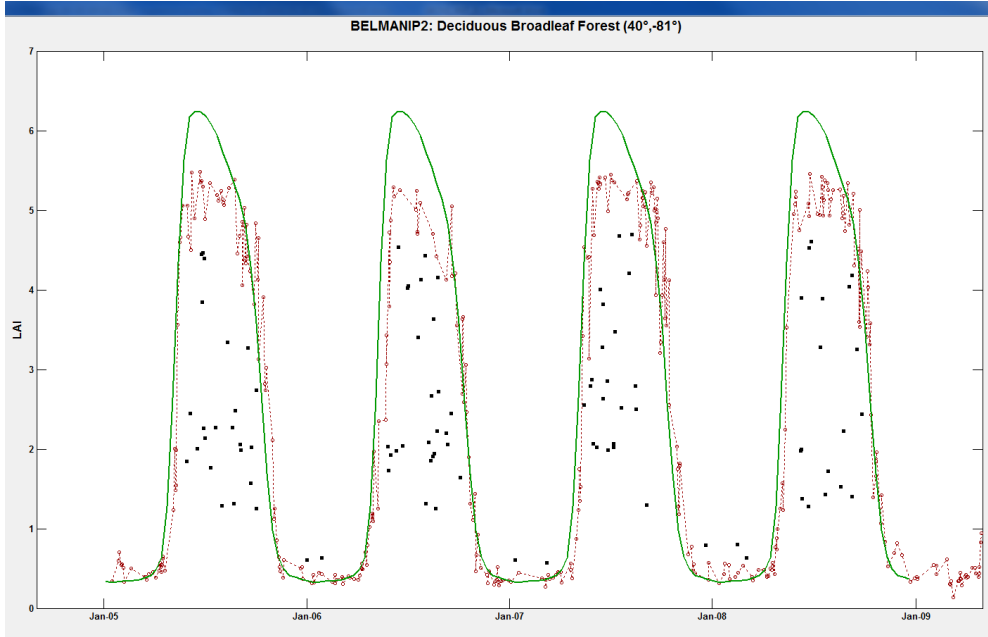


Développement de séries temporelles globales longues et cohérentes à résolution kilométrique (hectométrique) pour le suivi des évolutions/anomalies: LAI, FAPAR, FCOVER

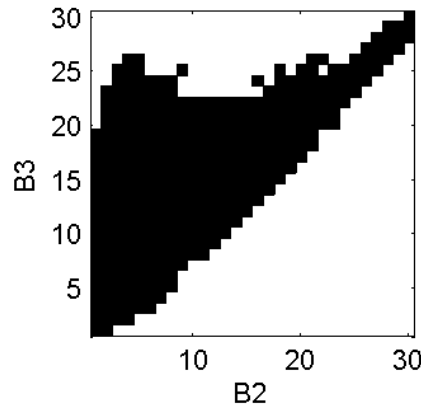
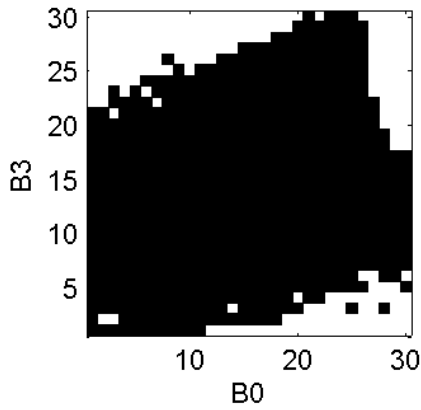
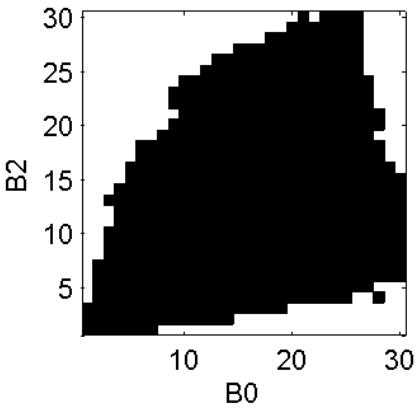
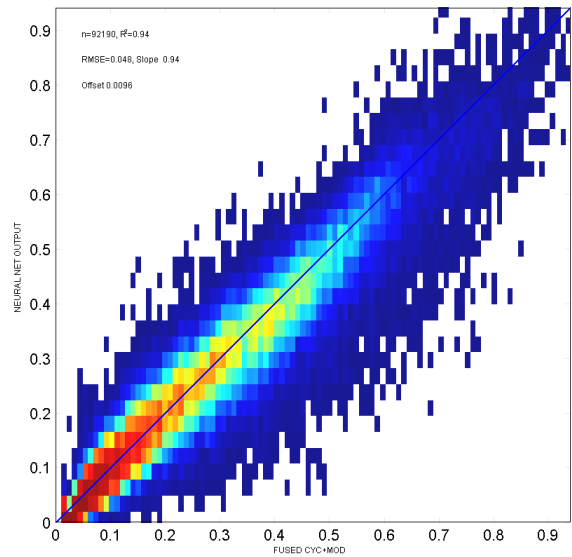
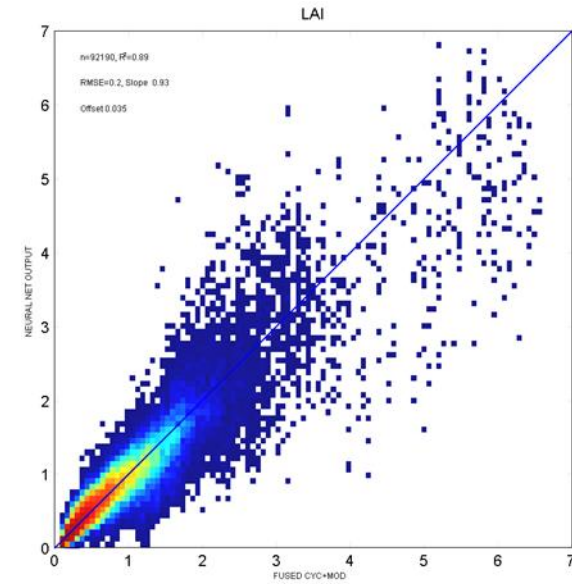
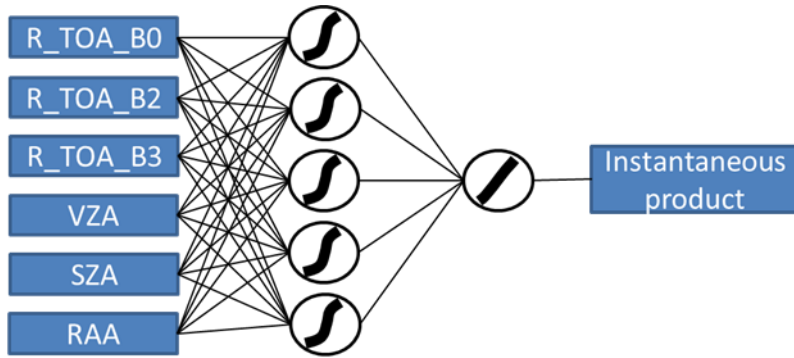




