

Suivi et modélisation de la dynamique structurelle des forêts perturbées avec les données de LiDAR aéroporté

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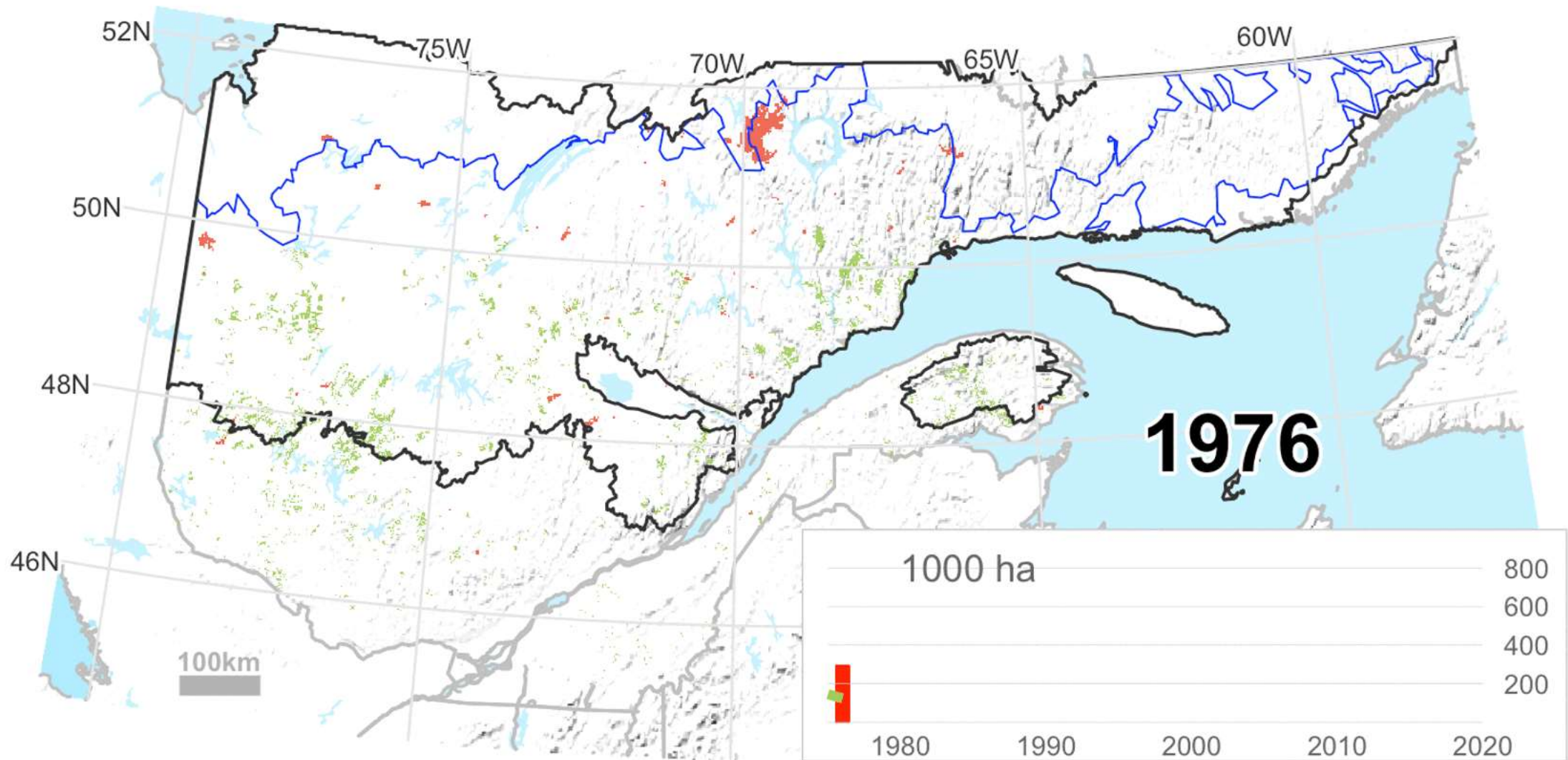
Victor Danneyrolles, Richard Fournier, Yan Boucher, Osvaldo Valeria

