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Usages des drones en environnement : de la détection de processus aux synergies possibles avec la donnée satellitaire

Thomas Houet, Emilien Alvarez-Vanhard

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HAL Id: hal-03474361

<https://hal.science/hal-03474361>

Submitted on 10 Dec 2021

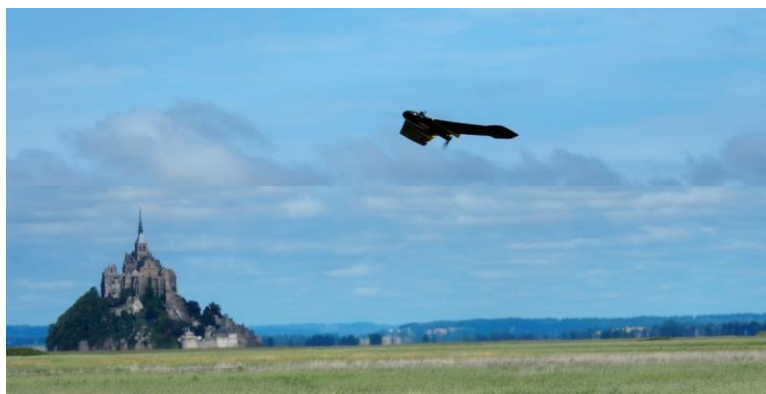
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Apports des drones en écologie et en environnement :

Observation, détection de processus et synergies possibles avec la donnée satellitaire



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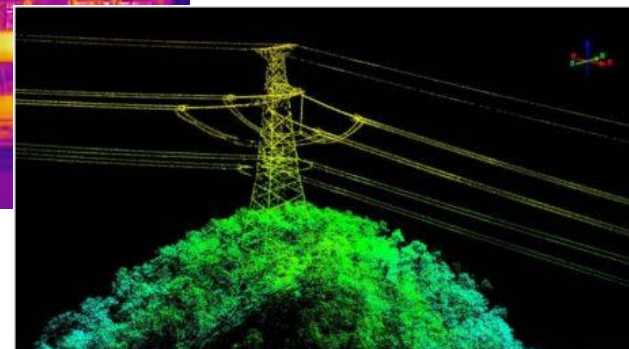
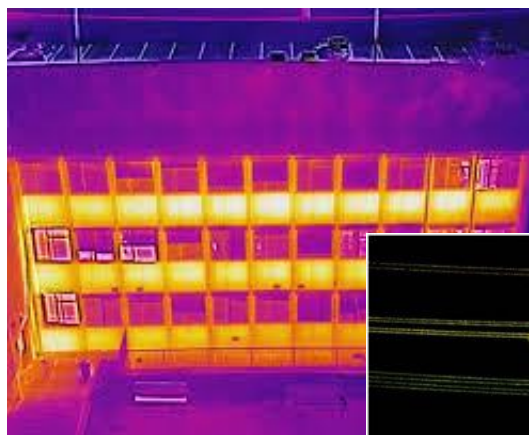
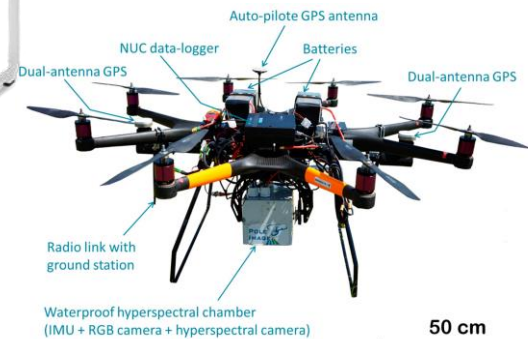




Voilure fixe



Voilure tournante



Grandes étendues
Applications cartographiques

Plus petites étendues
Vues obliques / 3D



OBSERVATION



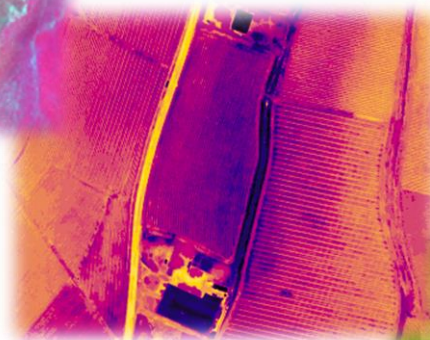
DÉTECTION



CARACTÉRISATION



PROCESSUS



SYNERGIES



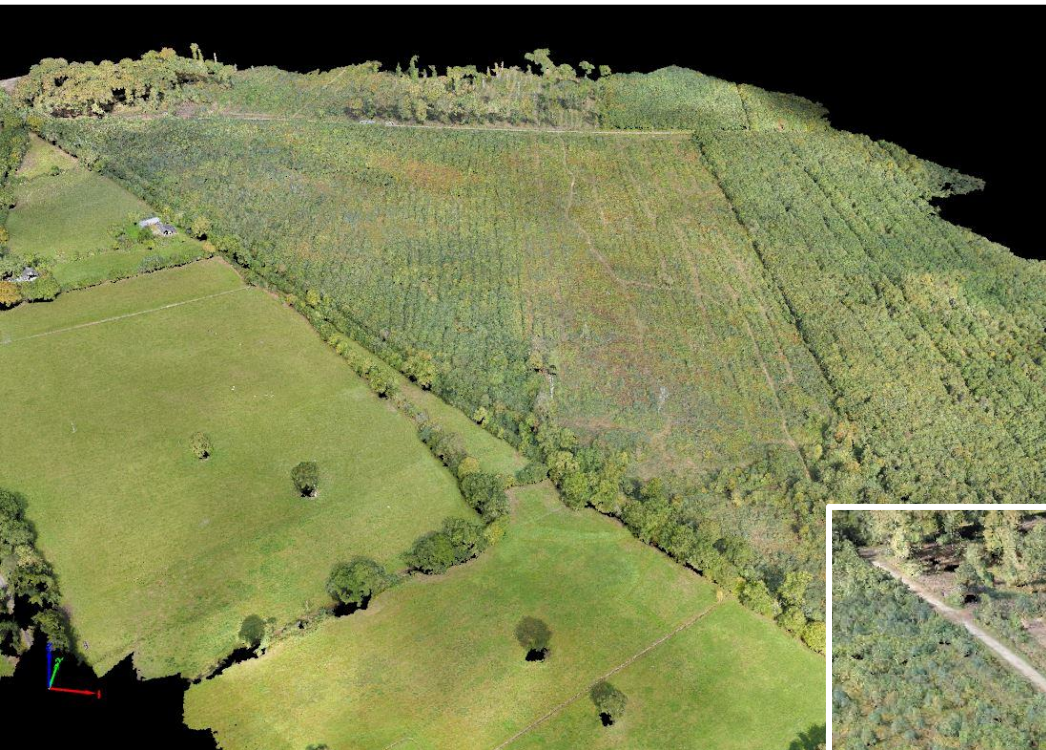
OBSERVATION

DÉTECTION

CARACTÉRISATION

PROCESSUS

SYNERGIES



OBSERVATION

DÉTECTION

CARACTÉRISATION

PROCESSUS

SYNERGIES

Journal of Coastal Research

SI

95

1117–1121

Coconut Creek, Florida

2020

Towards Better Mapping of Seagrass Meadows using UAV Multispectral and Topographic Data