Step A4 Learning from CYCLOPES and MODIS

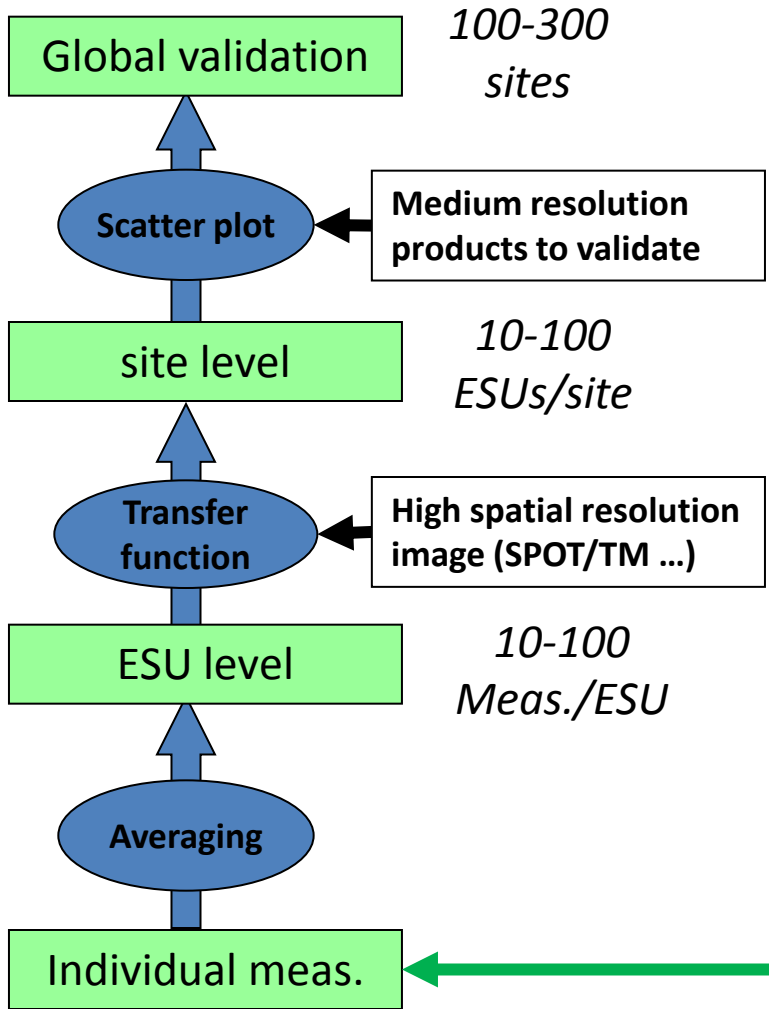
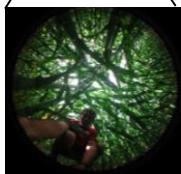
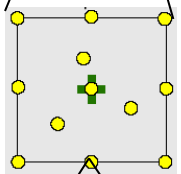
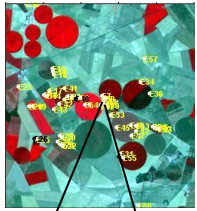
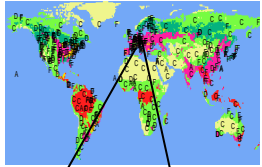


Step A4 Learning



Validation des produits biophysiques

CEOS



<http://calvalportal.ceos.org/olive>

MÉTHODES DE PROXI-DÉTECTION

Photo-hémisphériques



Photo @ 57°

PAR@METER



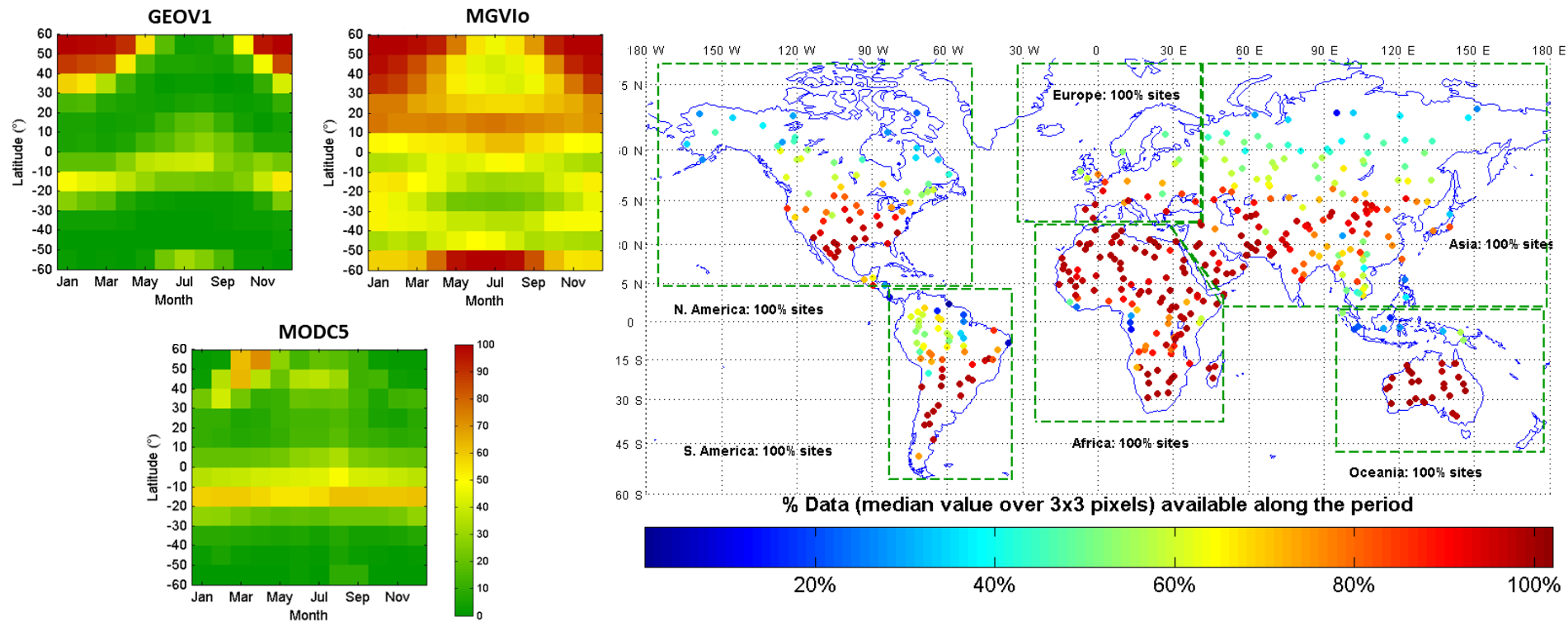
PASTIS57°



PIETON, UAV...

