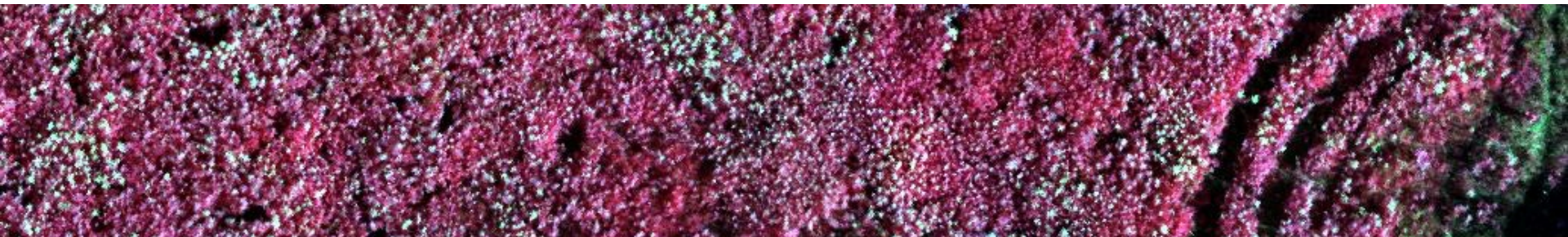


# La spectranomique aérienne entraîne la science de la biodiversité dans l'ère du *big data*



Etienne Laliberté  
Professeur

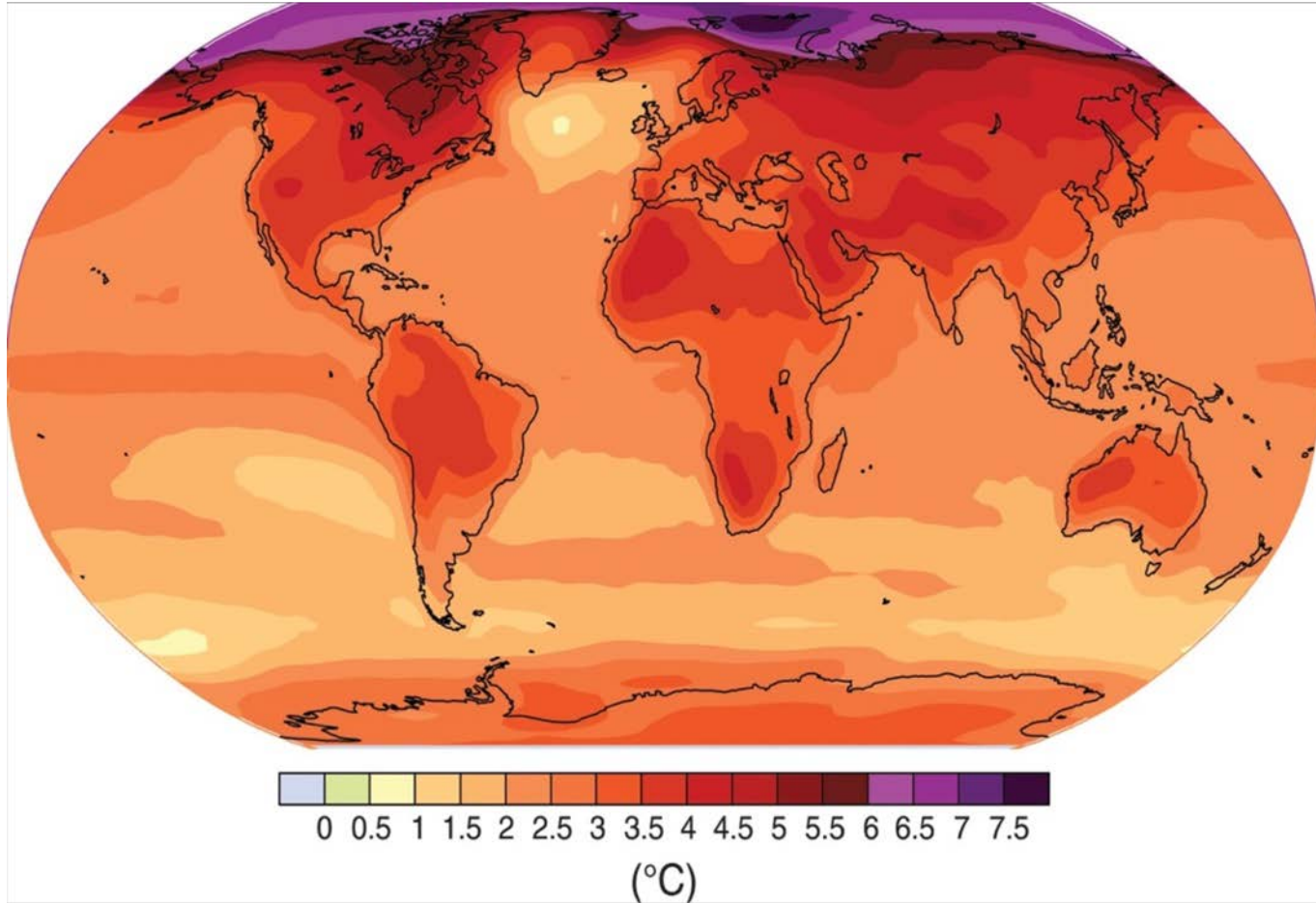


Institut de recherche  
en **biologie végétale**

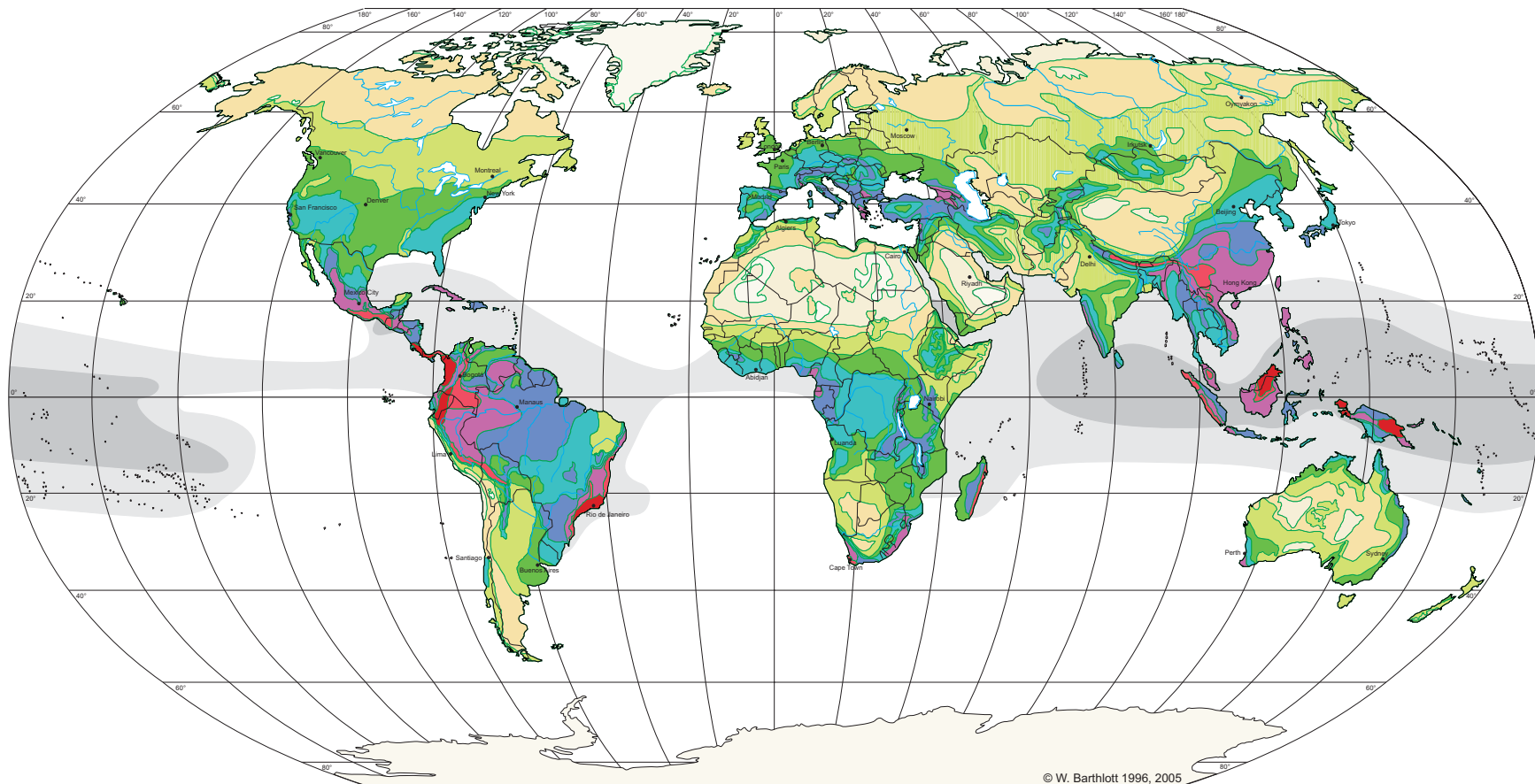
Centre sur la biodiversité  
de l'**Université de Montréal**