Dorothee James^{†*}, Antoine Collin^{†‡}, Thomas Houet[§], Antoine Mury[†], Hélène Gloria[†], and Nolwenn Le Poulain[†]

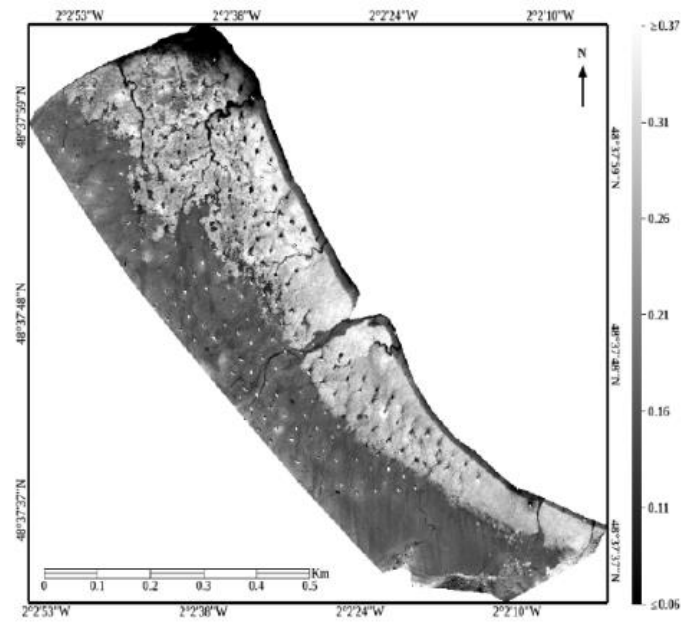
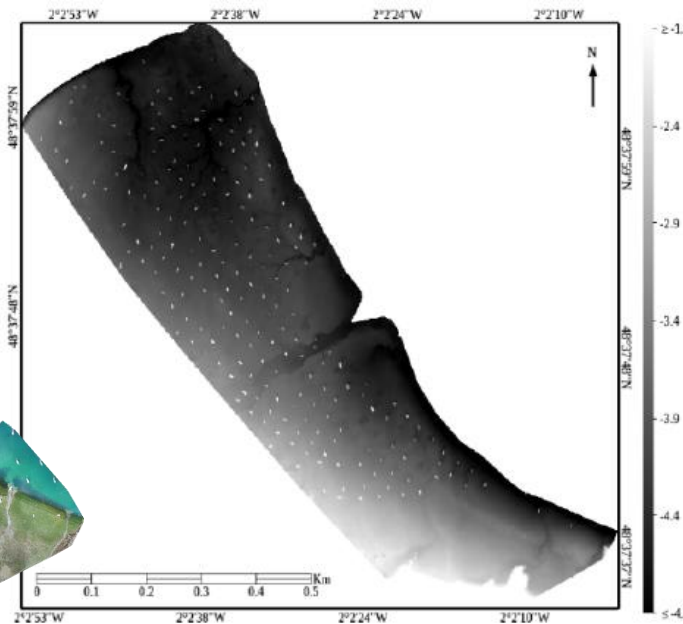
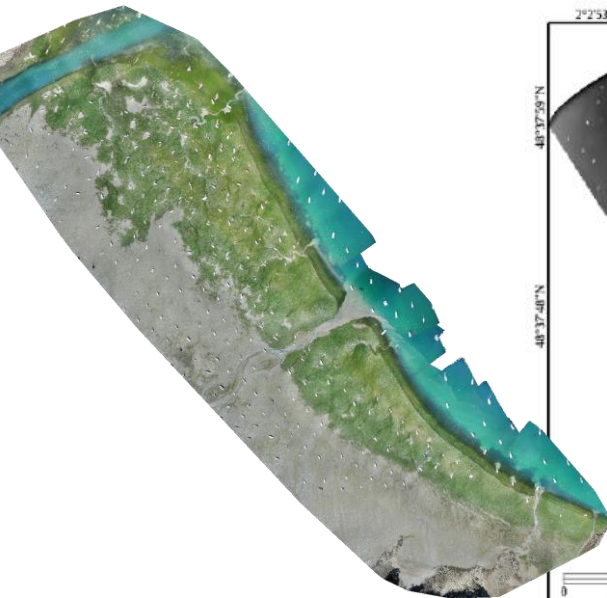
[†]Ecole Pratique des Hautes Etudes (EPHE), PSL Université Paris, CNRS UMR 6554 LETG, Dinard, France