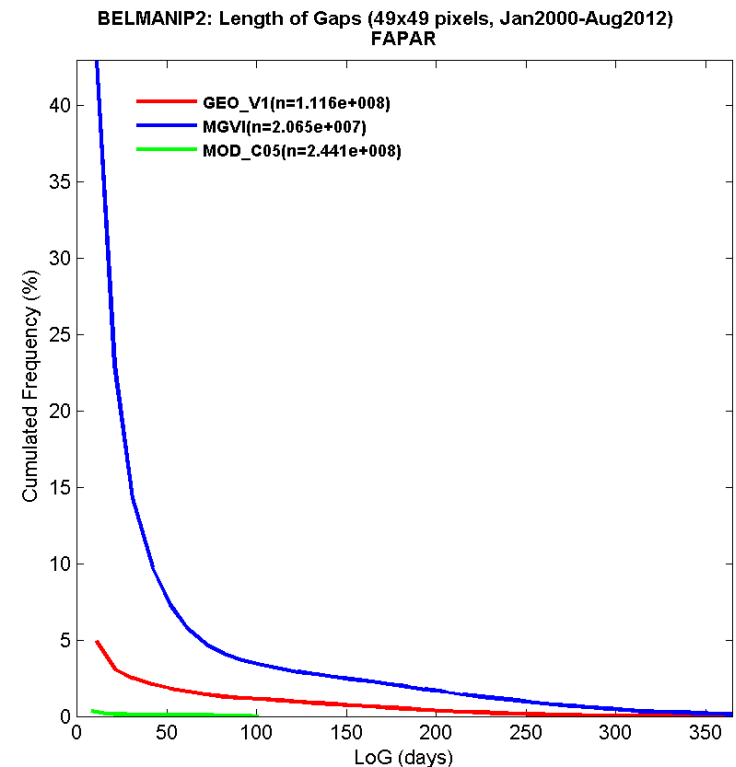
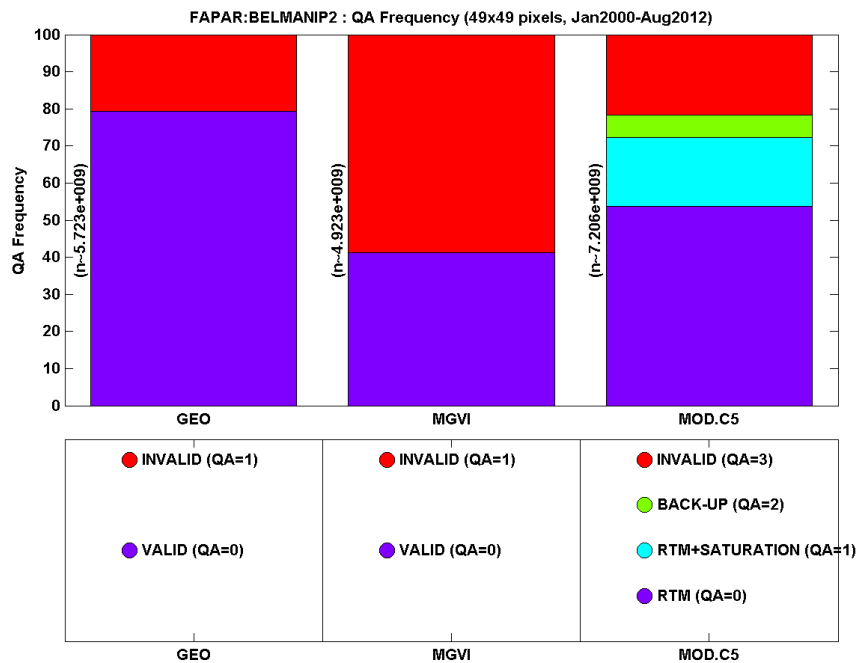
Validation : Completeness

- Percentage of valid data for BELMANIP2 sites
(site, biome, continental & global level, 49x49 km²)



Validation : Completeness

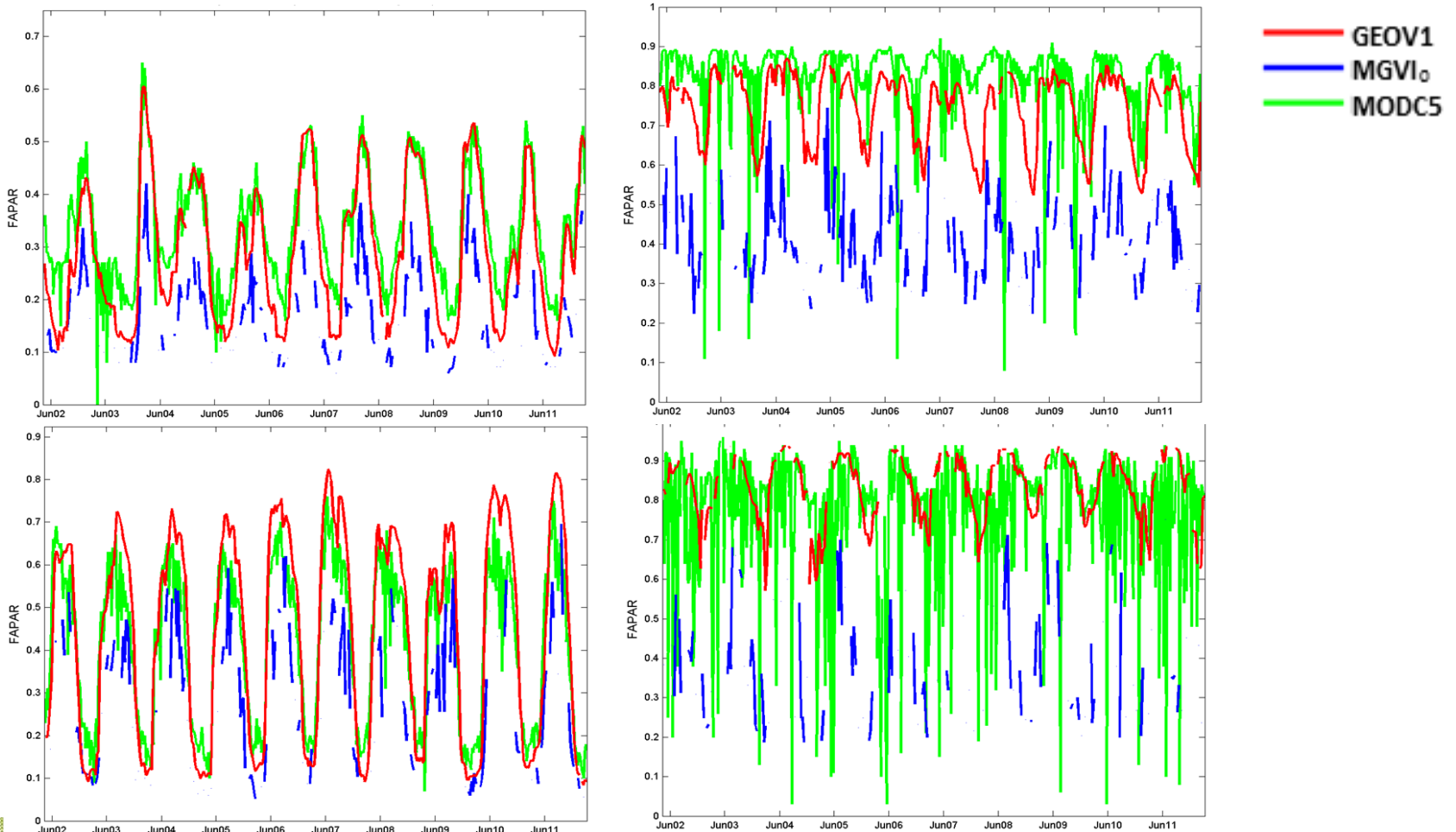
- Fraction of valid data for BELMANIP2 sites (49x49km²)
- Statistical distribution of LoG (Length of Gaps) (49x49km²)