# Température 2090-99 vs.1980-99



~350 000 espèces de plantes

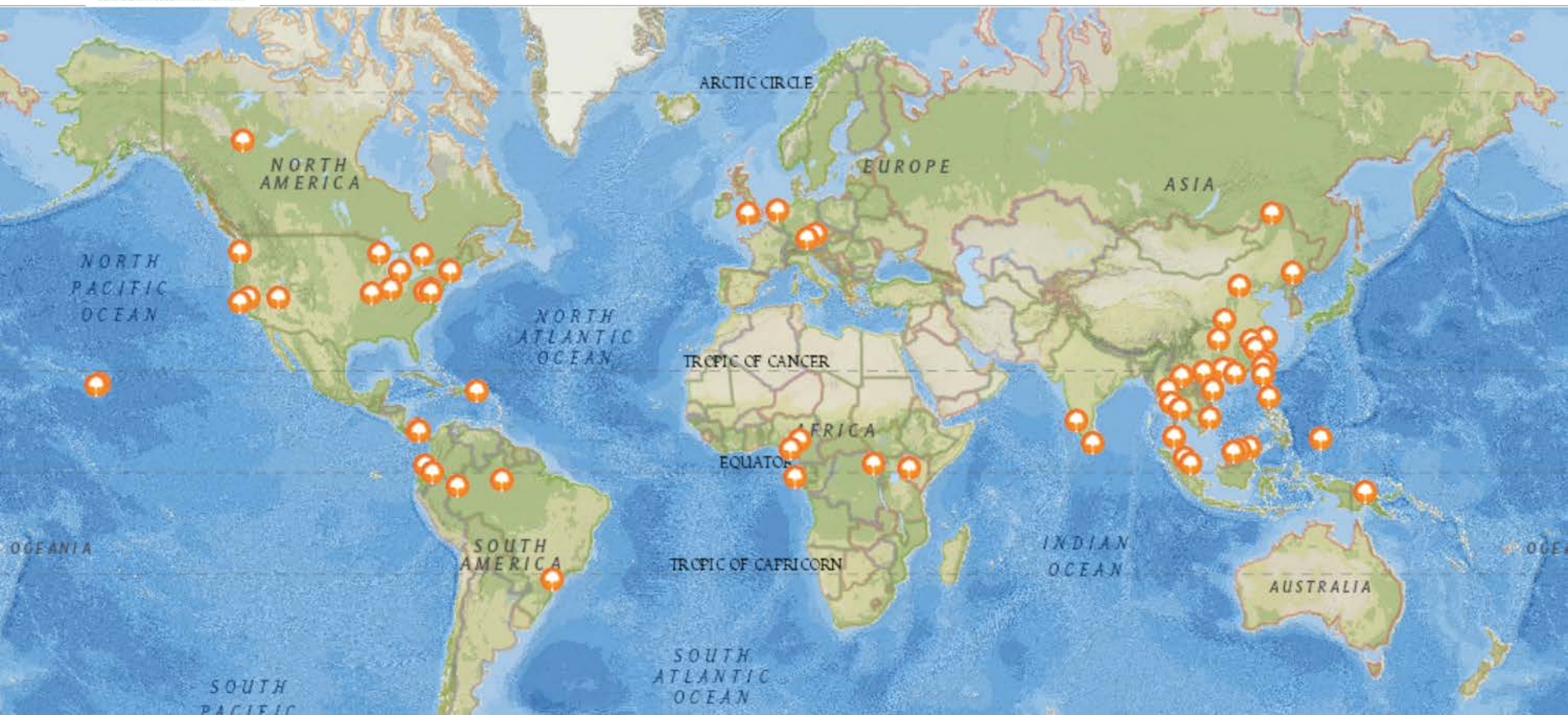


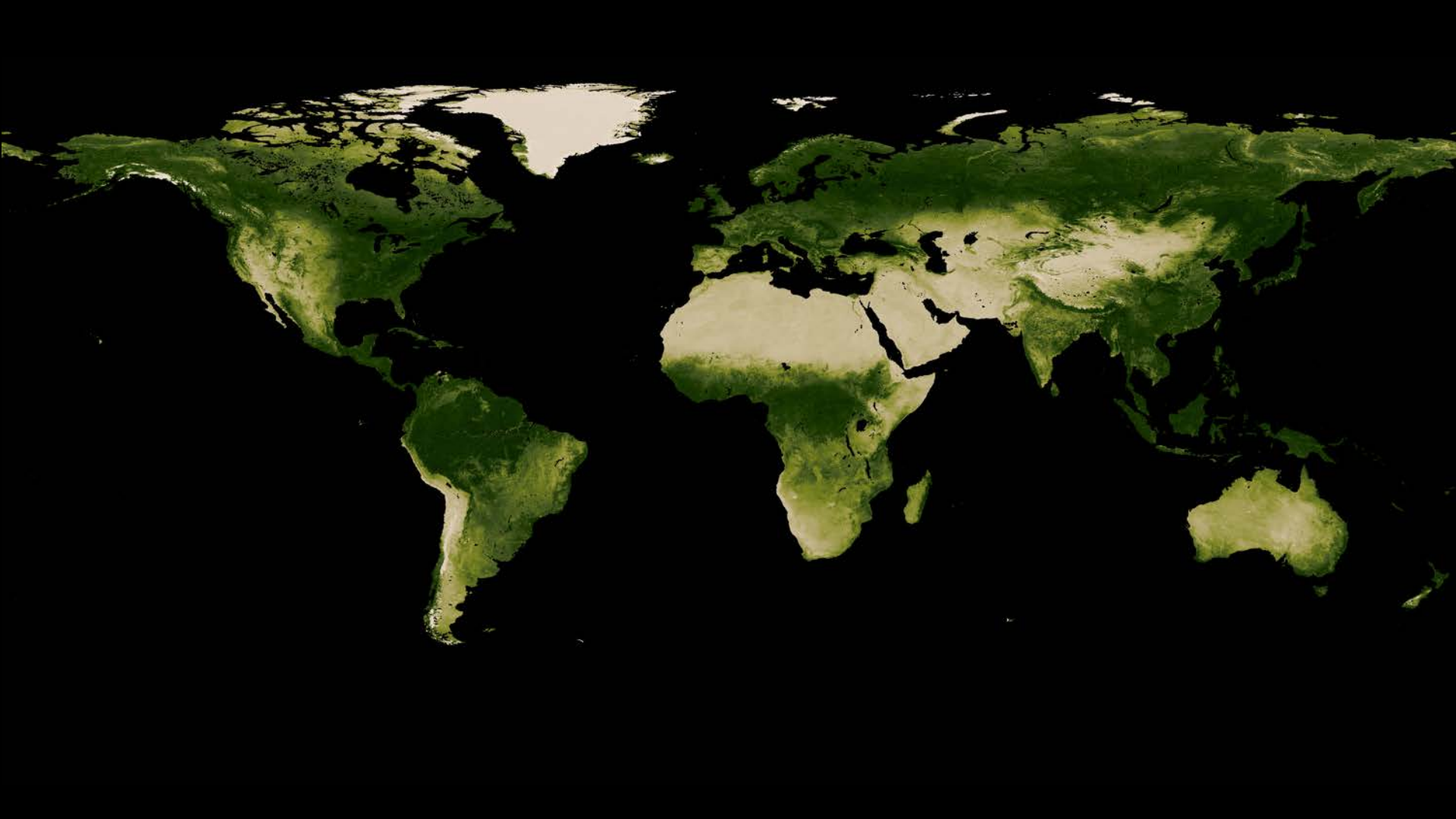


2700 terrains de soccer



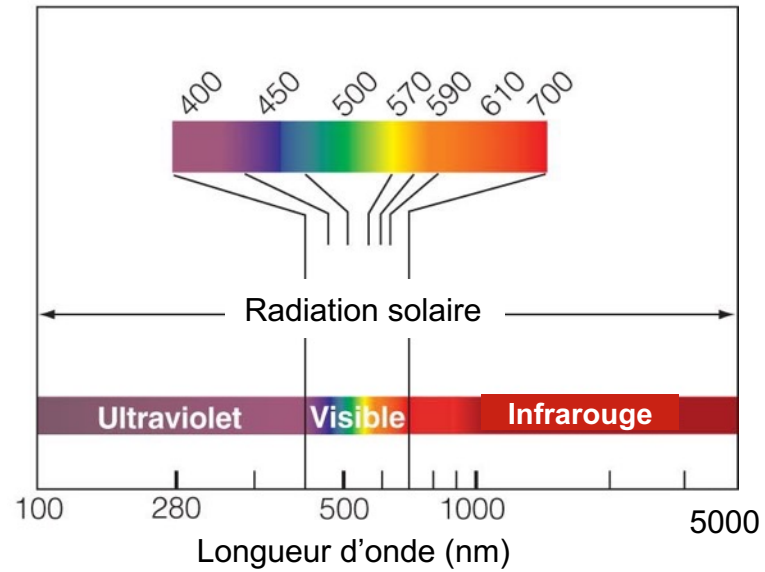
= 1 / 2 000 000 forêts

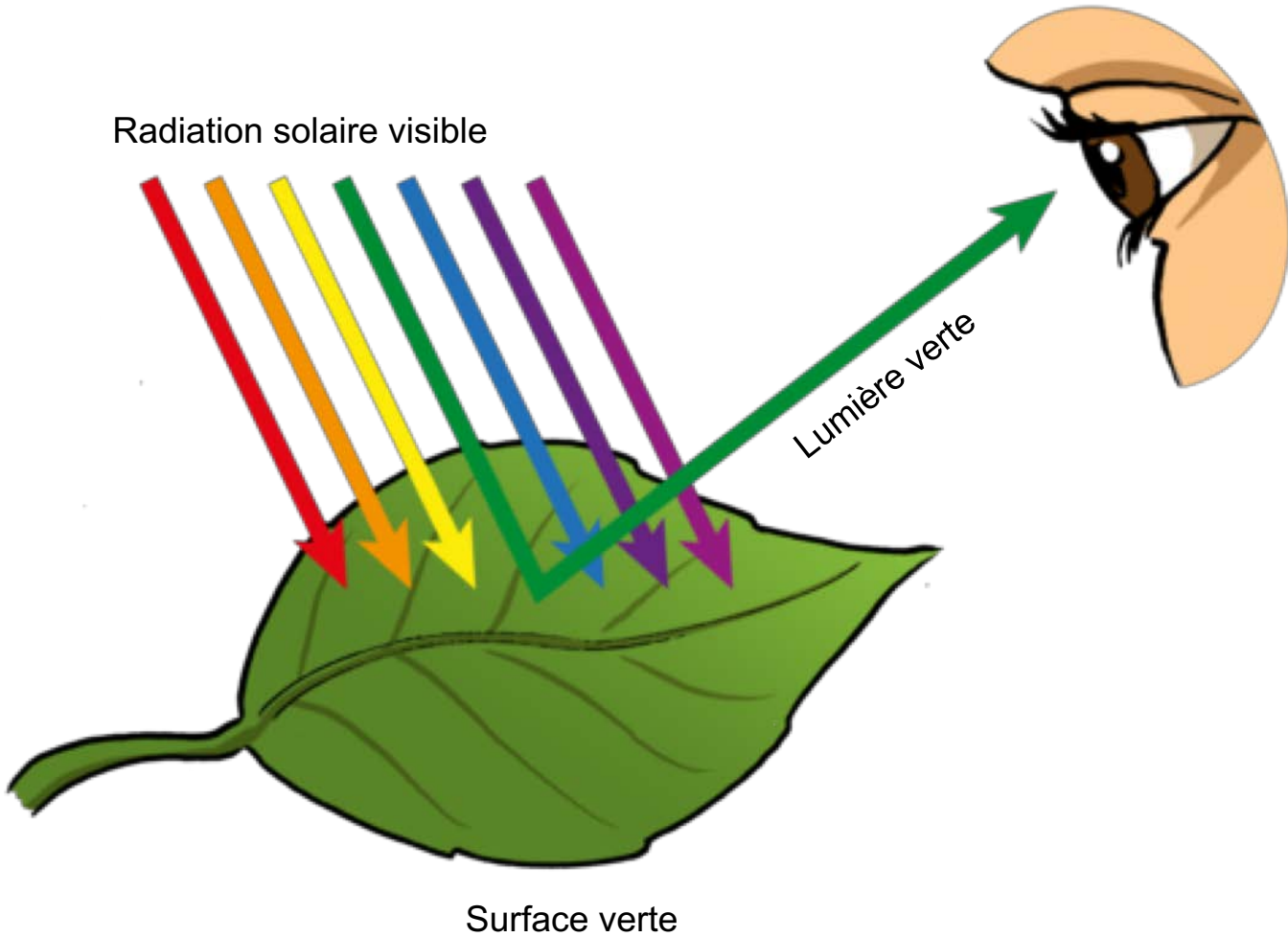


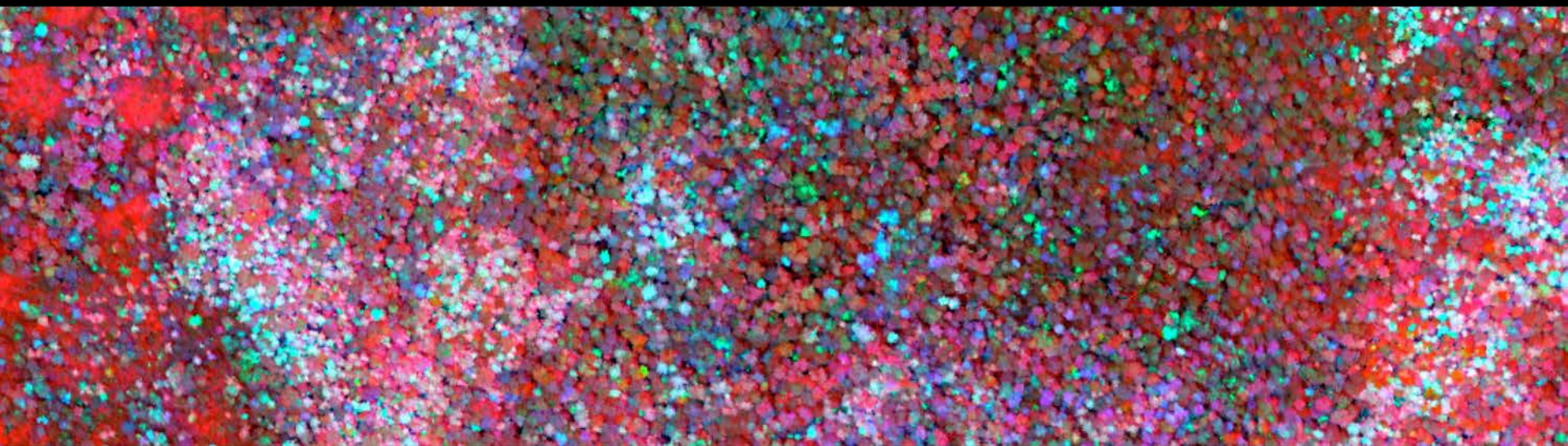


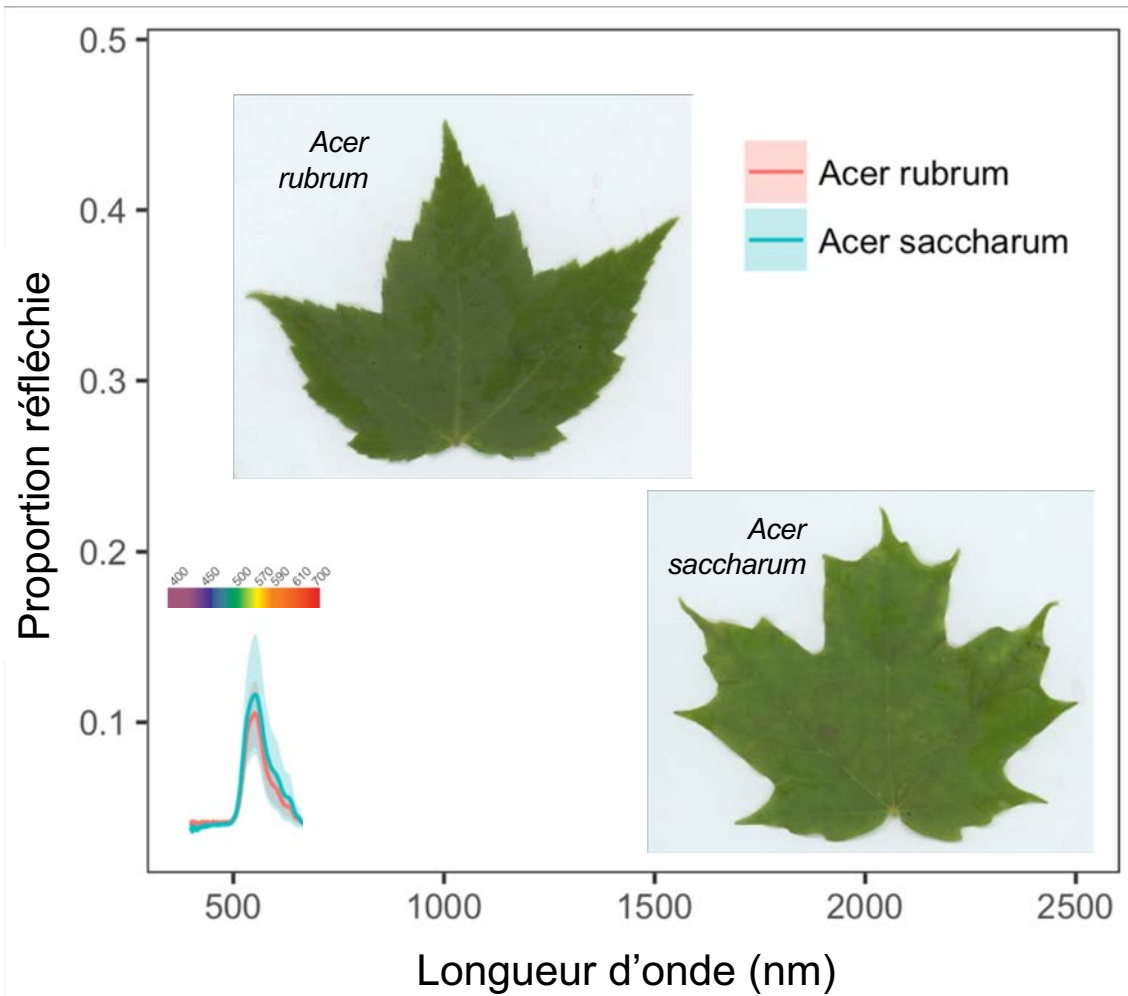


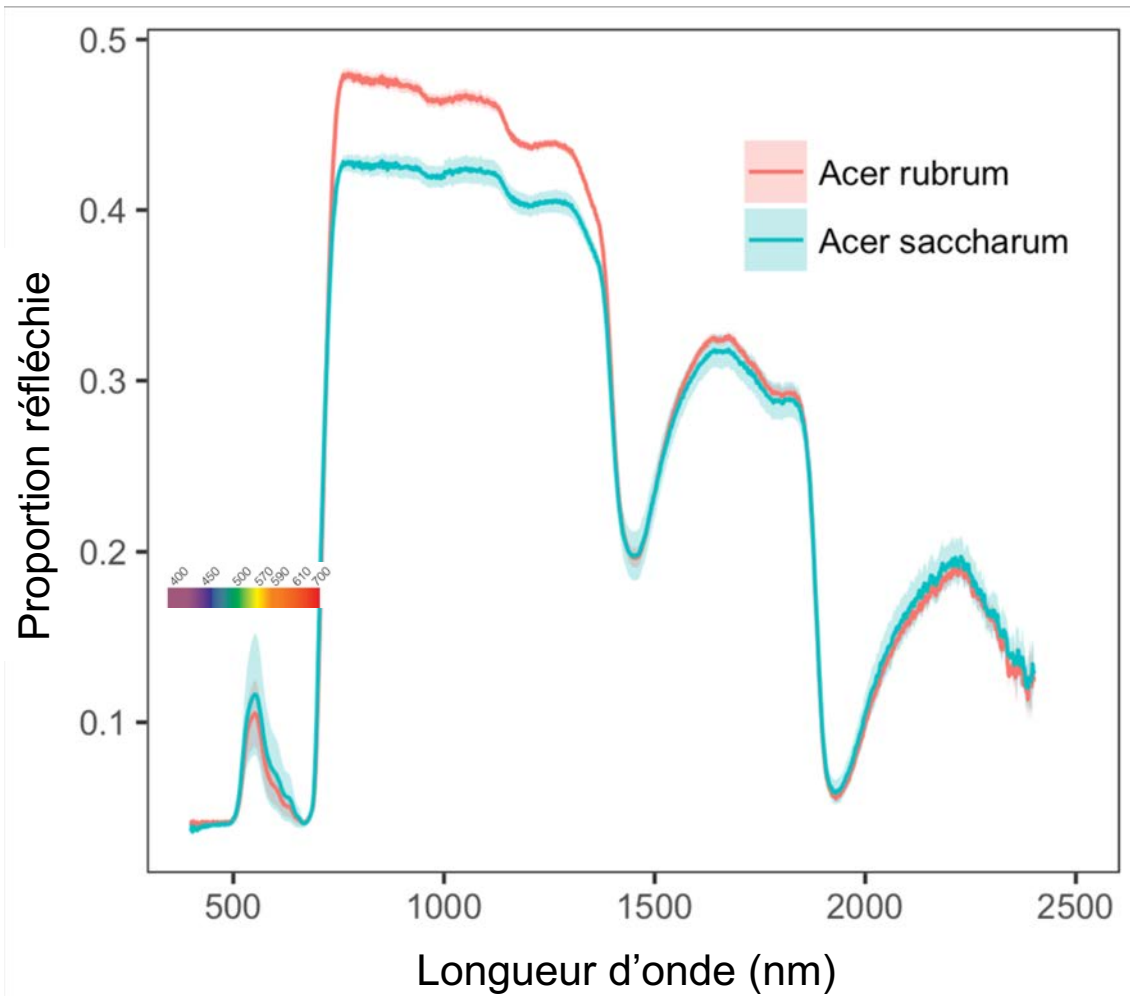


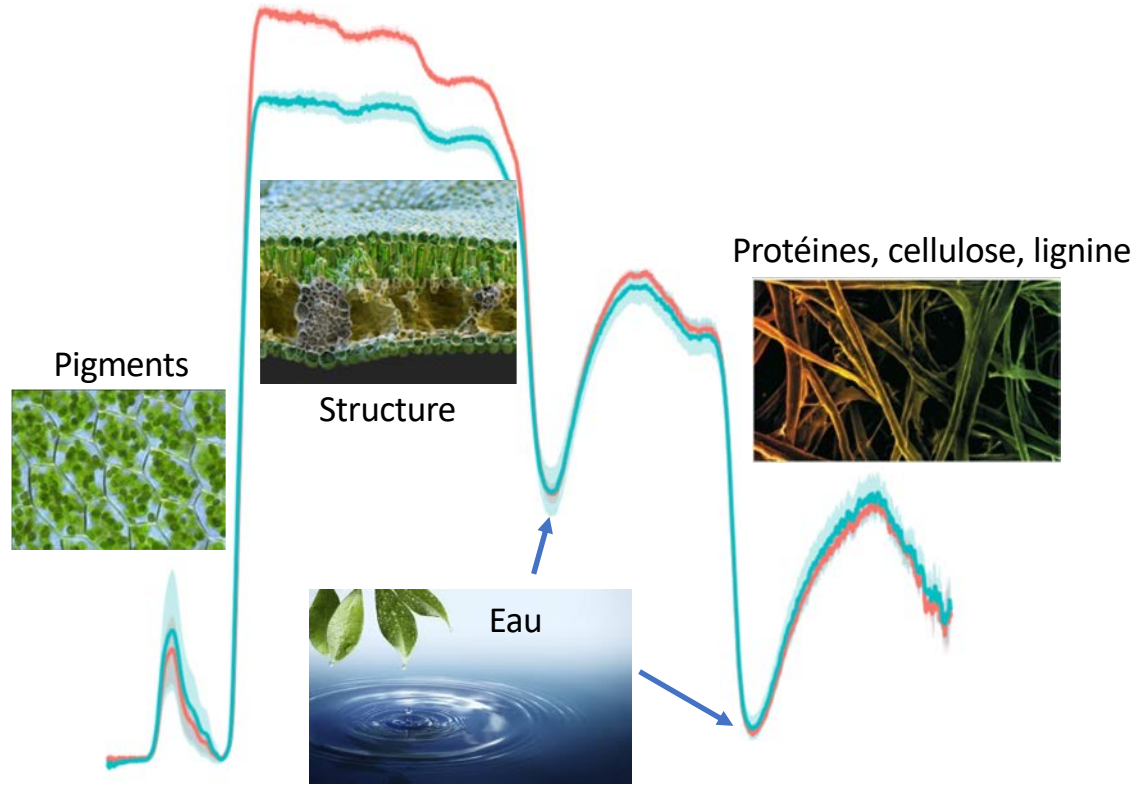






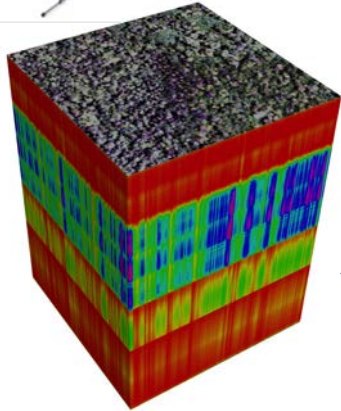








Imagerie  
hyperspectrale



Taxonomie