[‡]Laboratoire d'Excellence CORAIL, France

[§]CNRS UMR 6554 LETG, Rennes, France



www.cerf-jcr.org



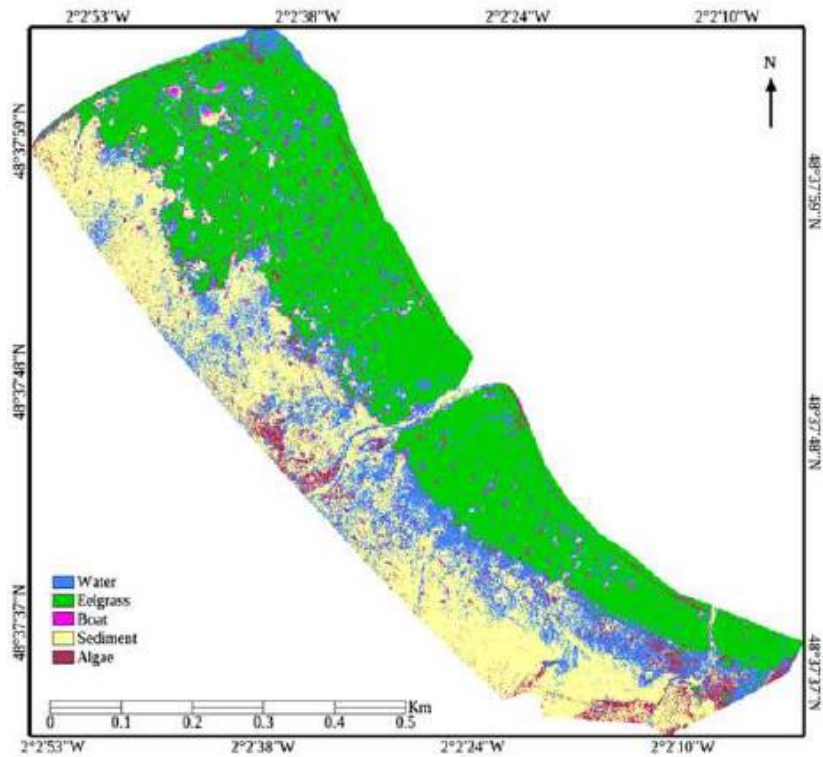
OBSERVATION

DÉTECTION

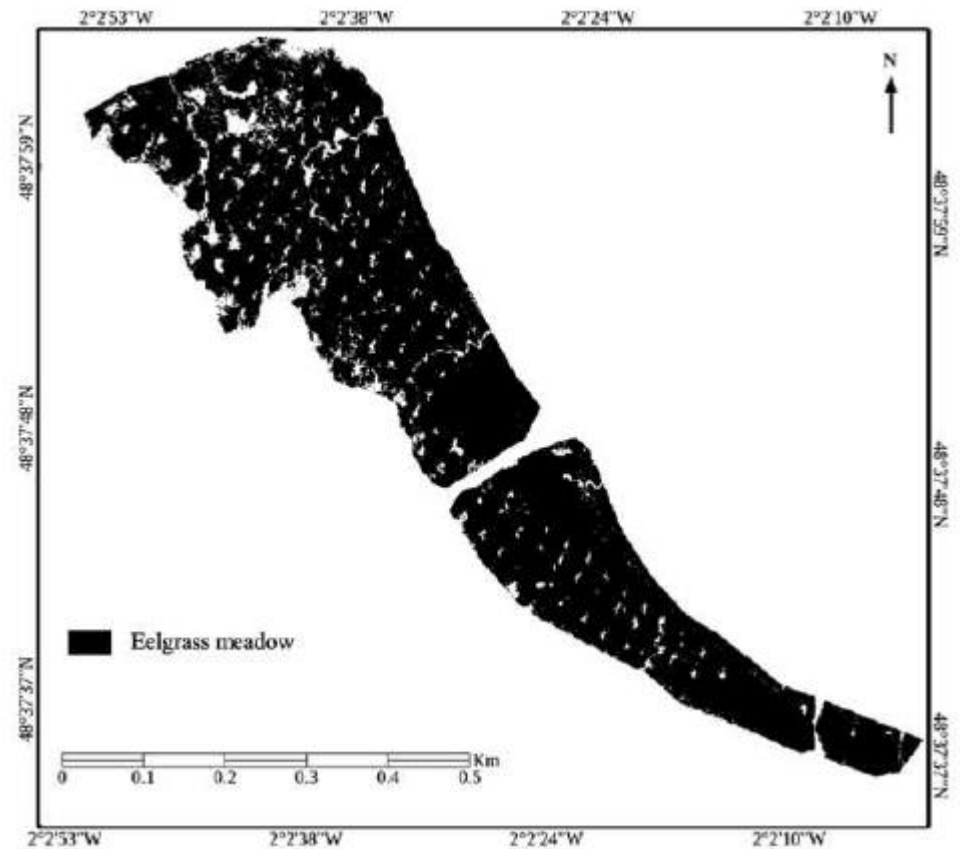
CARACTÉRISATION

PROCESSUS

SYNERGIES



14.64% de l'herbier est abimé par les bateaux





ELSEVIER

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Remote Sensing of Environment

journal homepage: www.elsevier.com/locate/rse

Can UAVs fill the gap between in situ surveys and satellites for habitat mapping?