Validation : Temporal Profiles

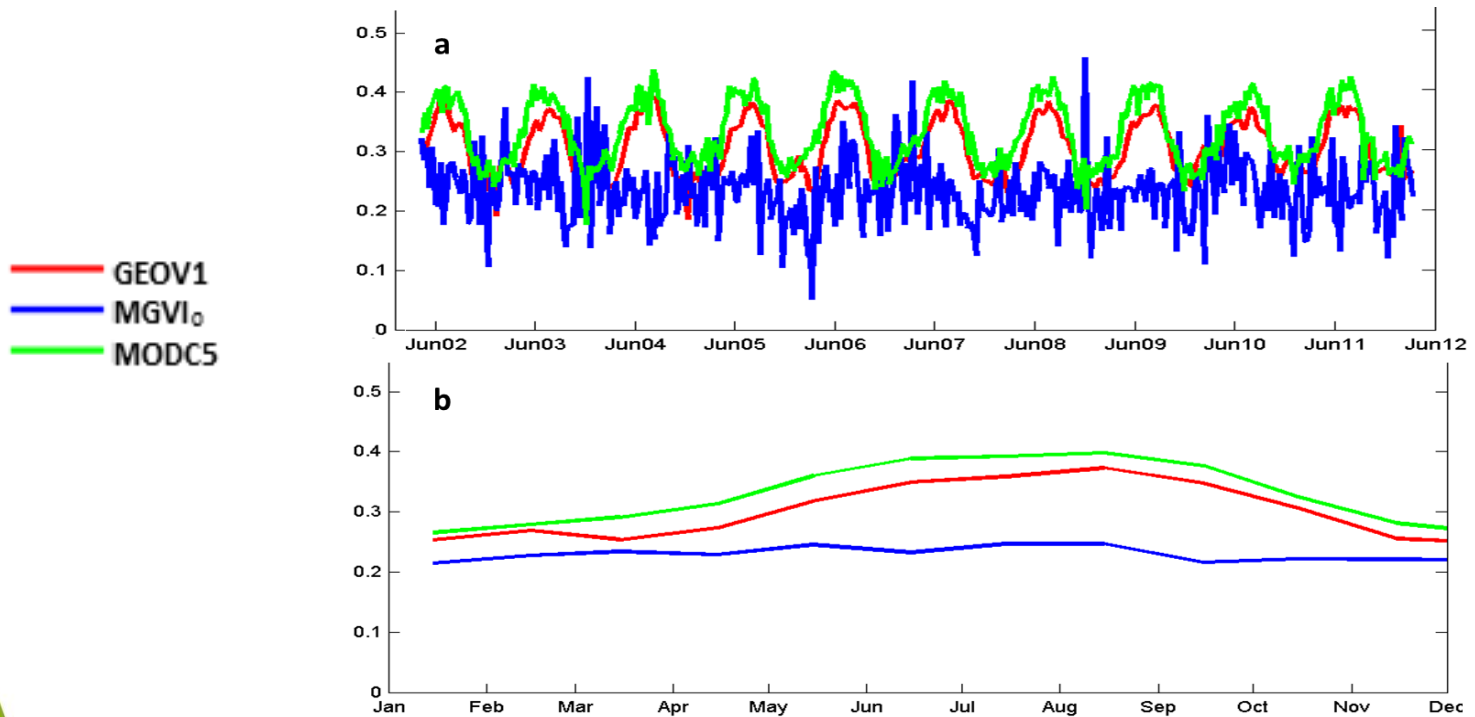
➤ BELMANIP2 & DIRECT (3x3km²)





Validation : climatologies

- Stability: global average
 - Dynamics: all BELMANIP, per date
 - Seasonality : all BELMANIP, and over years

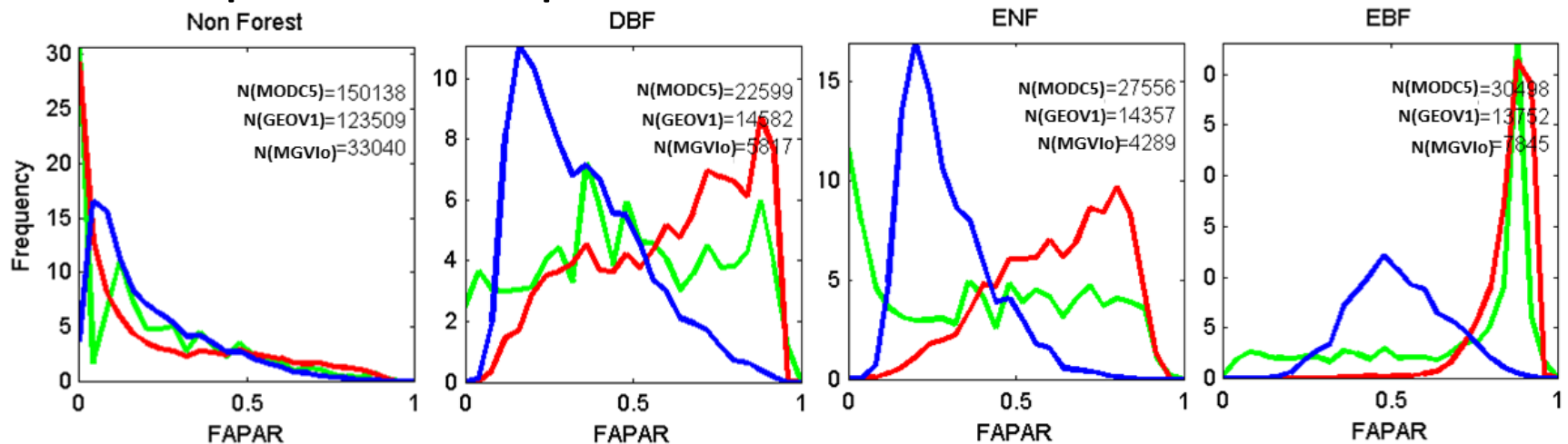




Validation : bulk statistics analysis

➤ BELMANIP2 (3x3km²):

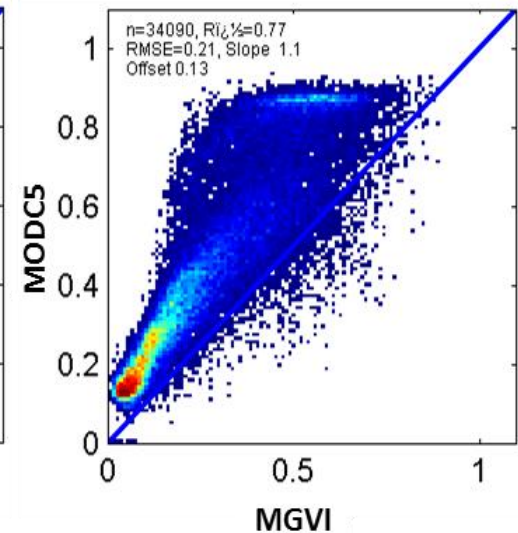
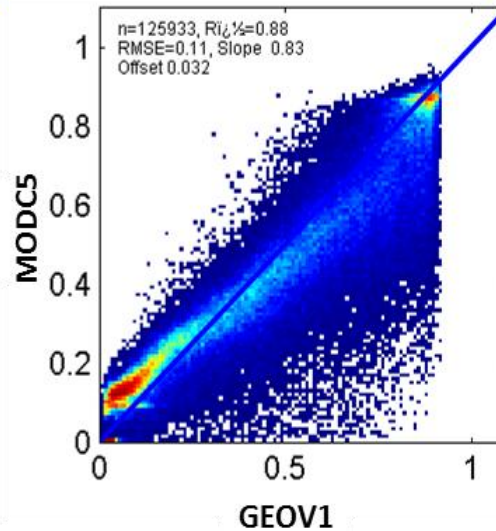
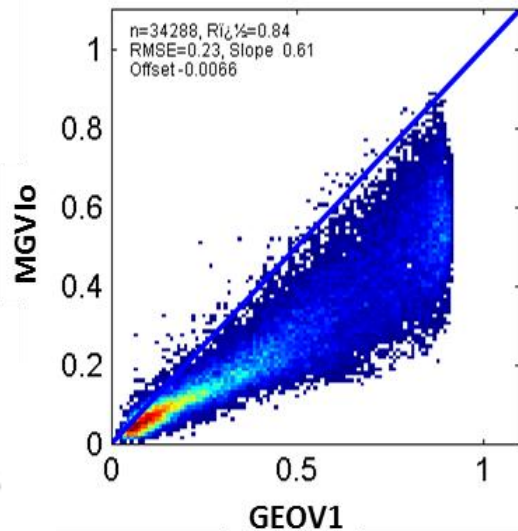
- histograms
- per biome, per continent