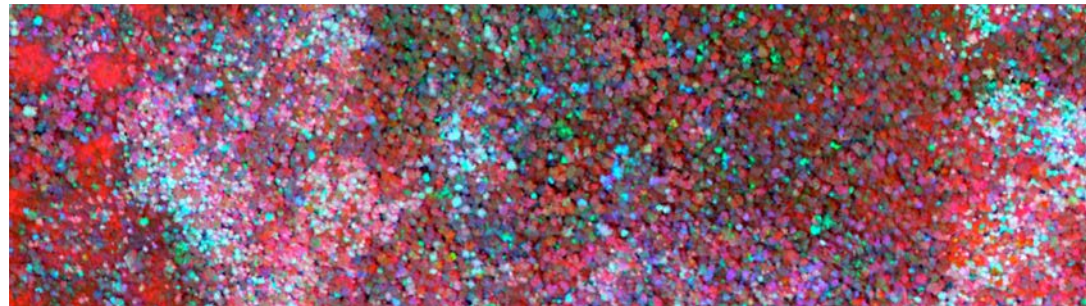
Composition chimique



Signatures spectrales foliaires



Cartes de biodiversité végétale



Photogrammètrie

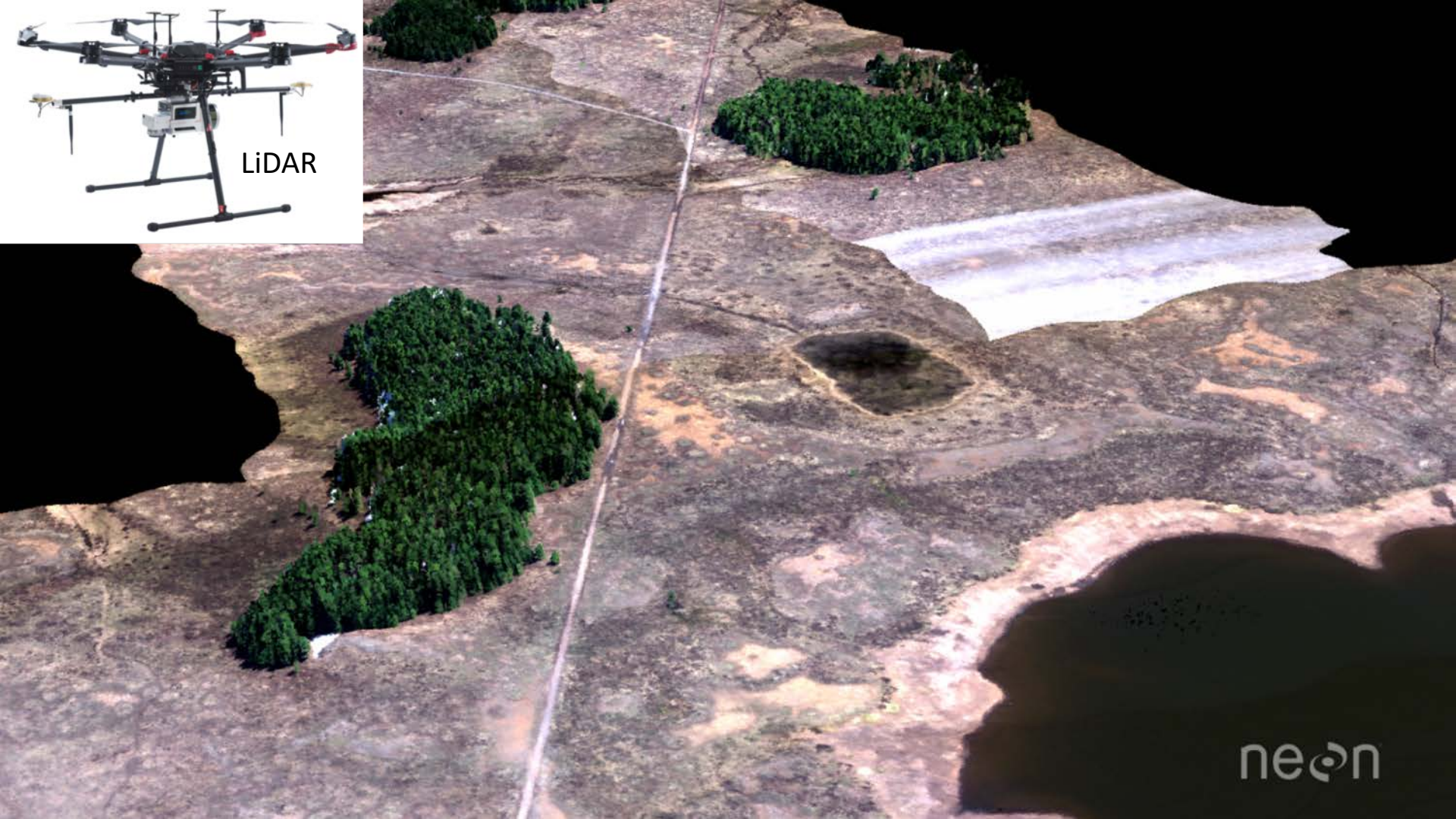




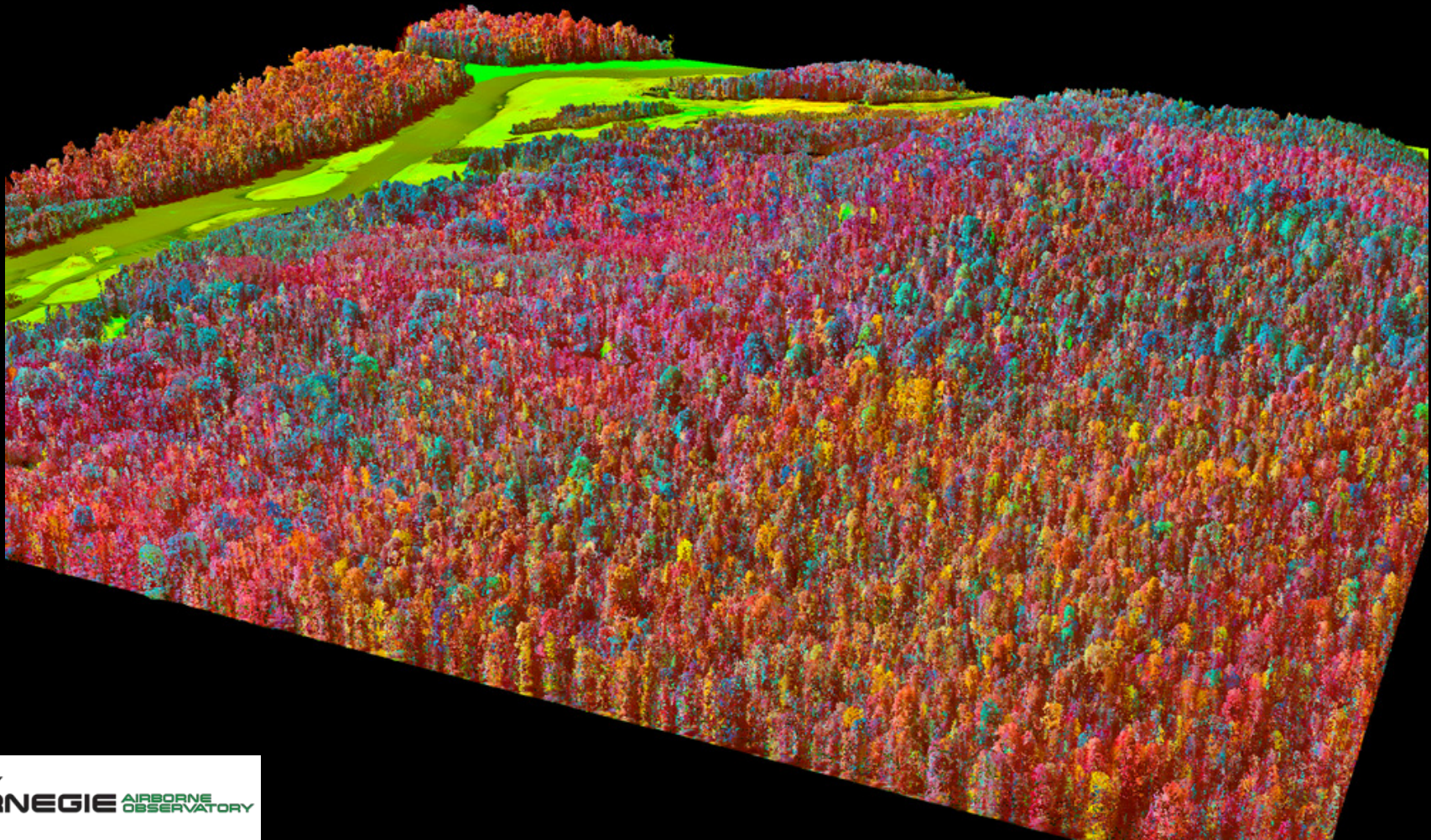


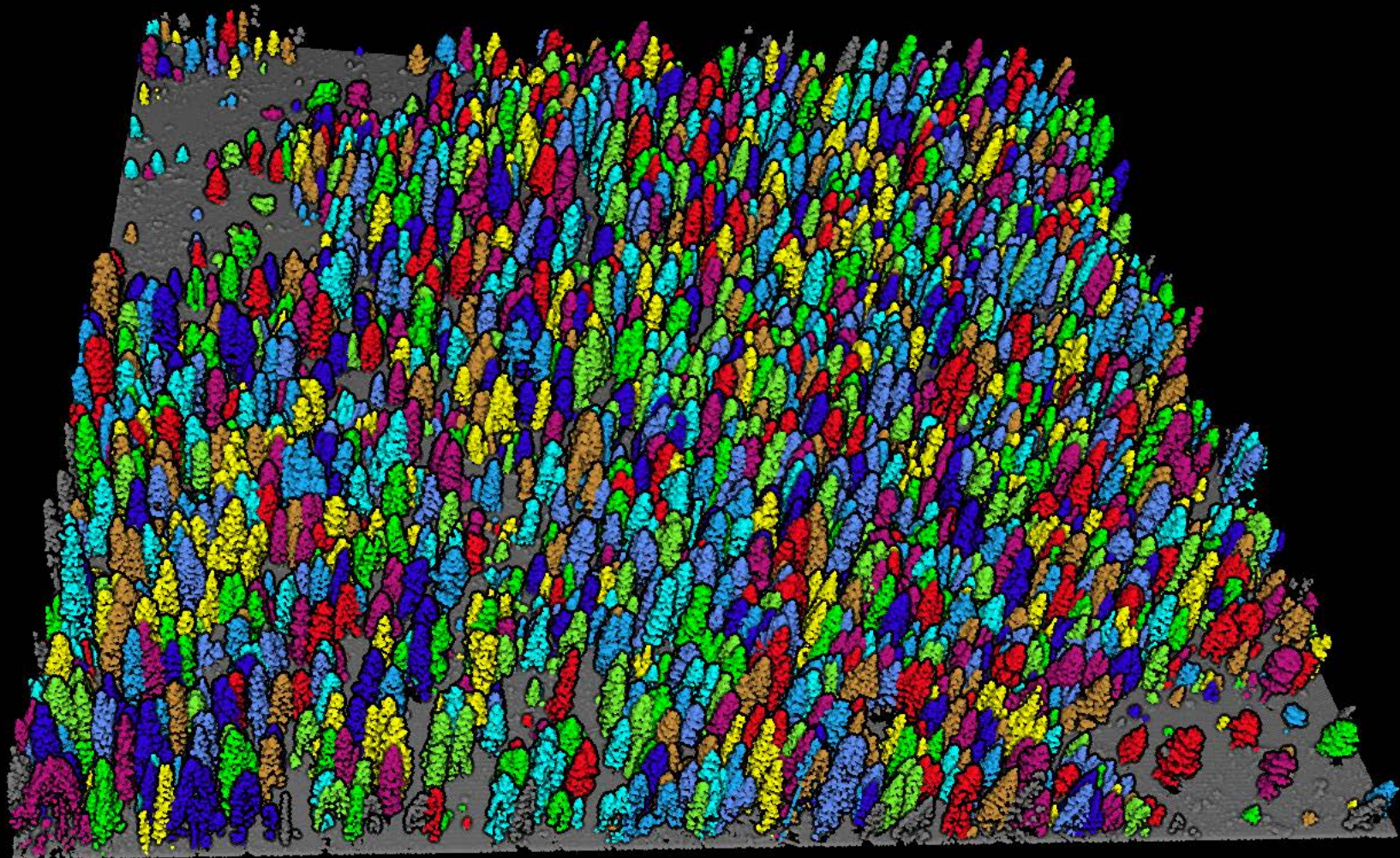


LiDAR



neon







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OBSERVATOIRE AÉRIEN  
CANADIEN DE LA BIODIVERSITÉ



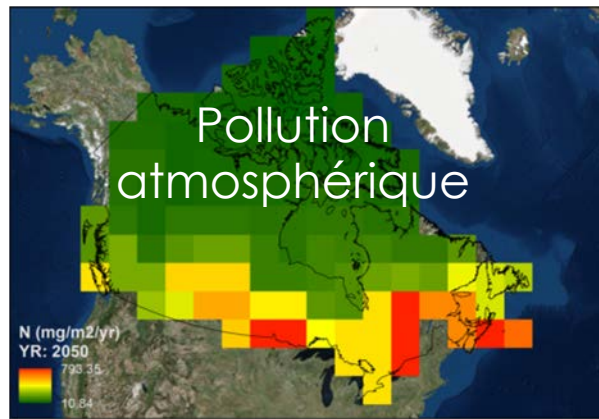
Utilisations des terres



Changements  
climatiques



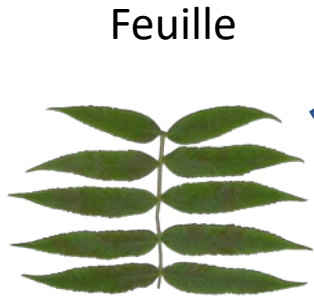