Emilien Alvarez-Vanhard^{a,c,*}, Thomas Houet^{a,c}, Cendrine Mony^{b,c}, Lucie Lecoq^{b,c}, Thomas Corpetti^a^a CNRS UMR 6554 LETG, Université Rennes 2, Place du recteur Henri le Moal, 35000 Rennes, France^b CNRS UMR 6553 ECOBIO, Université Rennes 1, Avenue Général Leclerc, 35000 Rennes, France^c LTSER site "ZA Armorique", France

Natura 2000 area



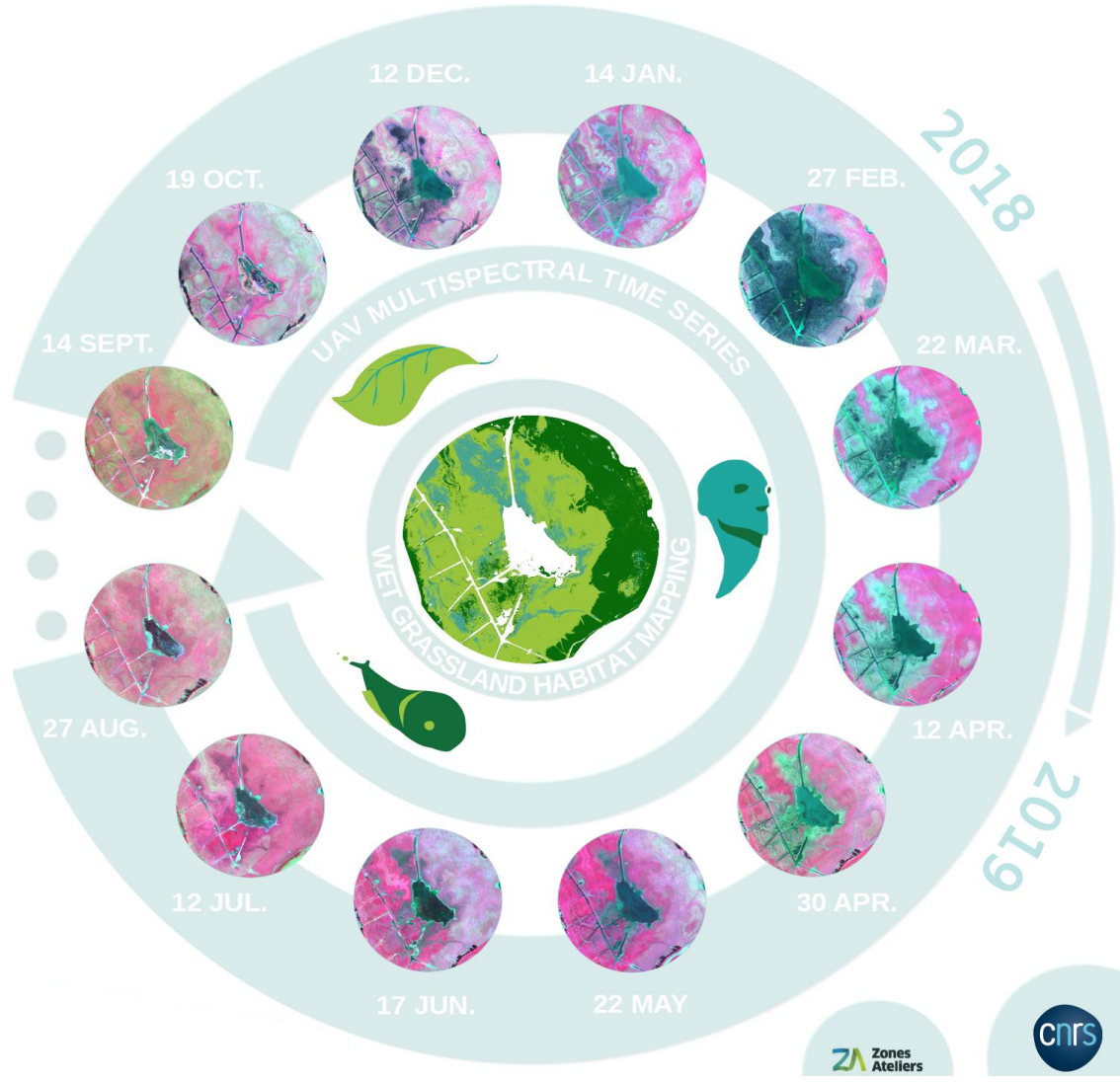
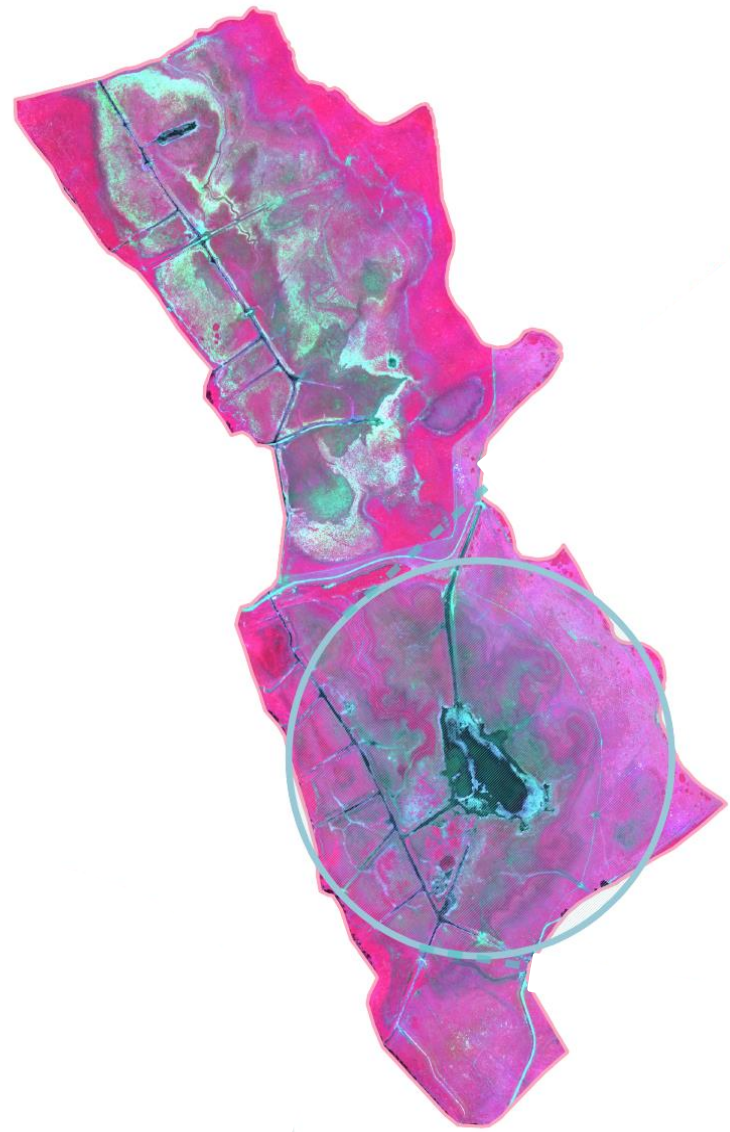
OBSERVATION