Validation : bulk statistics analysis

- BELMANIP2 (3x3km²):
 - scatterplots
 - per biome, per continent



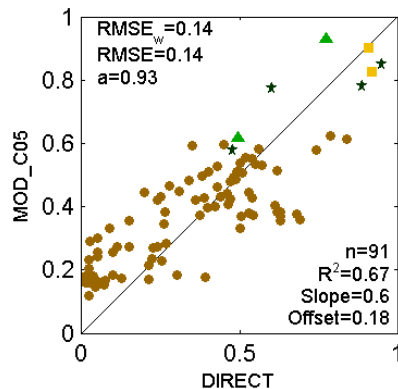
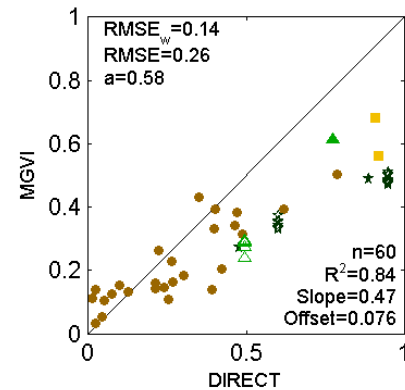
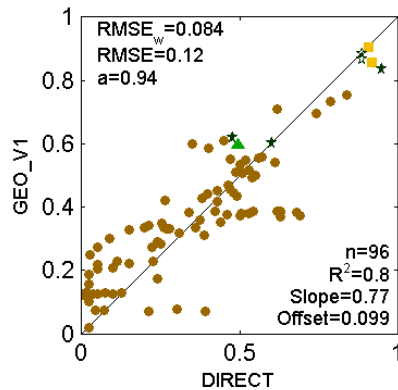
— GEOV1
— MGVI_o
— MODC5



Validation : Ground Measurement

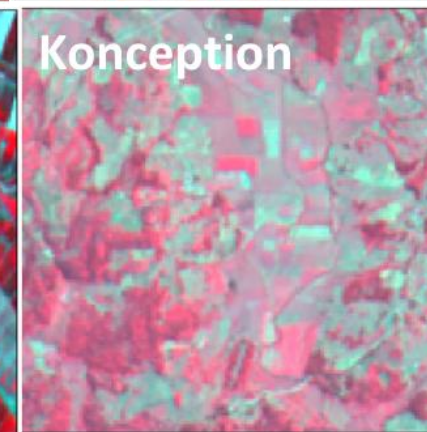
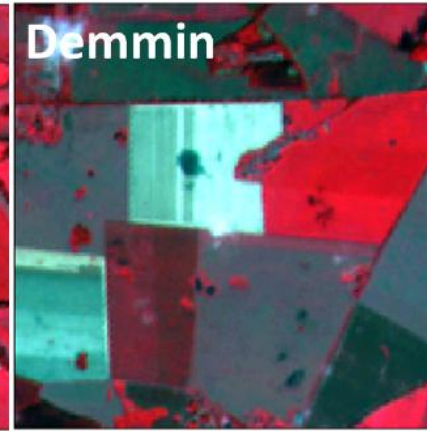
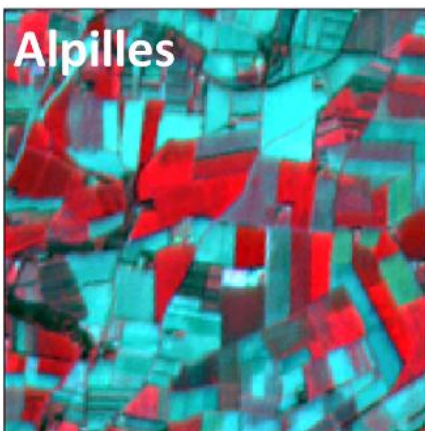
- Scatterplots between products & ground measurements (DIRECT, 3x3km²) + statistics

FAPAR: Jan2000-Aug2012 (smooth + interpolation)



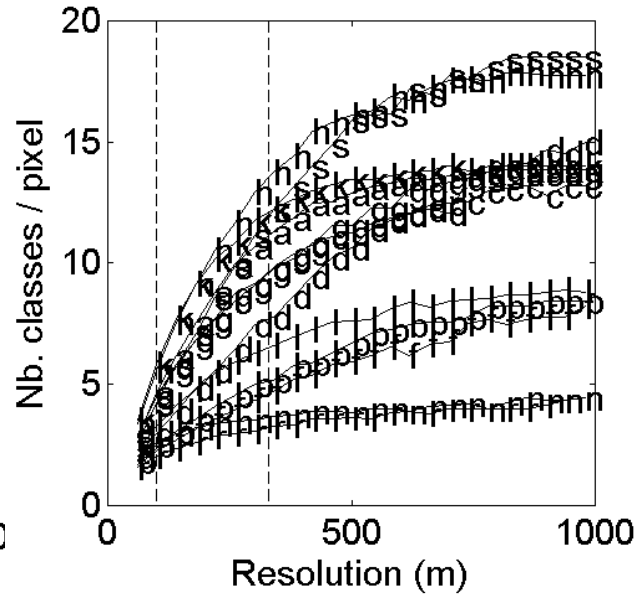
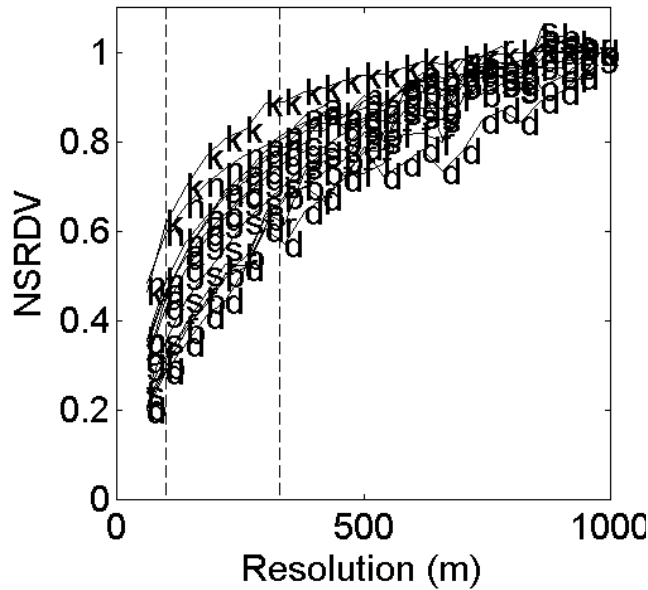
- △ Extrapolated ground value(acquisition out of validation)
- ▲ Needleleaf Forest
- ★ Evergreen Broadleaf Forest
- Deciduous Broadleaf Forest
- Non Forest