Espèces  
envahissantes

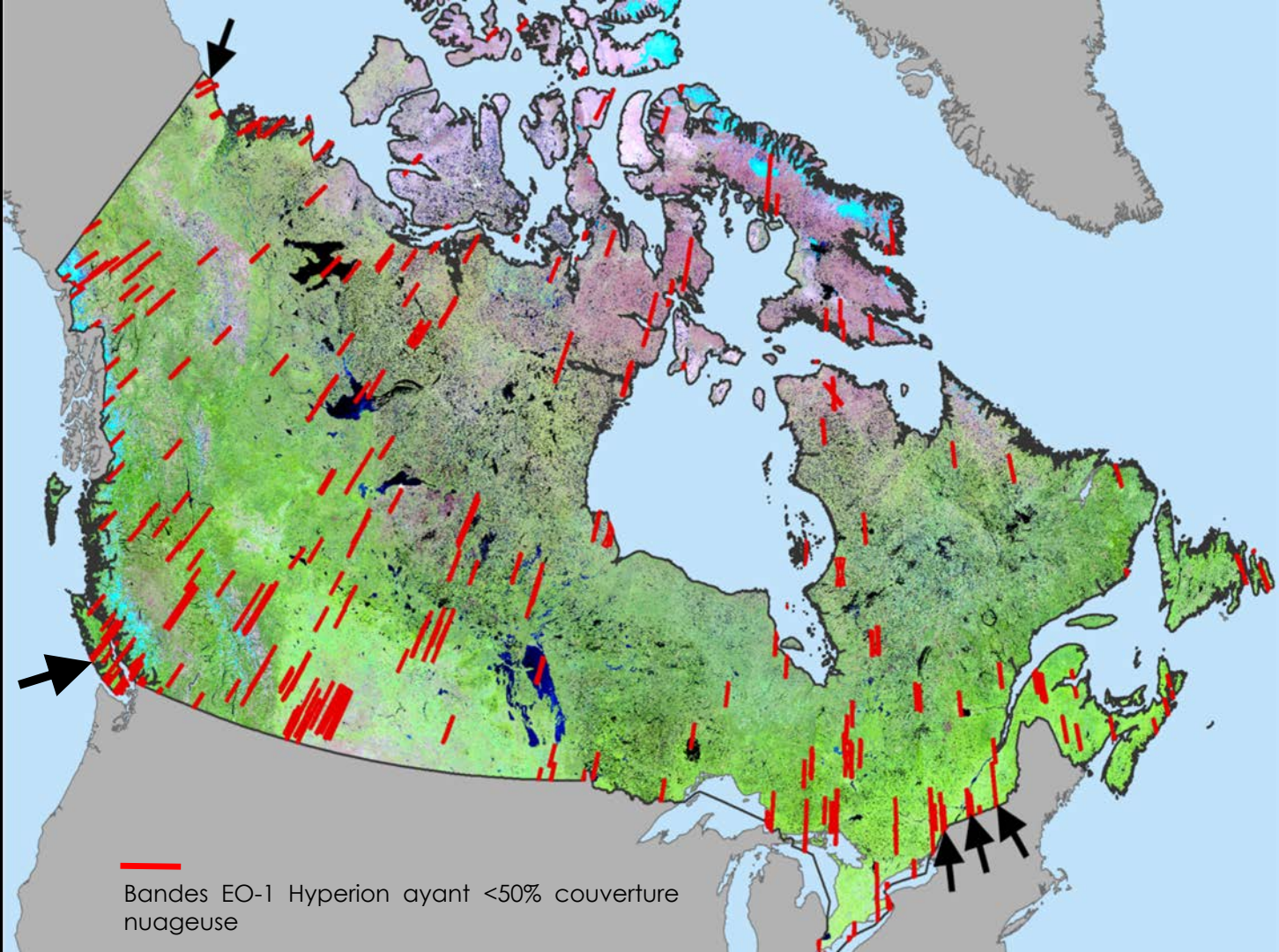


Pollution  
atmosphérique

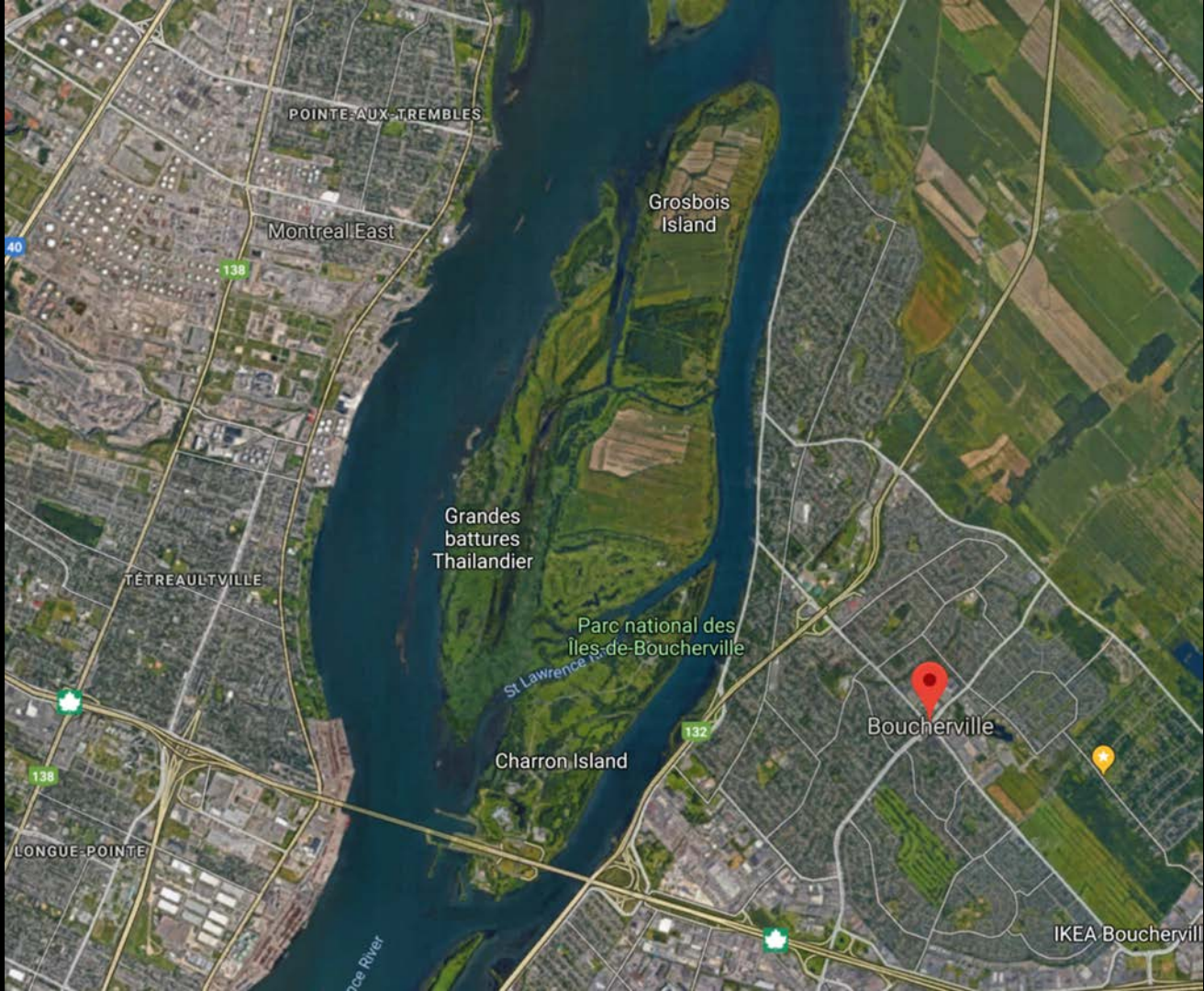
N (mg/m<sup>2</sup>/yr)  
YR: 2050  
799.35  
10.84

# Approche multi-échelle





 Bandes EO-1 Hyperion ayant <50% couverture nuageuse





A photograph of a field of tall, green reeds (Phragmites australis ssp. australis) under a blue sky with white clouds. In the foreground, there is a rectangular frame made of white PVC pipes, partially obscured by the dense vegetation. The reeds have long, narrow