UDS Université de Sherbrooke

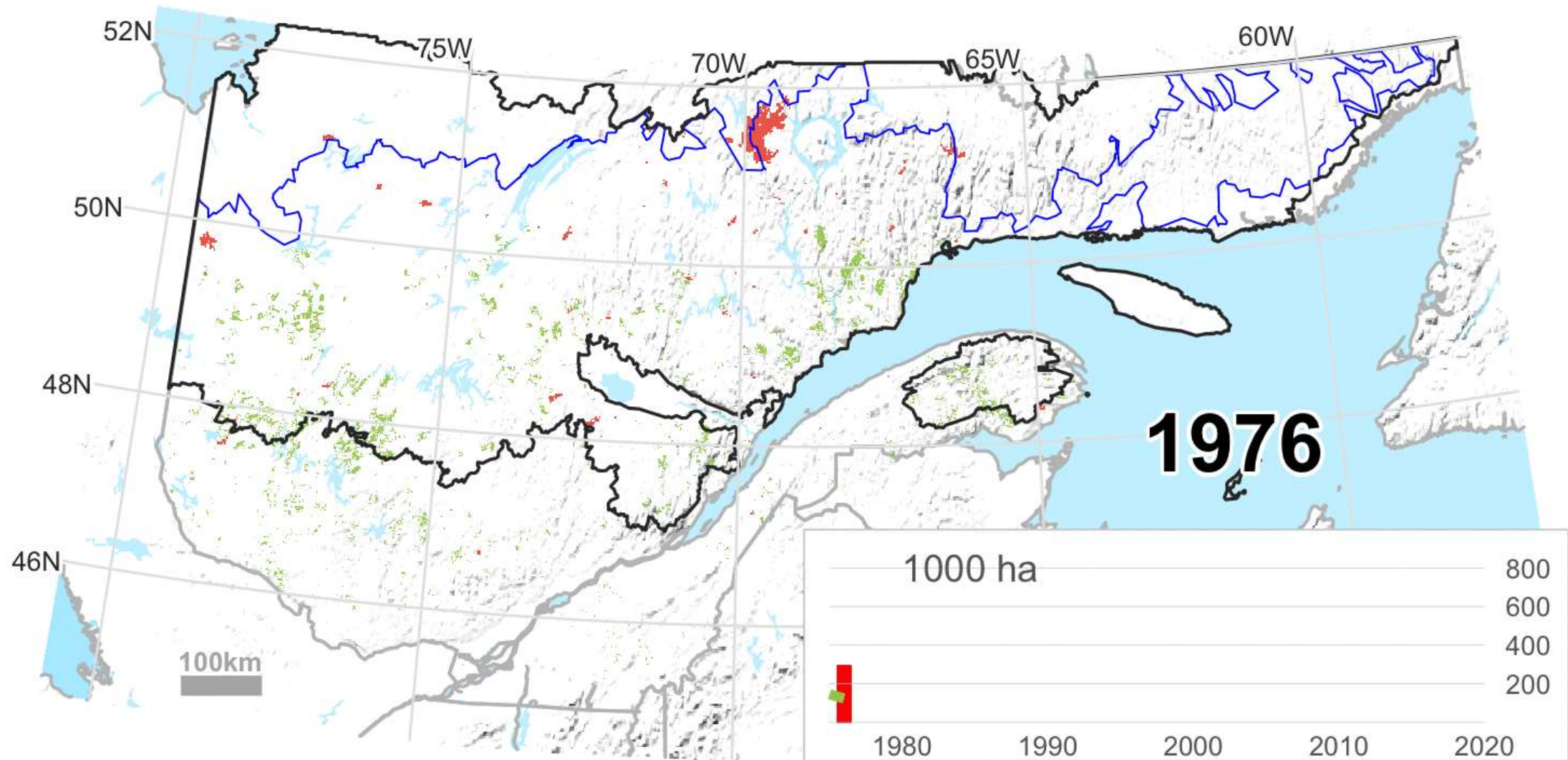
UQAC
UNIVERSITÉ DU QUÉBEC
À CHICOUTIMI

UQAT
UNIVERSITÉ DU QUÉBEC
EN ABITIBI-TEMISCAMINGUE

Les forêts perturbées au Québec