Interest of high spatial resolution



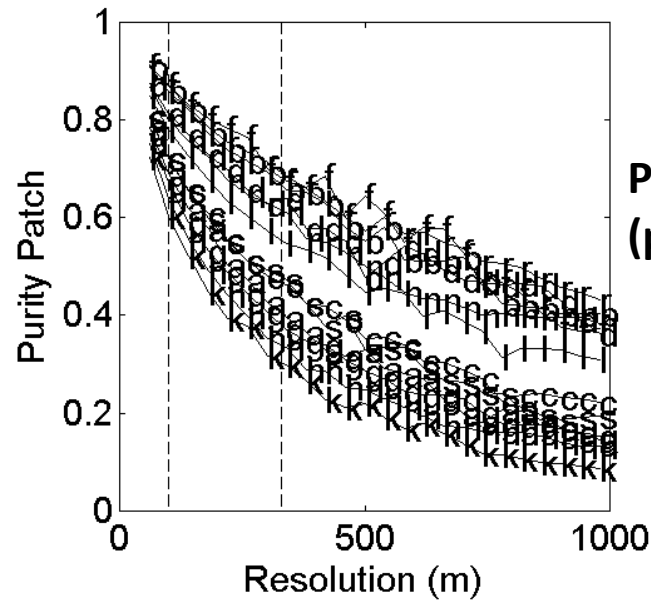
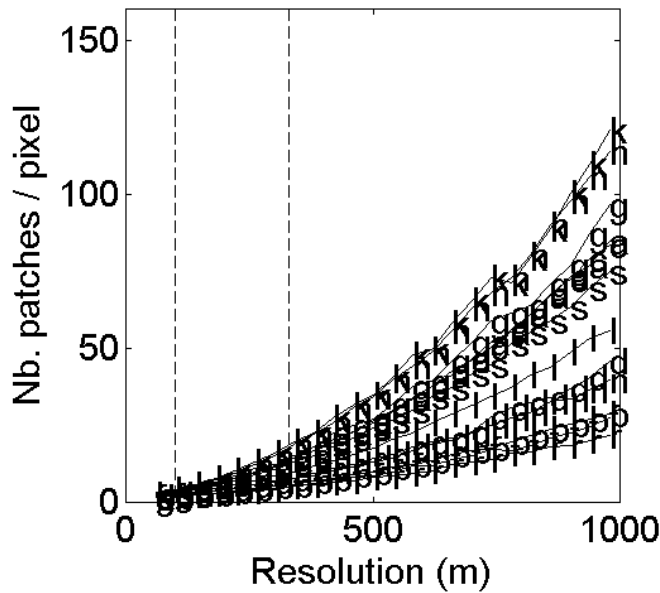
Impact of the spatial resolution

Variability within pixels:
Normalized Standard Deviation (NSRDV)



Number of classes per pixel

Number of patches per pixel

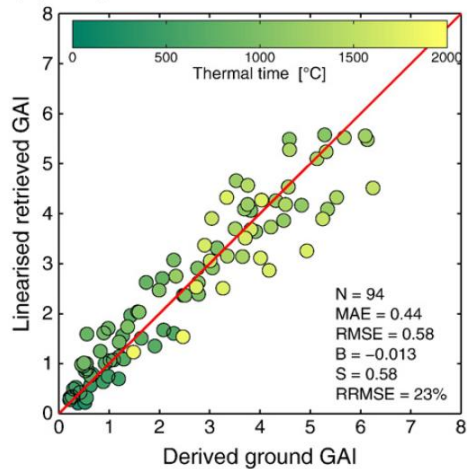


Purity (patches/classes)