DÉTECTION

CARACTÉRISATION

PROCESSUS

SYNERGIES



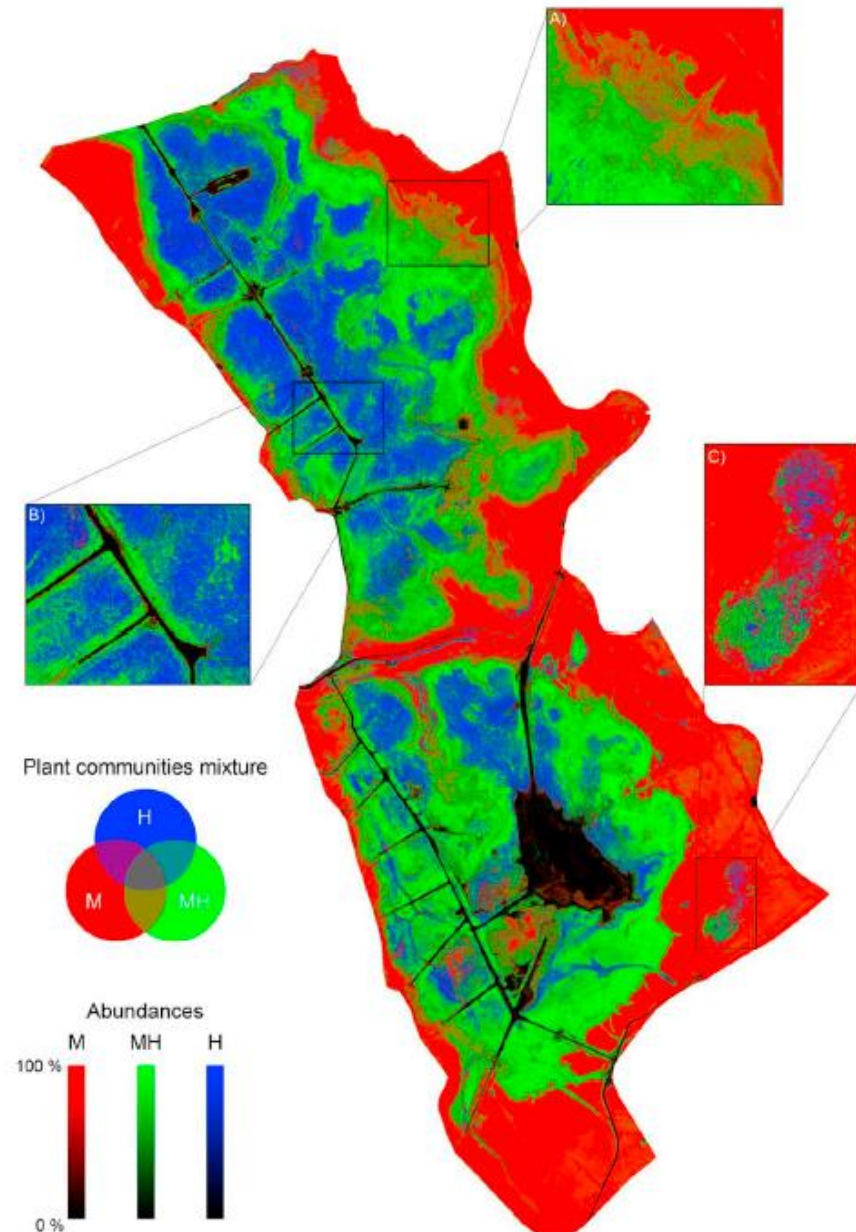
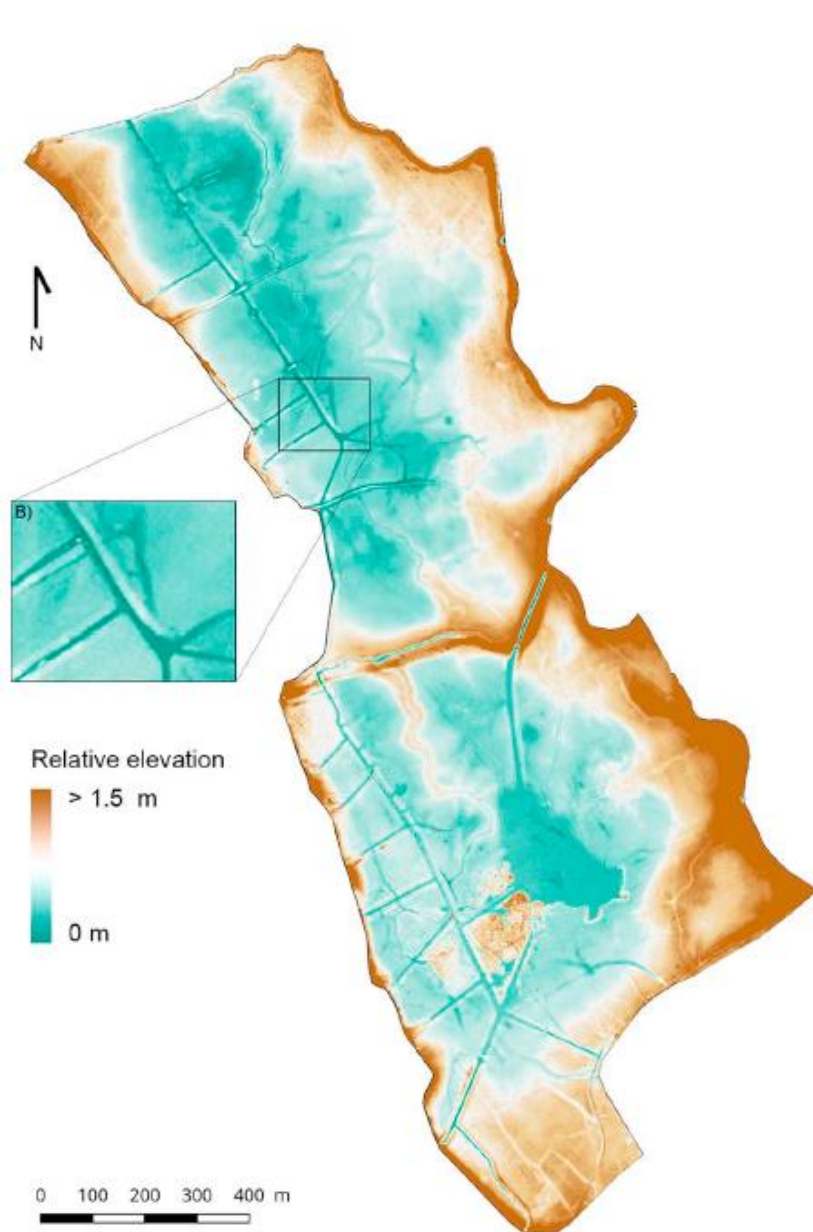
OBSERVATION