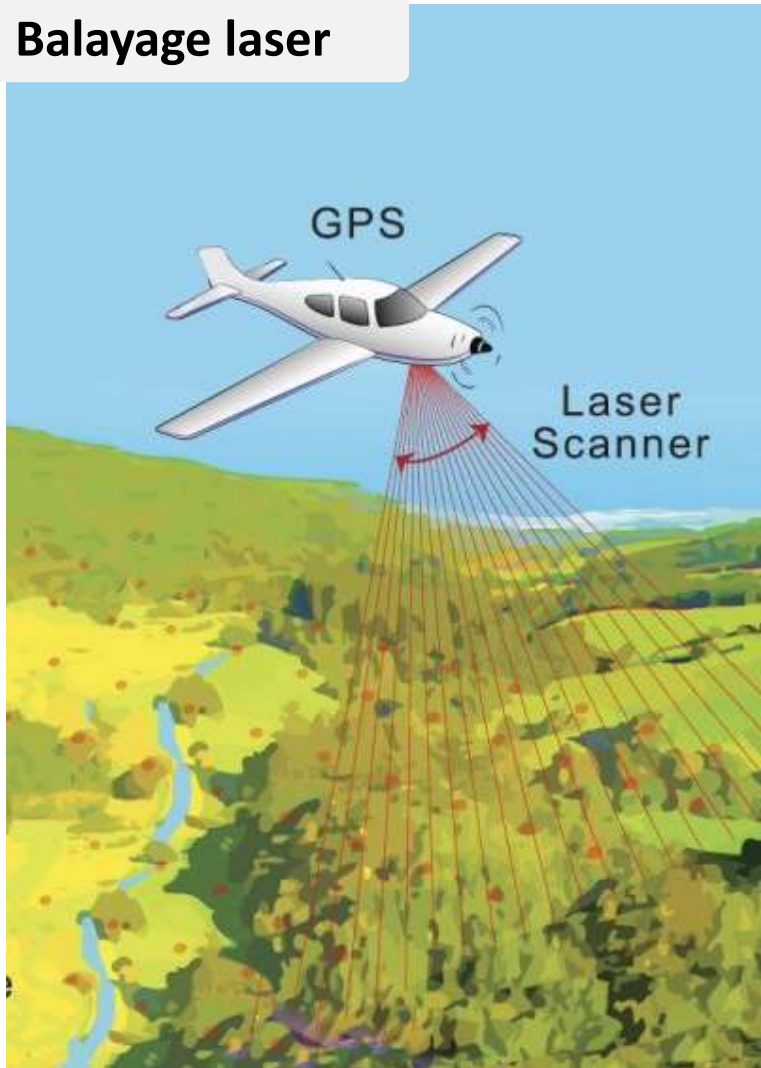


Les forêts perturbées au Québec

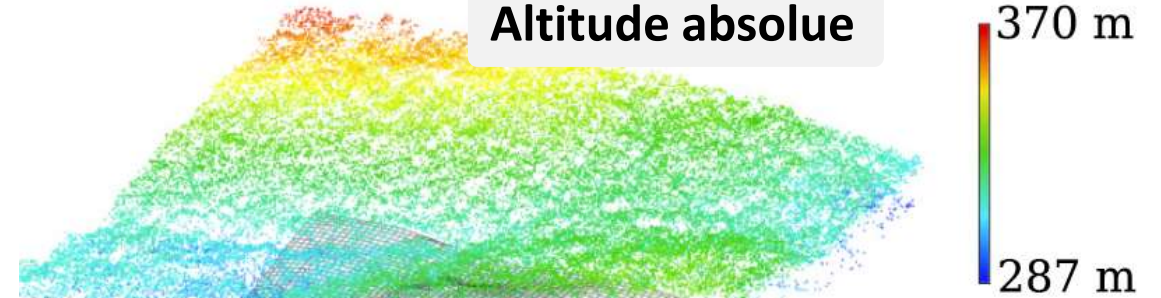


Le LiDAR aéroporté

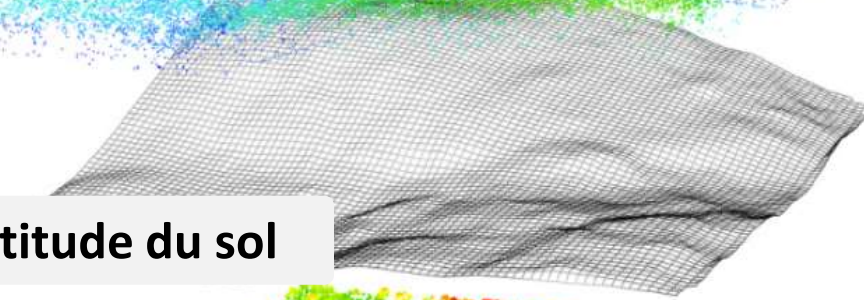