leaves and some have brown, feathery seed heads. The overall scene is a natural, outdoor setting.

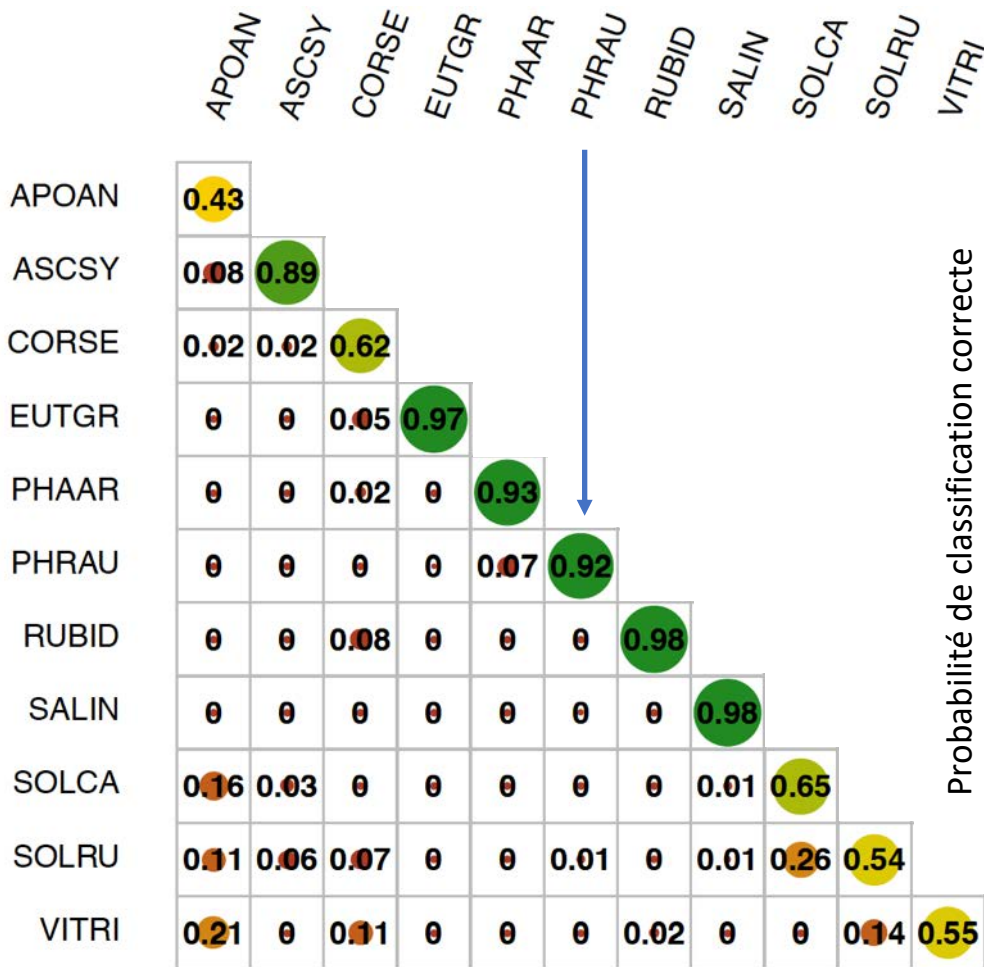
Roseau commun exotique (*Phragmites australis ssp. australis*)



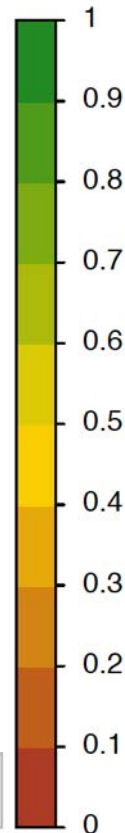
*Phalaris*



*Phragmites*



Probabilité de classification correcte



Dr Anna Schweiger

A photograph showing three people in a field setting up a drone. The drone is on a white mat on the ground. The people are wearing blue shirts and khaki pants. The background is a field of tall grass and trees.