DÉTECTION

CARACTÉRISATION

PROCESSUS

SYNERGIES



OBSERVATION

DÉTECTION

CARACTÉRISATION

PROCESSUS

SYNERGIES

MICRO-CLIMATOLOGIE VITICOLE

Saint-Emilion – Château Ausone



OBSERVATION

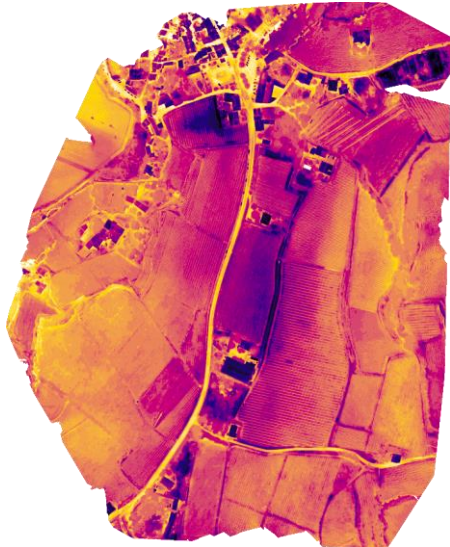
DÉTECTION

CARACTÉRISATION

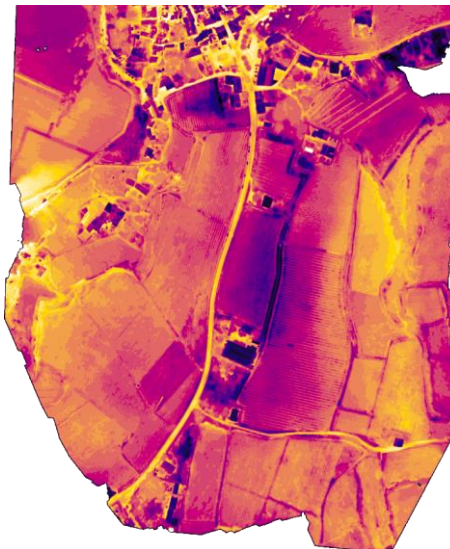
PROCESSUS

SYNERGIES

T1: 7h



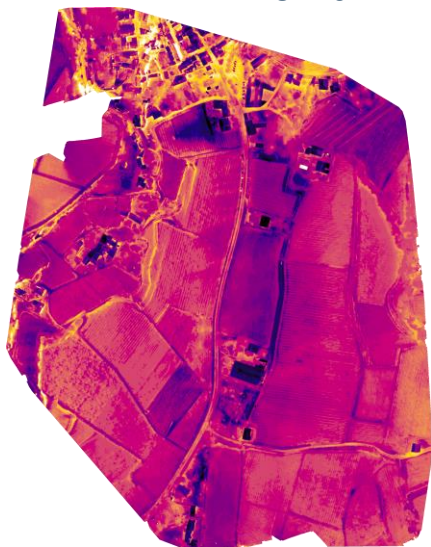
T2: 7h20



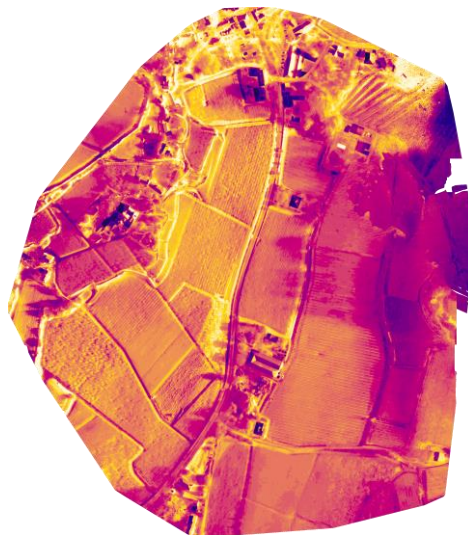
T3: 7h40



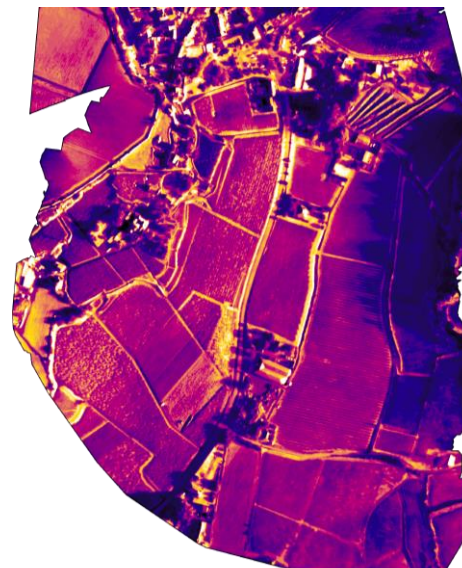
T4: 8h10



T5: 8h40



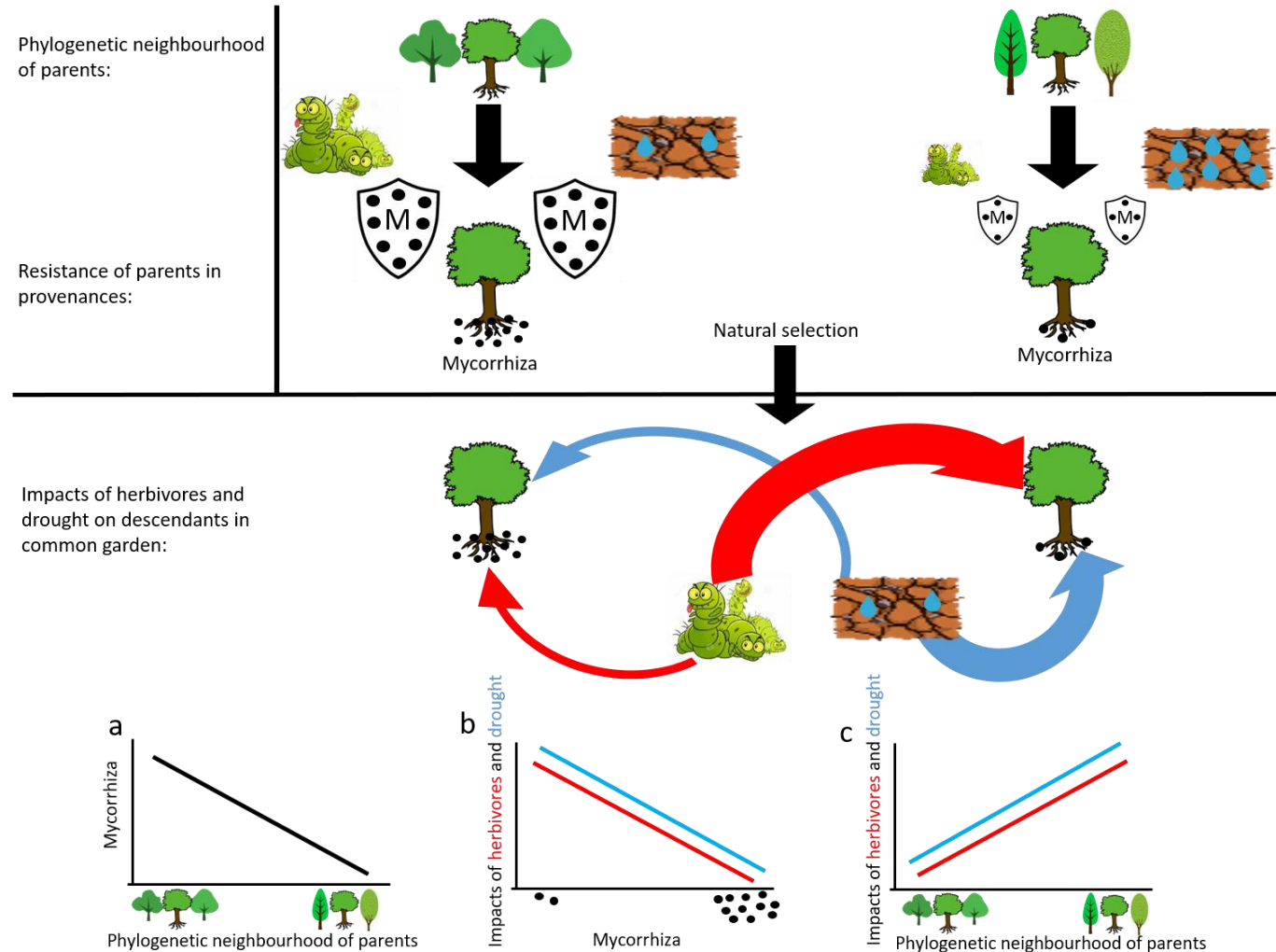
T6: 9h40



Compréhension des processus en écologie forestière

Forêt de la Petite Charrie

Pihain et al. (Submitted) Nature Ecology and Evolution



OBSERVATION

DÉTECTION

CARACTÉRISATION

PROCESSUS

SYNERGIES



<https://portail.indigeo.fr/geonetwork/srv/api/records/a3cf45c2-5dde-49eb-a7b4-794e2da17b45>

Jeu de données Drone de la Forêt de la Petite Charnie

Jeu de données acquises par drone sur la forêt INRAe de la Petite Charnie. Acquisition le 2018-09-01_

Téléchargements et liens

	Digital Object Identifier (DOI) https://doi.org/10.35110/a3cf45c2-5dde-49eb-a7b4-794e2da17b45	Ouvrir le lien
	Charnie_2018-09-01_MNS Charnie_2018-09-01_MNS Charnie_2018-09-01_MNS https://portail.indigeo.fr/geoserver/D2T/wms?REQUEST=getCoverage&service=WCS&coverage=Charnie_2018-09-01_MNS&version=1.0.0&CRS=EPSG:2154&bbox=464004.623,6780709.3861,465567.973,6781320.5861&resx=0.0499999999999993&resy=0.05000000000000152&format=geotiff	Télécharger
	Charnie_2018-09-01_MS Charnie_2018-09-01_MS Charnie_2018-09-01_MS https://portail.indigeo.fr/geoserver/D2T/wms?REQUEST=getCoverage&service=WCS&coverageId=Charnie_2018-09-01_MS&version=2.0.1&CRS=EPSG:2154&bbox=463966.19802,6780769.73788,465524.55174,6781301.3329&resx=0.126060000000001&resy=0.126059999999974&format=geotiff	Télécharger

Aperçu

Étendue spatiale

Étendue temporelle

Date de publication
2021-03-22

Periode
Sat Sep 01 2018 00:00:00 GMT+0200 ▶ Sat Sep 01 2018 00:00:00 GMT+0200

Fourni par

<https://doi.org/10.35110/a3cf45c2-5dde-49eb-a7b4-794e2da17b45>

OBSERVATION

DÉTECTION

CARACTÉRISATION

PROCESSUS

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Science of Remote Sensing 3 (2021) 100019

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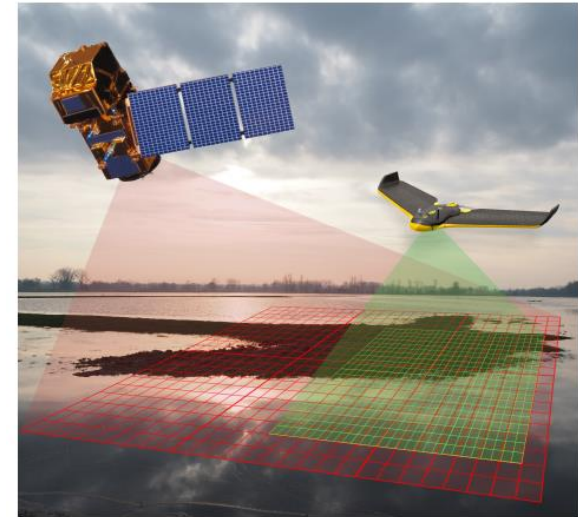