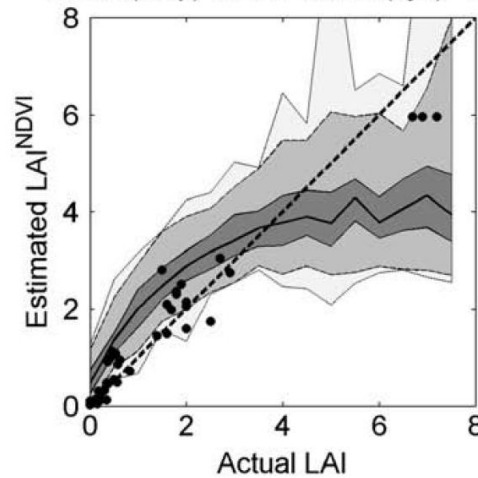
Approche Empirique / physique

EMPIRICAL

(a) Empirical retrieval

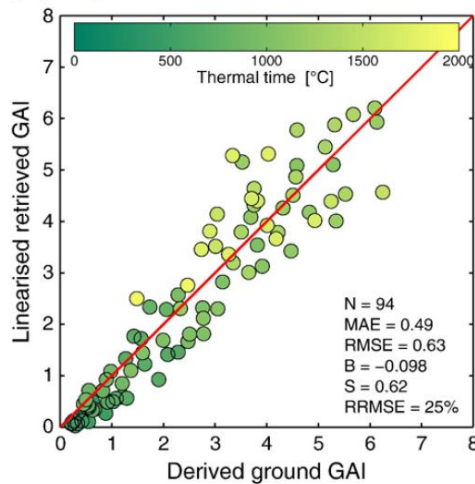


RMSE(emp)=0.48; RMSE(syn)=1.73

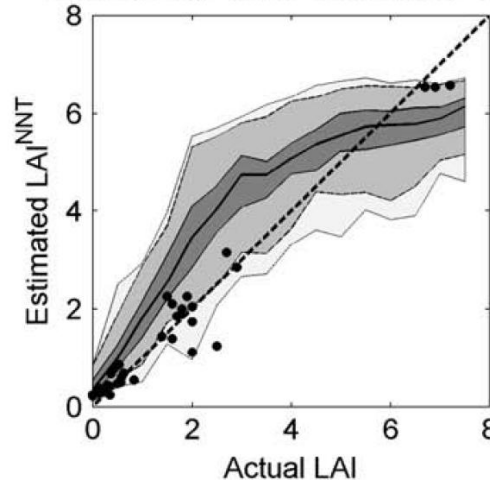


PHYSICAL

(b) Physical-based retrieval



RMSE(emp)=0.37; RMSE(syn)=1.13

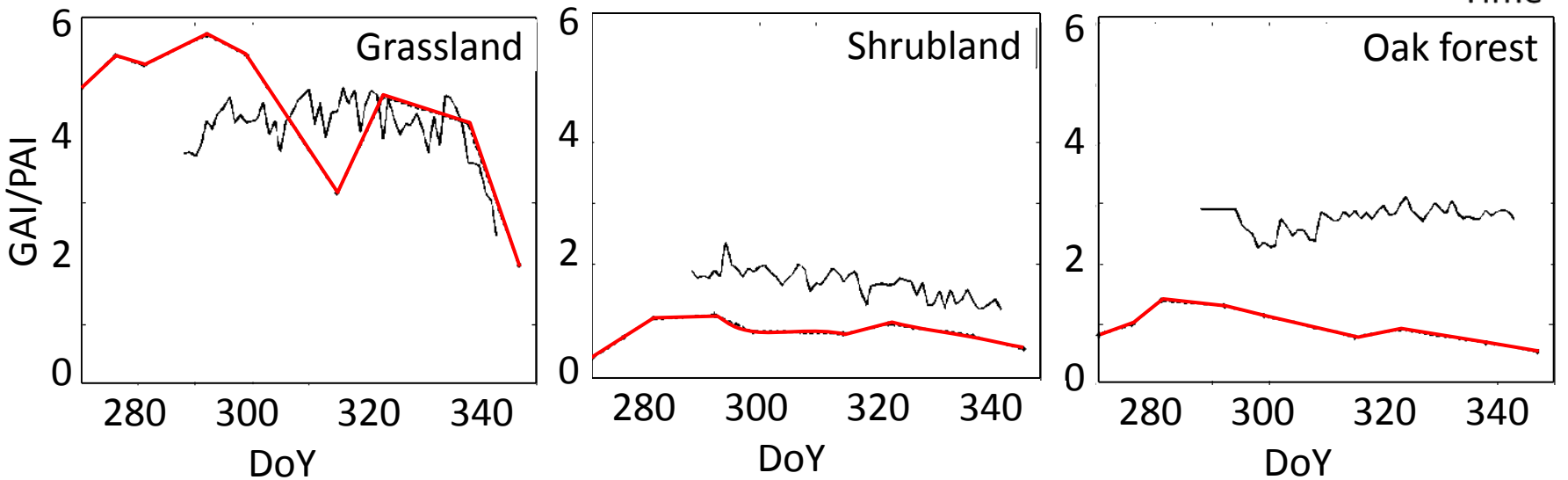
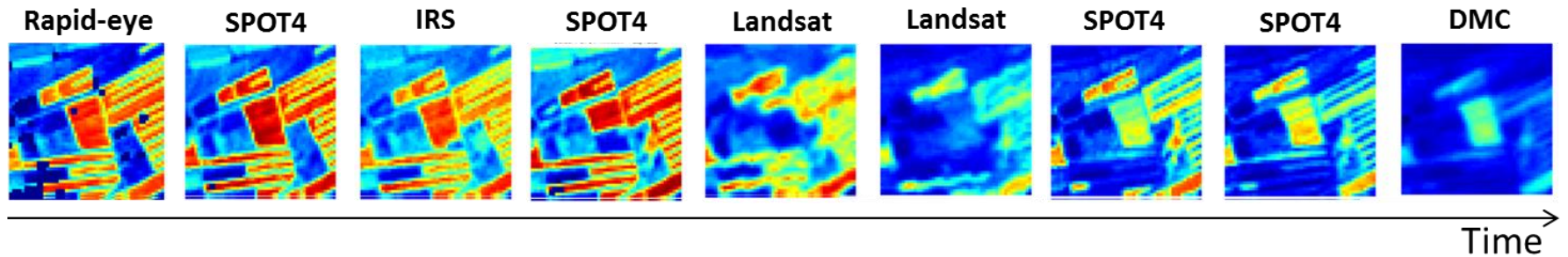


Les approches physiques ont atteint une bonne maturité

Applications opérationnelles

Development of generic decametric algorithms

➤ S2, LANDSAT, SPOT, DMC ...



Projets: SYNCRAU (TOSCA), VALSE2 (ESA), BVNET

Combination hecto-decametric observations



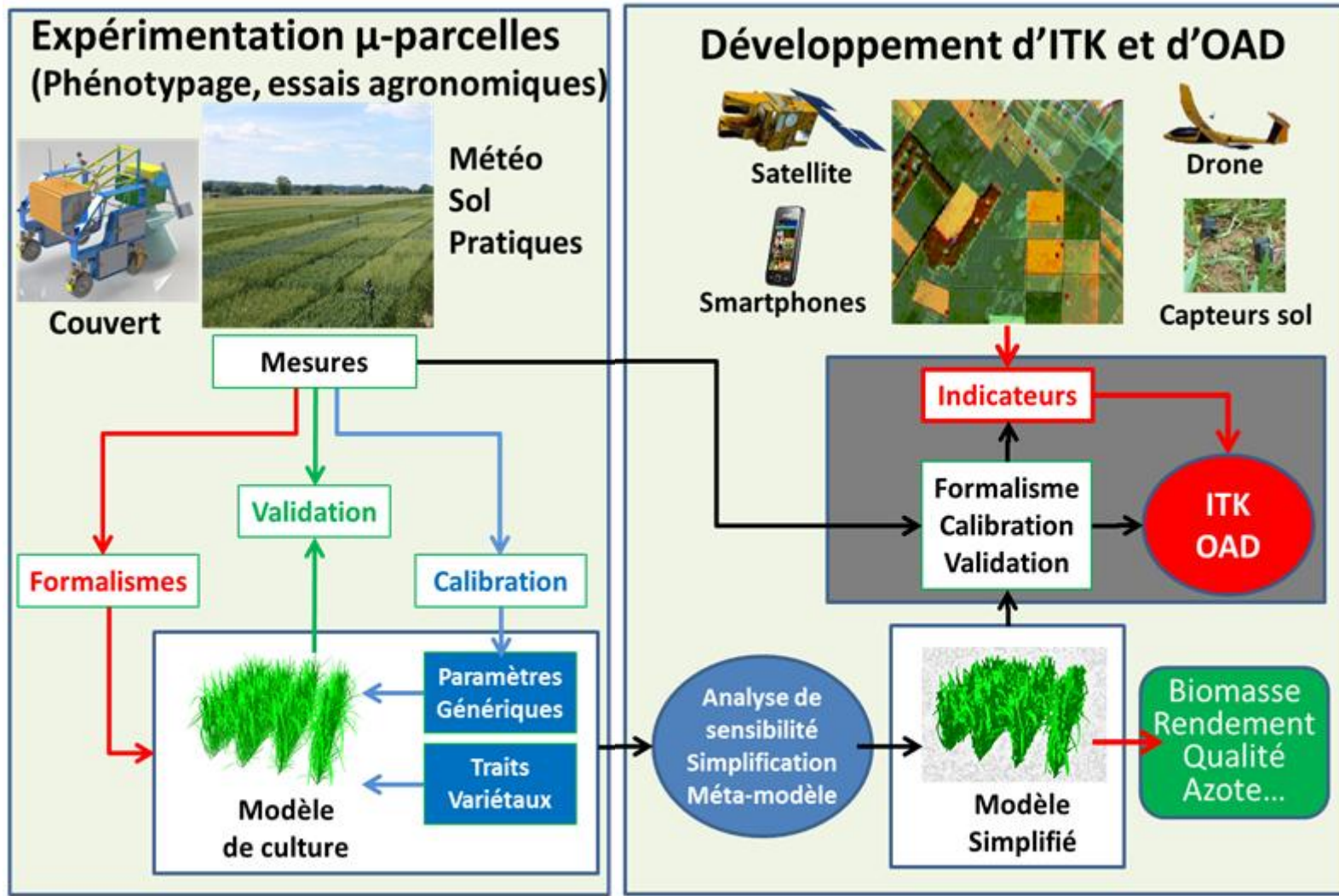
➤ Combination of

- Hecto (PROBA-V): daily observations @300m
- LANDSAT (S2) observations @20m

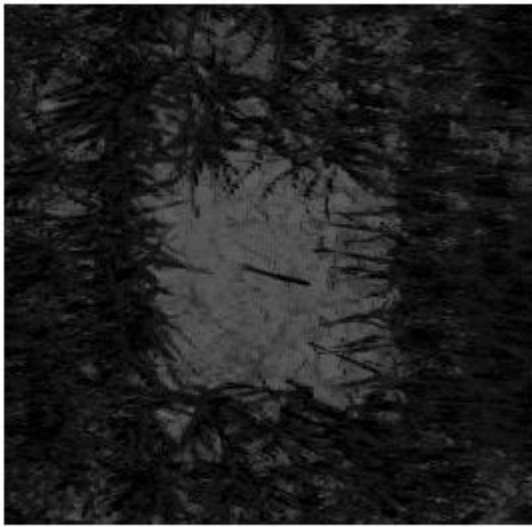
➤ Disaggregation

- Characterization of the PROBA-V PSF (products)