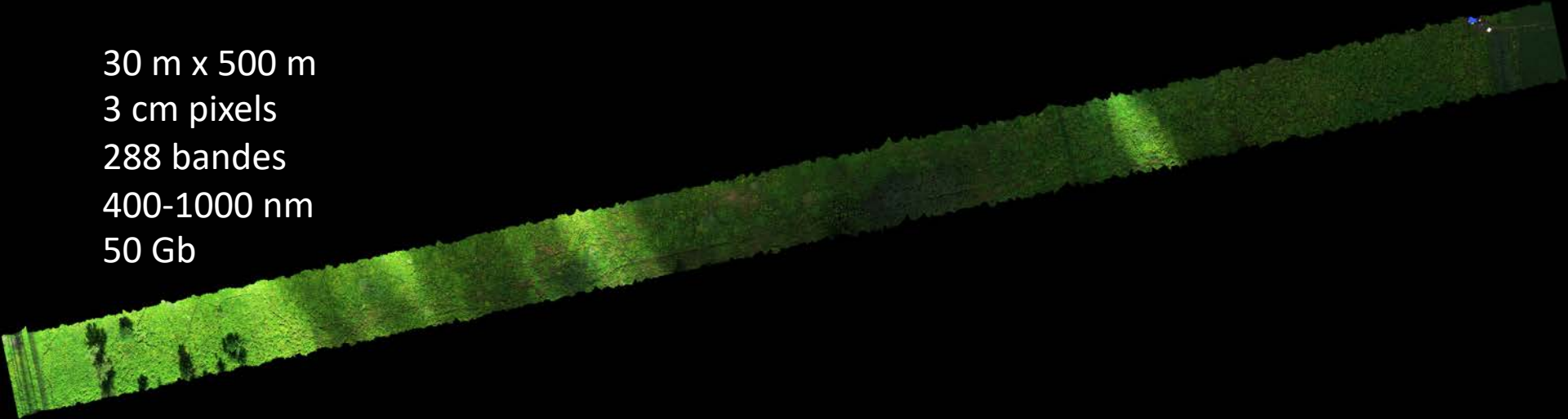
**Margaret Kalacska**  
Géographie, McGill

**Oliver Lucanus**  
Pilote UAV

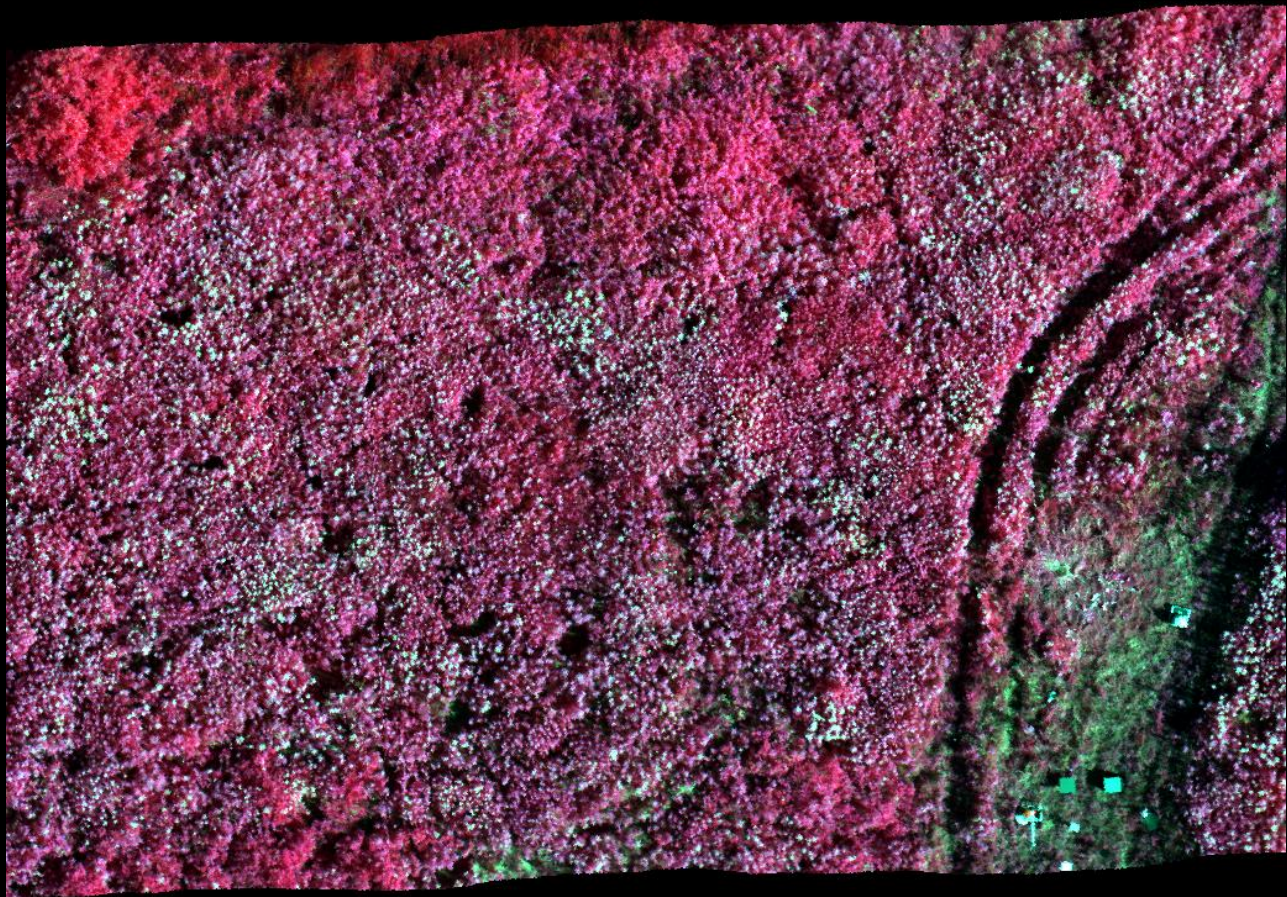
**Pablo Arroyo**  
National Research Council