Review Article

UAV & satellite synergies for optical remote sensing applications: A literature review

Alvarez-Vanhard Emilien*, Corpetti Thomas, Houet Thomas

CNRS UMR 6554 LETG, Université Rennes, Place Du Recteur Henri Le Moal, 35000, Rennes, France



1 à 30cm

Illimitée

(Infra-horaire à mensuelle, Jour / nuit)

Qq 10^{aines} à 100^{aines} d'Ha

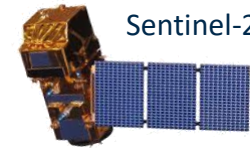
RGB, multispectral, thermique, Lidar

RESOLUTION SPATIALE

FREQUENCE

ETENDUE

CAPTEURS



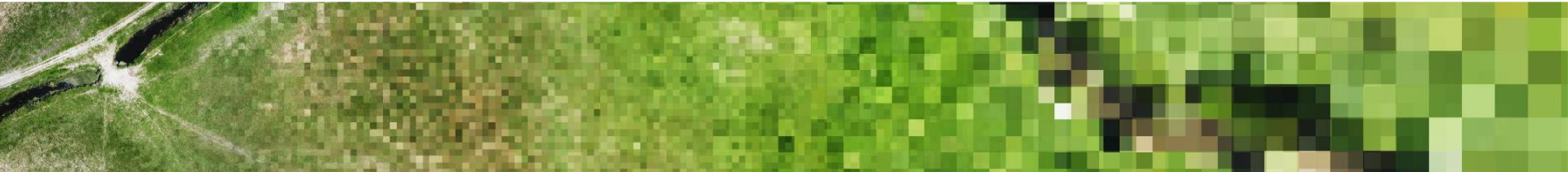
Sentinel-2

10m

5 jours / Heure fixe

Milliers de km²

Multispectral



OBSERVATION

DÉTECTION

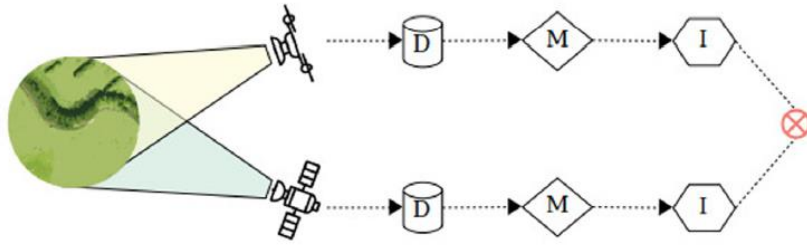
CARACTÉRISATION

PROCESSUS

SYNERGIES

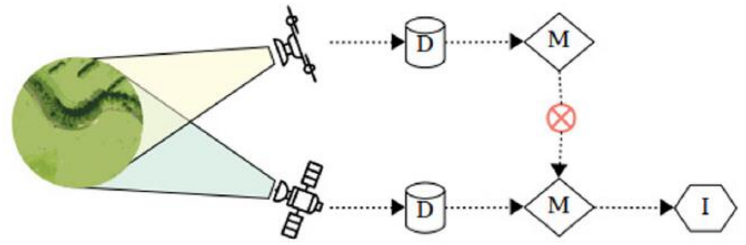
A)

Data Comparison



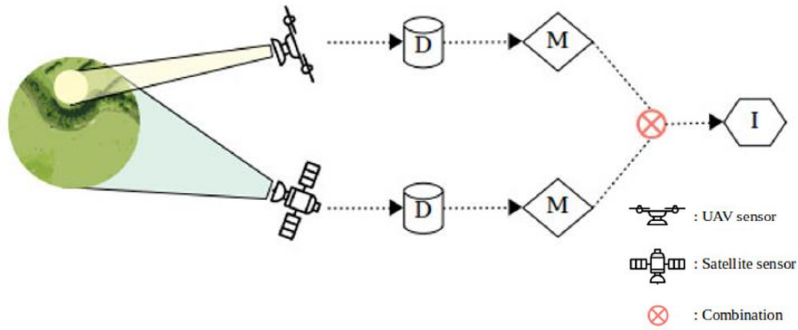
C)

Model Calibration



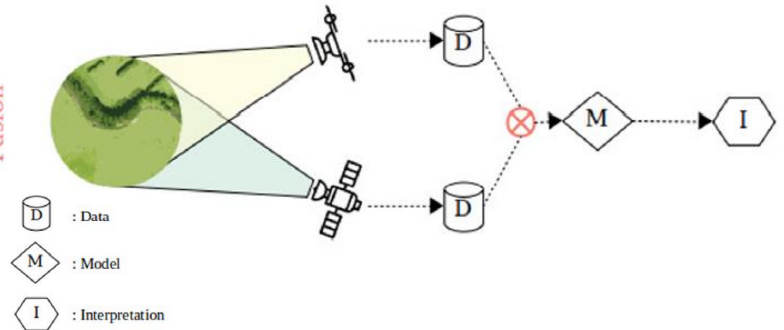
B)

Multiscale Explanation



D)

Data Fusion



A)



OBSERVATION

DÉTECTION

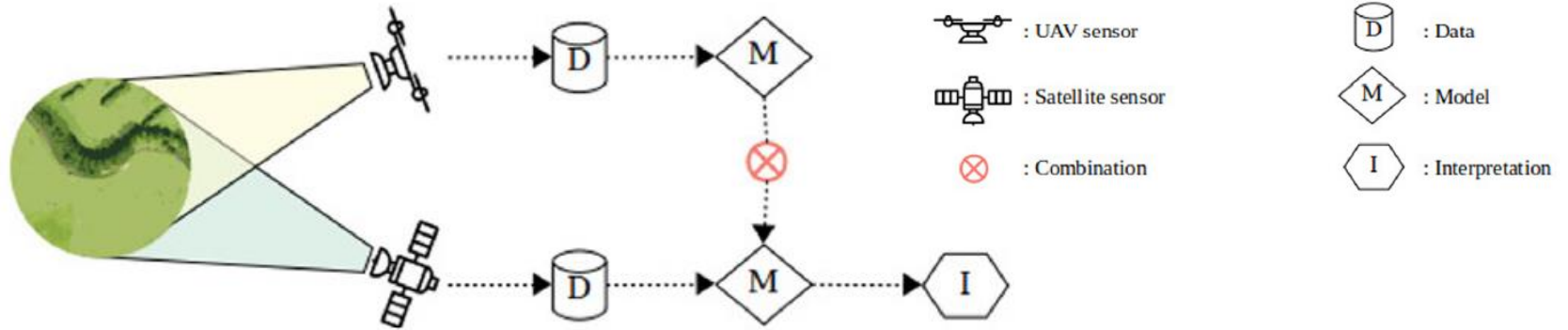
CARACTÉRISATION

PROCESSUS

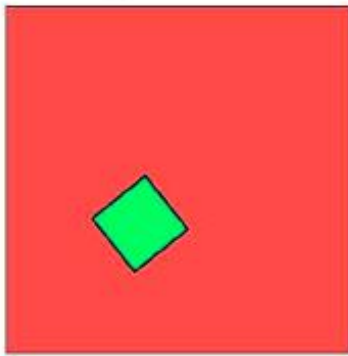
SYNERGIES

C)