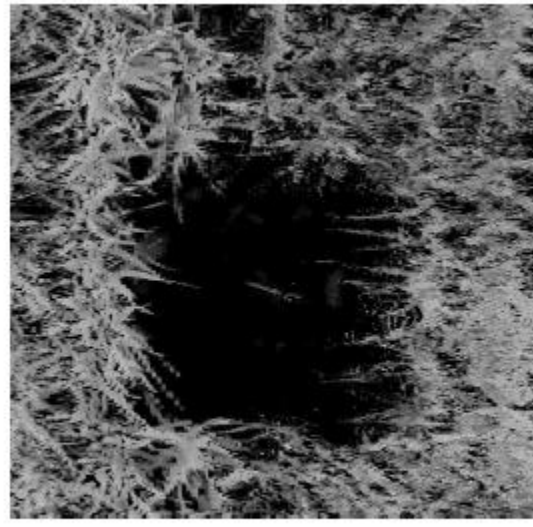
Development of specific products for decametric observations



UAV (dynamics) and phenomobile



Lidar couleur



Lidar hauteur



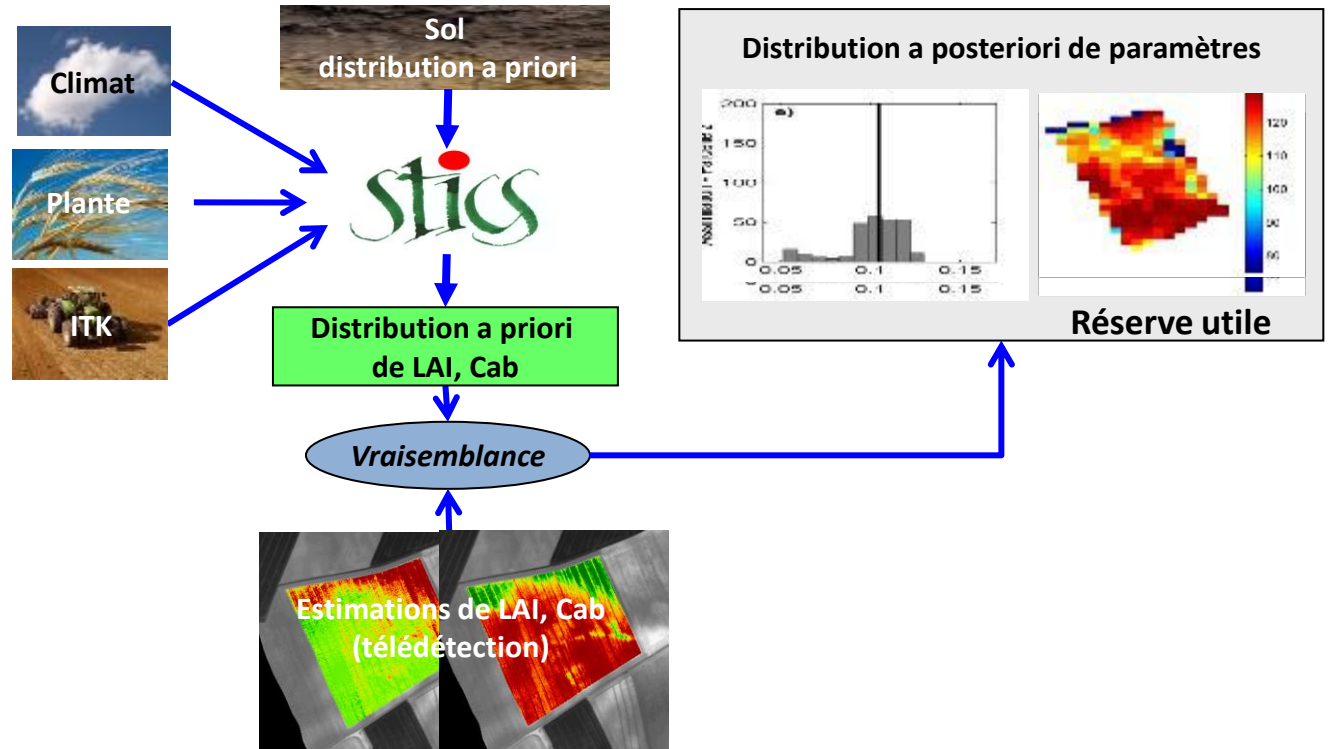
Image RGB



Assimilation des observations dans les modèles de culture

Estimation des propriétés des sols

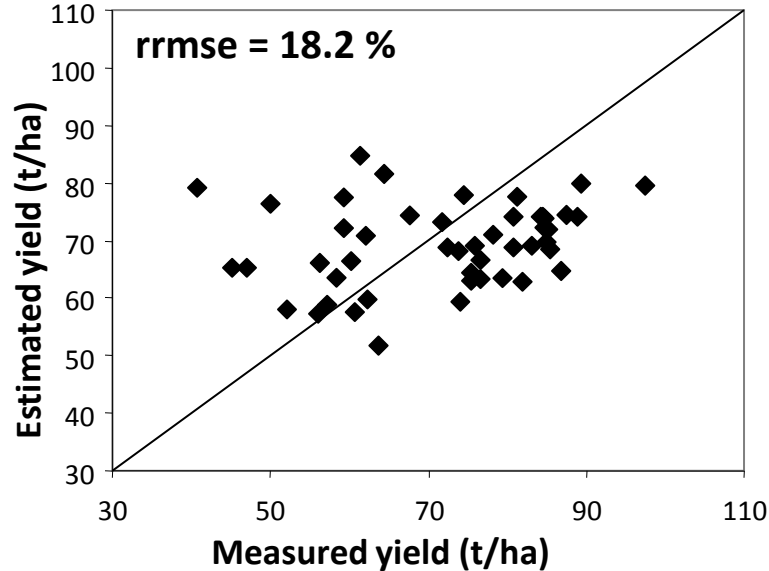
Principe



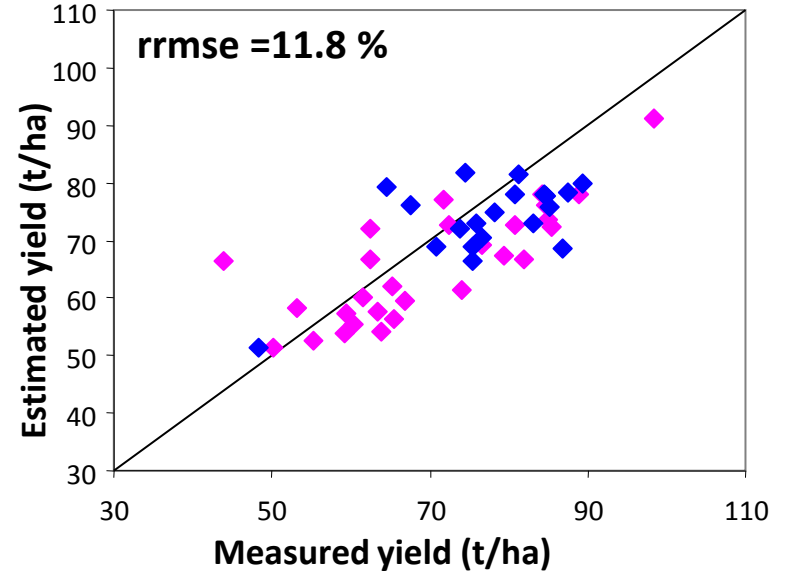
Assimilation des observations dans les modèles de culture

Exemple: rendements de betterave sur un bassin sucrier (Picardie)

Avant assimilation



Après assimilation



CONCLUSION

- Continuation on global products (maintenance, adaptation to S3, long time series)
- Higher spatial resolution:
 - Virtual constellations
 - S2
 - Combination of PROBA-V with L8+S2
- Specific products
 - Synergy with phenotyping activities
- Validation
 - Development of ground measurement systems
 - UAV?
- Assimilation
 - Improvement of canopy structural/functional models