30 m x 500 m  
3 cm pixels  
288 bandes  
400-1000 nm  
50 Gb



N

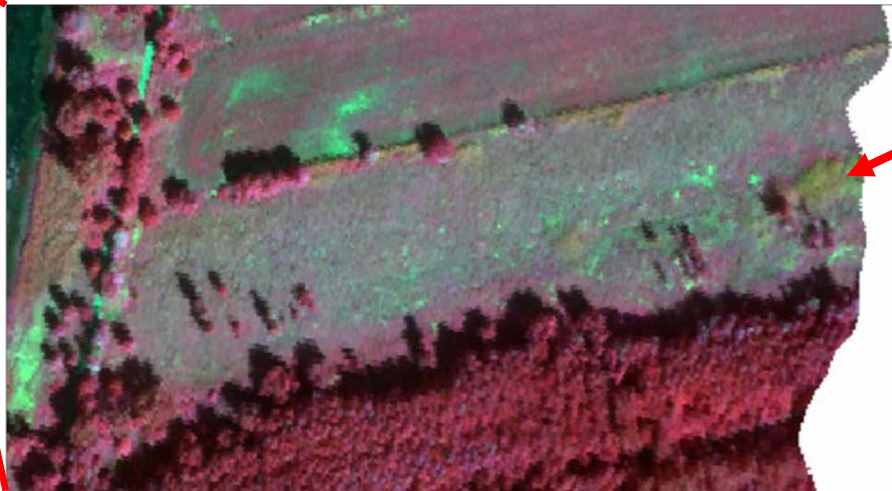








Pixels 70 cm

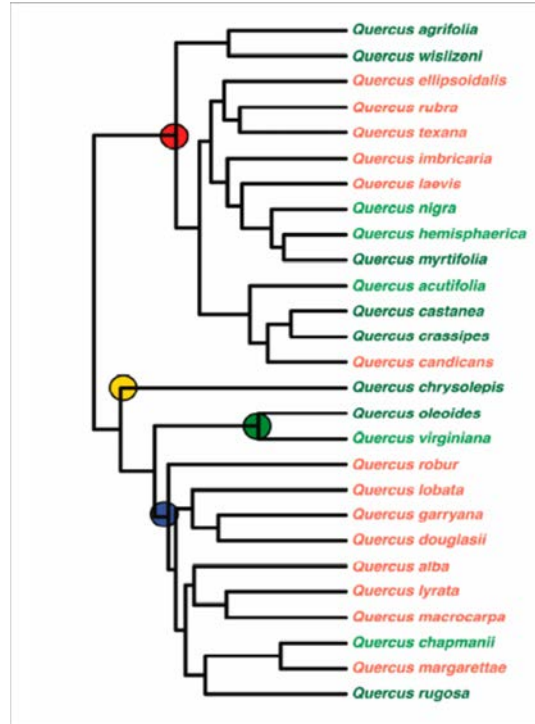


Roseau

# Signatures spectrales et phylogénie



Responsable  
Anne Bruneau



# Signatures spectrales et traits foliaires



**Responsable**  
Etienne Laliberté

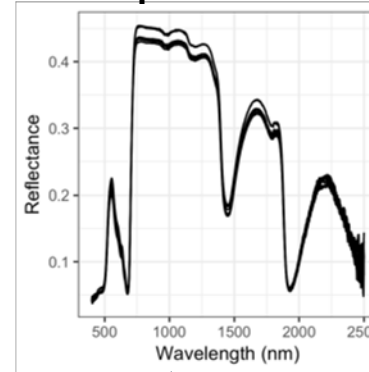
Université   
de Montréal



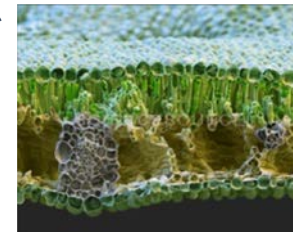
Spectroscopie

Analyses de laboratoire

**Spectres**



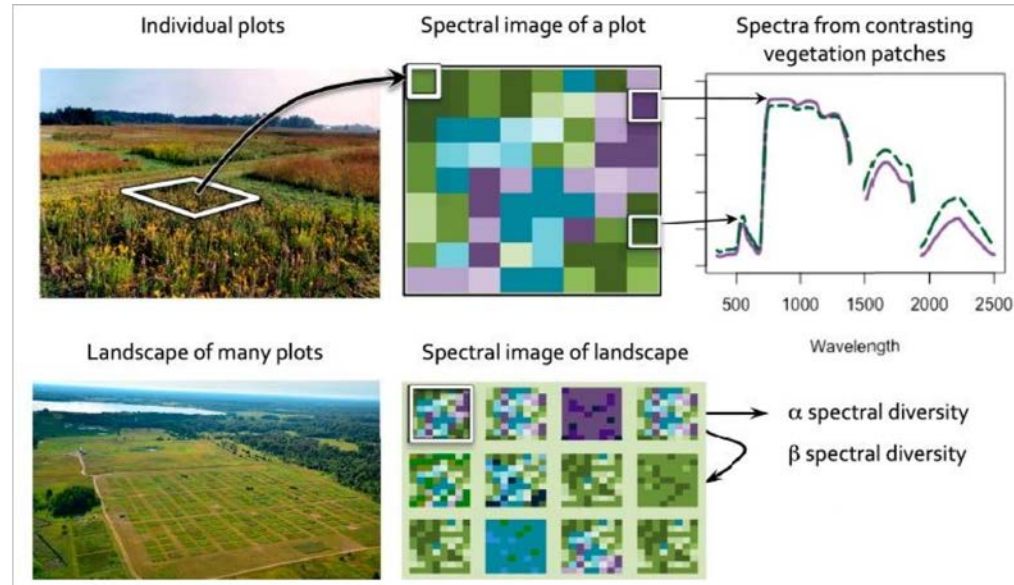
**Chimie / morphologie / anatomie**



# Inventaires de biodiversité végétale



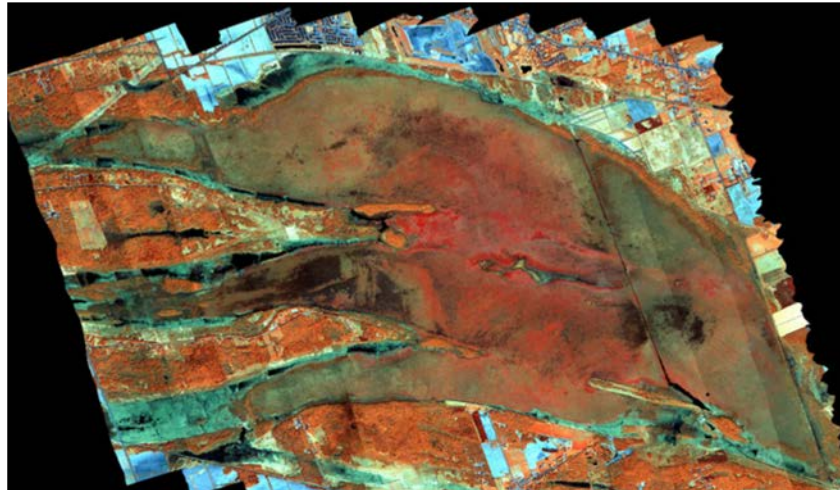
**Responsable**  
Mark Vellend



# Téledétection hyperspectrale



**Responsable**  
Margaret Kalacska



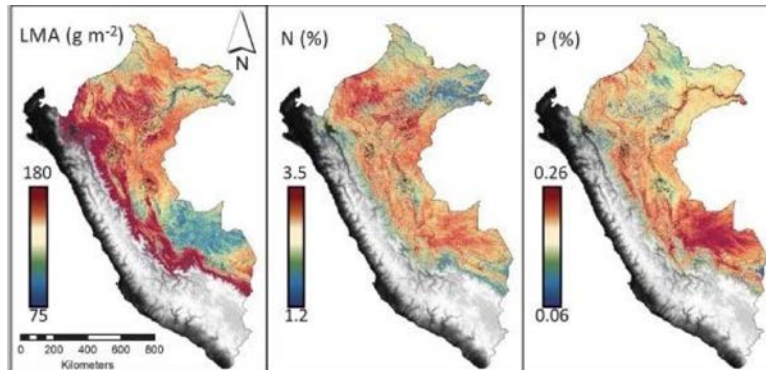
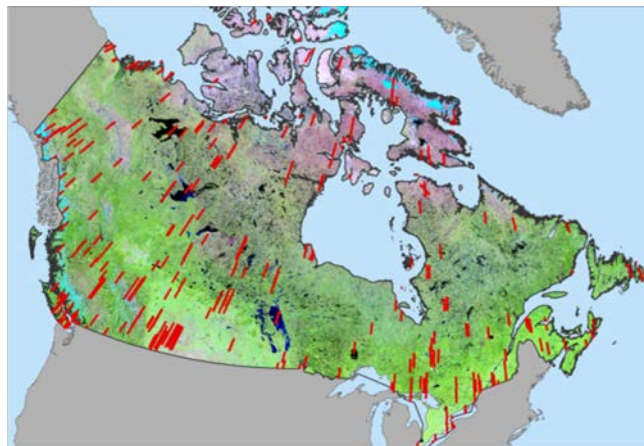
# Imagerie satellitaire



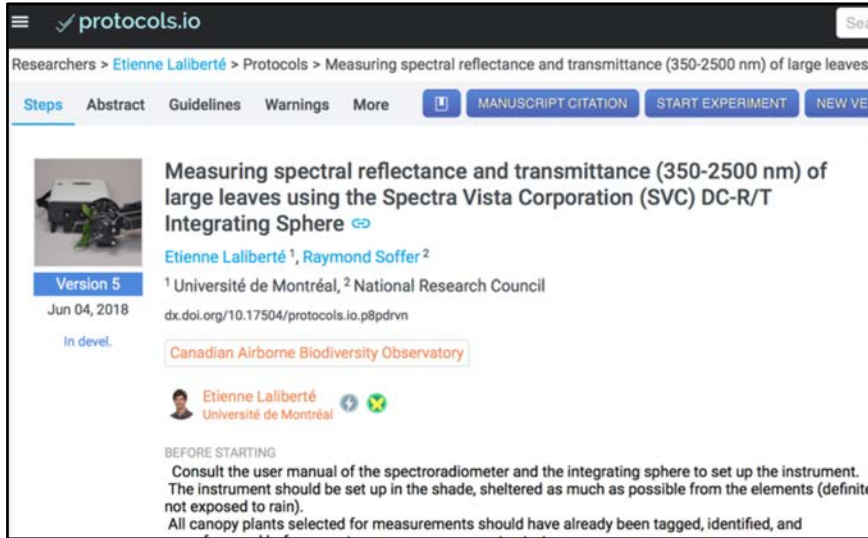
Responsable  
Nicholas Coops



EO-1  
Hyperion  
(2001-2016)



# Livrables: protocoles et applications



protocols.io

Researchers > Etienne Laliberté > Protocols > Measuring spectral reflectance and transmittance (350-2500 nm) of large leaves

Steps Abstract Guidelines Warnings More

MANUSCRIPT CITATION START EXPERIMENT NEW VER

## Measuring spectral reflectance and transmittance (350-2500 nm) of large leaves using the Spectra Vista Corporation (SVC) DC-R/T Integrating Sphere

Etienne Laliberté<sup>1</sup>, Raymond Soffer<sup>2</sup>

Version 5  
Jun 04, 2018  
In devel.

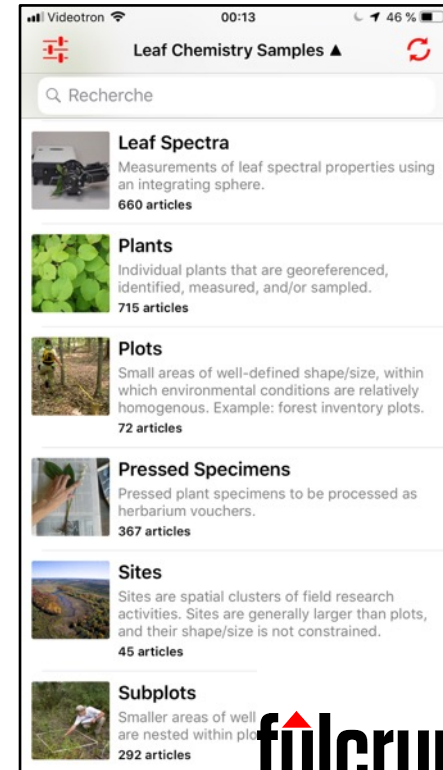
<sup>1</sup> Université de Montréal, <sup>2</sup> National Research Council  
dx.doi.org/10.17504/protocols.io.p8pdrvn

Canadian Airborne Biodiversity Observatory

Etienne Laliberté  
Université de Montréal

BEFORE STARTING

Consult the user manual of the spectroradiometer and the integrating sphere to set up the instrument. The instrument should be set up in the shade, sheltered as much as possible from the elements (definitely not exposed to rain). All canopy plants selected for measurements should have already been tagged, identified, and



Leaf Chemistry Samples


Recherche

- Leaf Spectra**  
Measurements of leaf spectral properties using an integrating sphere.  
660 articles
- Plants**  
Individual plants that are georeferenced, identified, measured, and/or sampled.  
715 articles
- Plots**  
Small areas of well-defined shape/size, within which environmental conditions are relatively homogenous. Example: forest inventory plots.  
72 articles
- Pressed Specimens**  
Pressed plant specimens to be processed as herbarium vouchers.  
367 articles
- Sites**  
Sites are spatial clusters of field research activities. Sites are generally larger than plots, and their shape/size is not constrained.  
45 articles
- Subplots**  
Smaller areas of well-defined shape/size, are nested within plots.  
292 articles






# Livrables: base de données de signatures spectrales et traits foliaires




**CABO**


[Browse spectral data](#)



[Browse trait data](#)

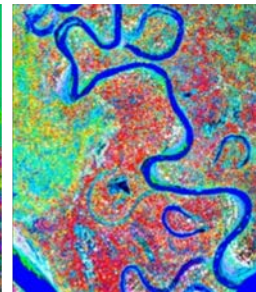
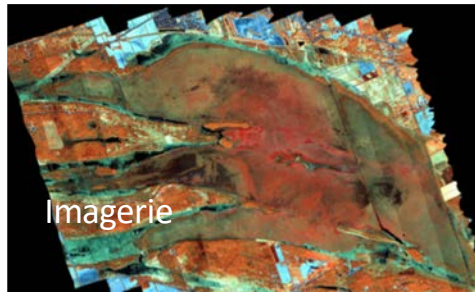
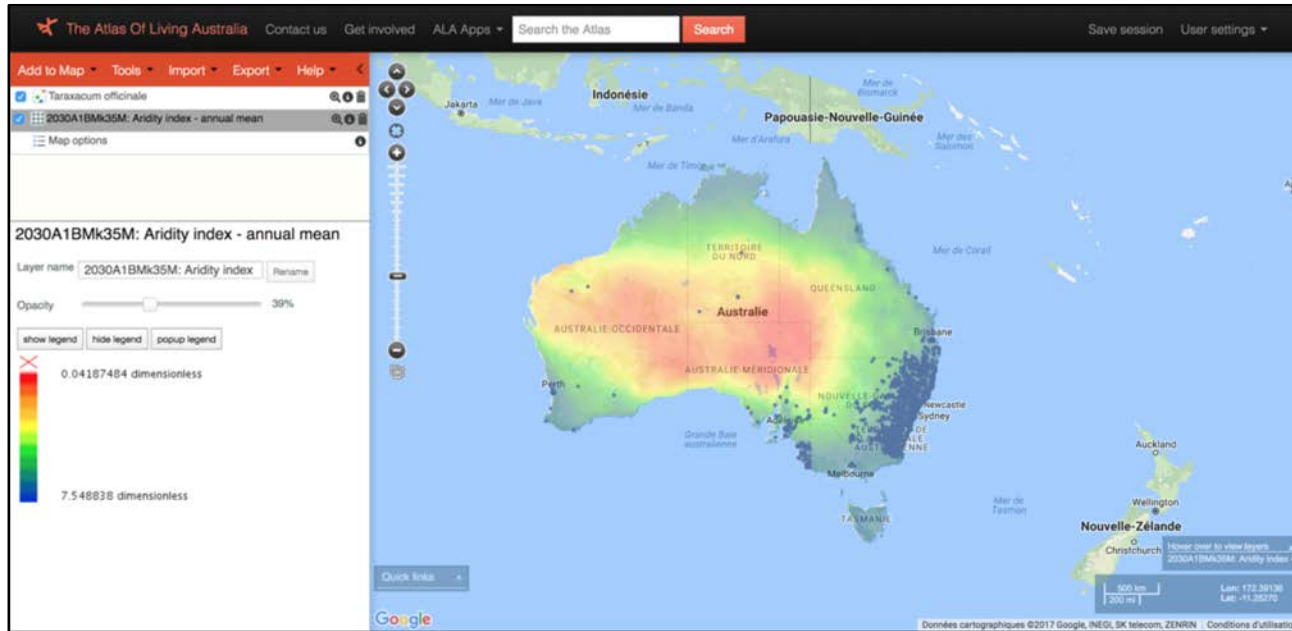