Model
Calibration

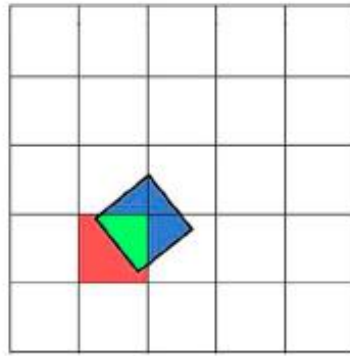


1) Sentinel-2



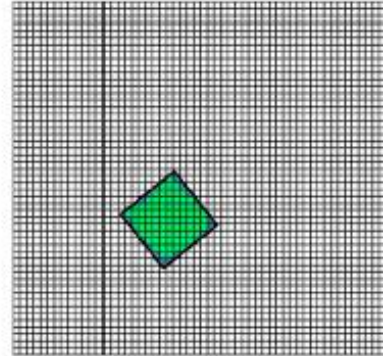
10 m

2) Pleiades



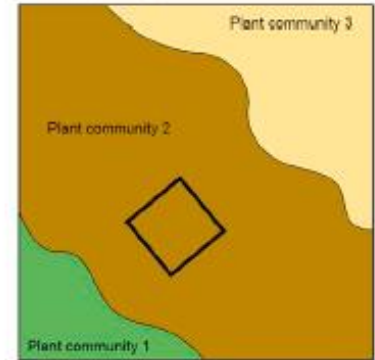
2 m

3) UAV



0.2 m

4) Vegetation cover

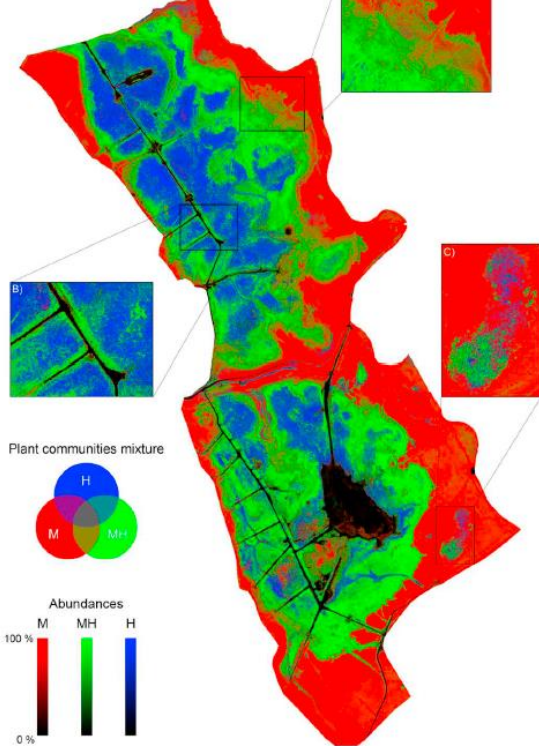


Spatial resolution of remotely sensed data (pixel size)

- Red square: Potential mixture
- Green square: Pure signal
- Blue square: Missing signal



Plot area



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Can UAVs fill the gap between in situ surveys and satellites for habitat mapping?

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^a CNRS UMR 6554 LETG, Université Rennes 2, Place du recteur Henri le Moal, 35000 Rennes, France

^b CNRS UMR 6553 ECOBIO, Université Rennes 1, Avenue Général Leclerc, 35000 Rennes, France

^c LTSER site "ZA Armorique", France

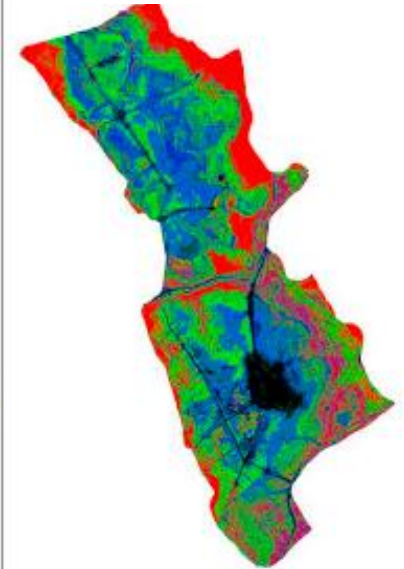
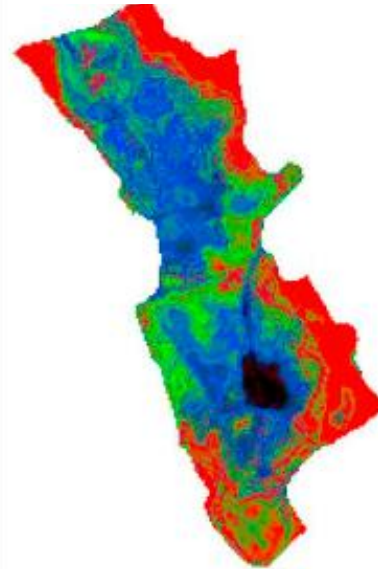
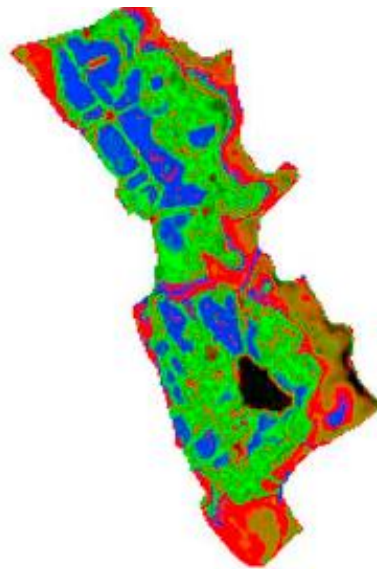
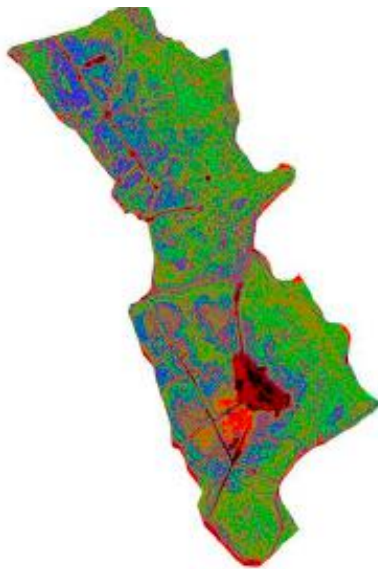
Nov 2017 Pléiades

Apr 2018 – S2

May 2018 S2

May 2018 – Pléiades

UAV
Endmembers



CONCLUSIONS

- Une approche de l'écologie et de l'environnement à la fois indépendante et complémentaire aux approches existantes (in situ monitoring, surface sensing, remote sensing)
- Le trait d'union entre l'espace (satellite) et le terrain indispensable dans le suivi des socio-écosystèmes