[Browse occurrence data](#)



Canadensys

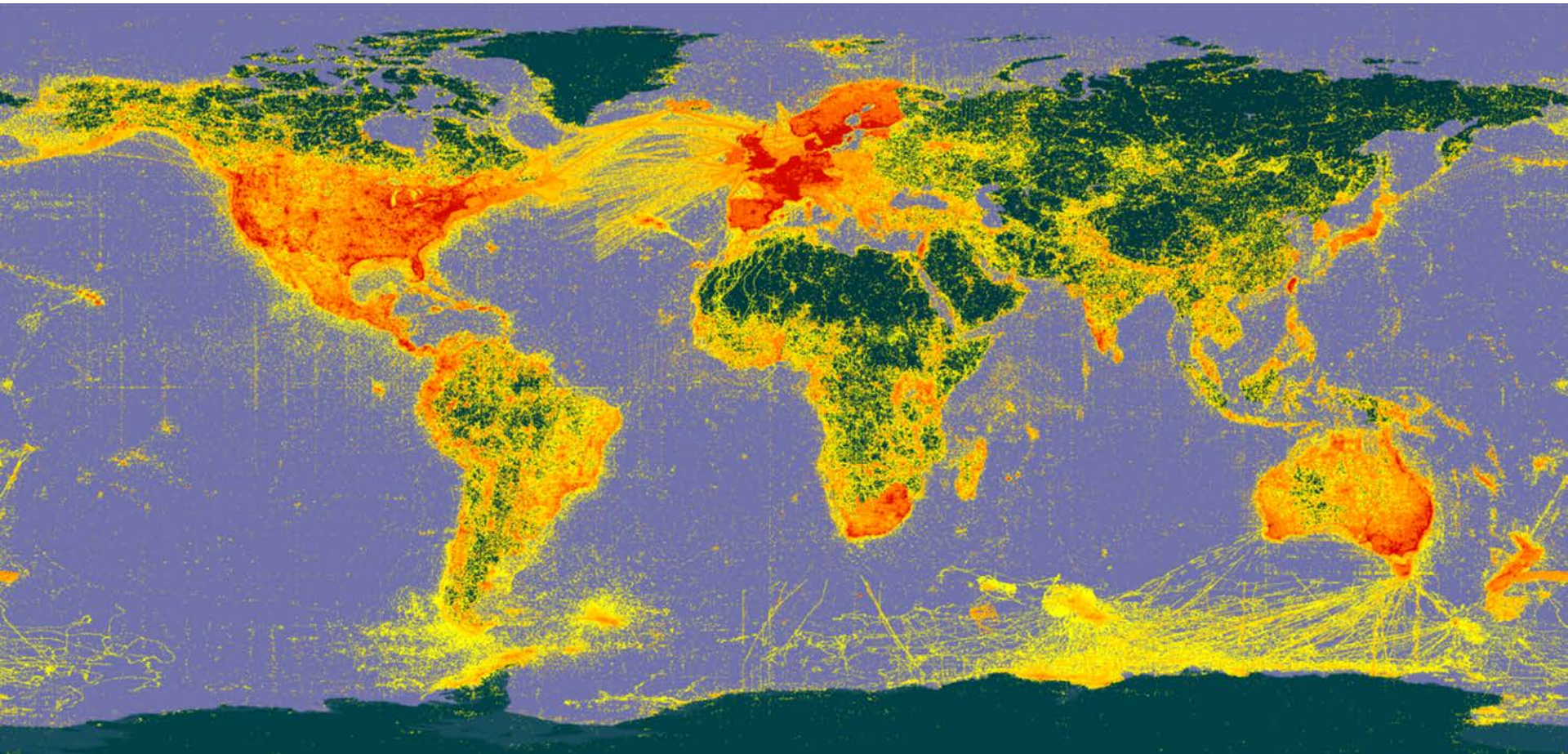
# Livrables: imagerie & cartes

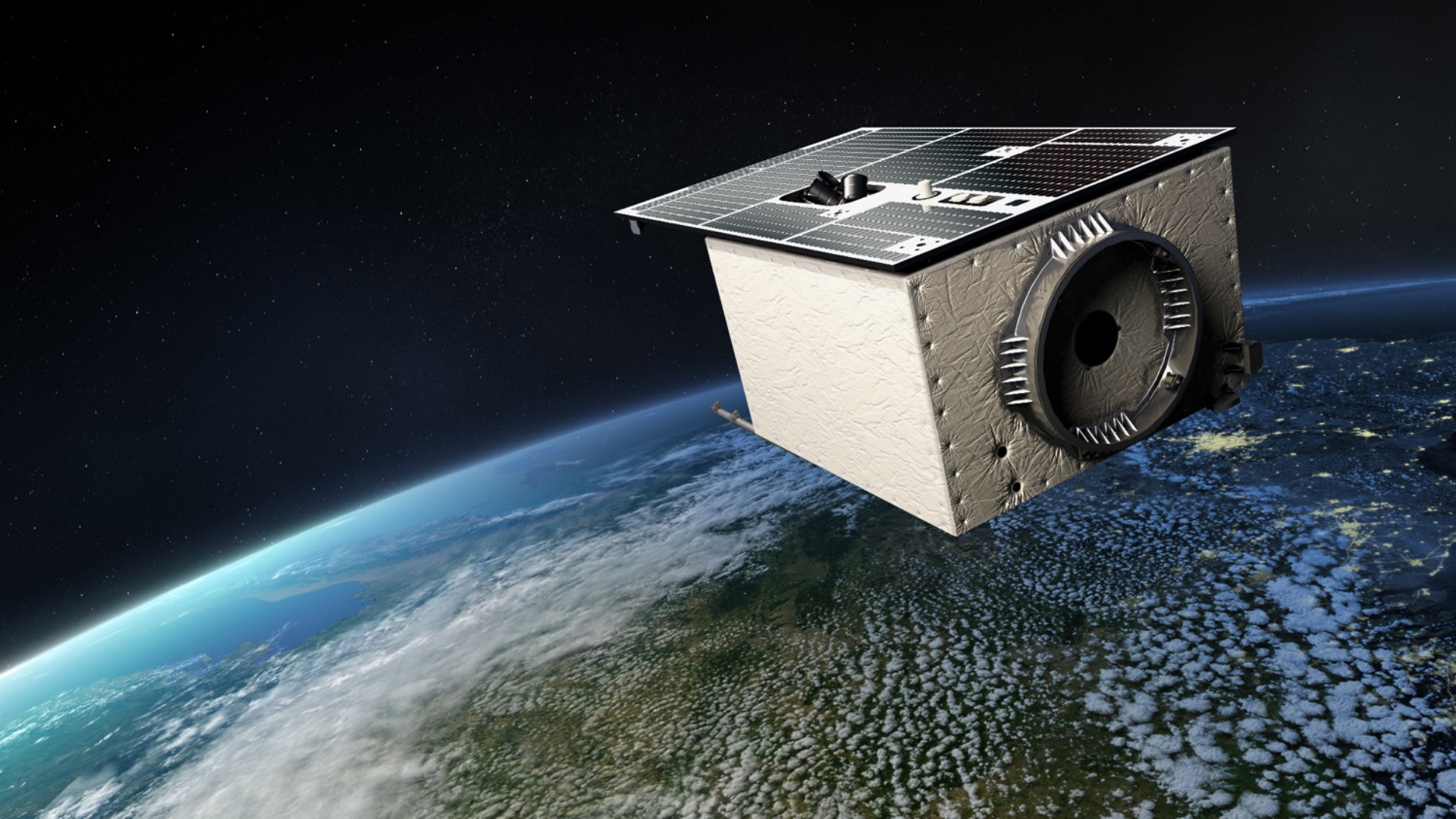


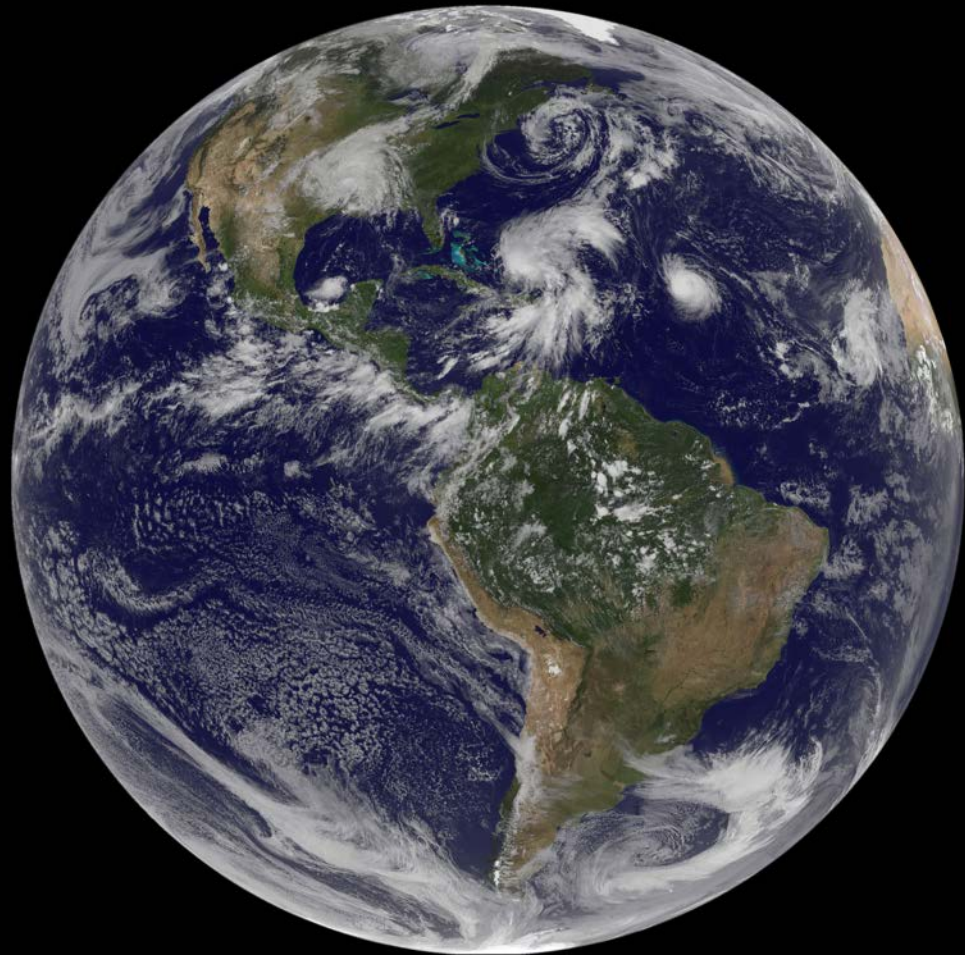
# Spectranomique aérienne: défis et opportunités

- Nouvelle façon d'acquérir les données de biodiversité
- Volume de données important
  - Entreposage / archivage
  - Accès
- Algorithmes pour cartographier la biodiversité (espèces, traits)
  - Imagerie hyperspectrale
  - Nuages de points 3D
  - Base de données foliaires
- Fusion avec autres bases de données de biodiversité

>1 000 000 000 occurrences d'espèces









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