Balayage laser



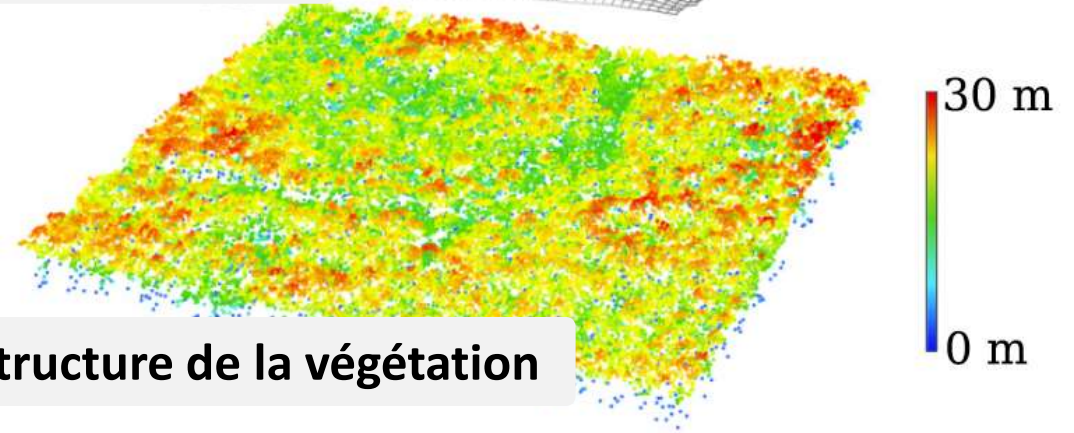
Altitude absolue



Altitude du sol



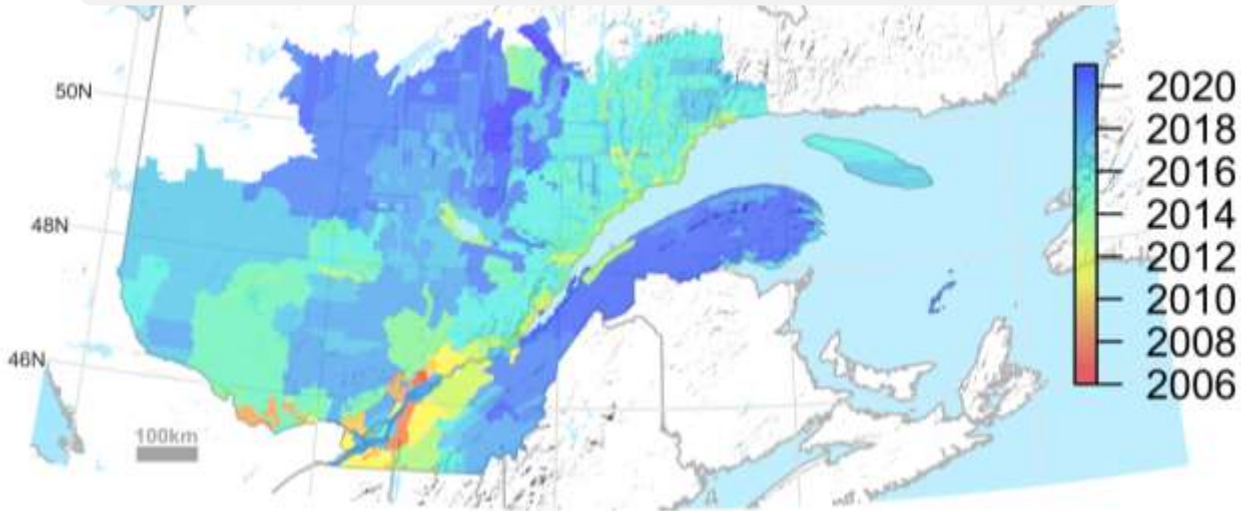
Structure de la végétation



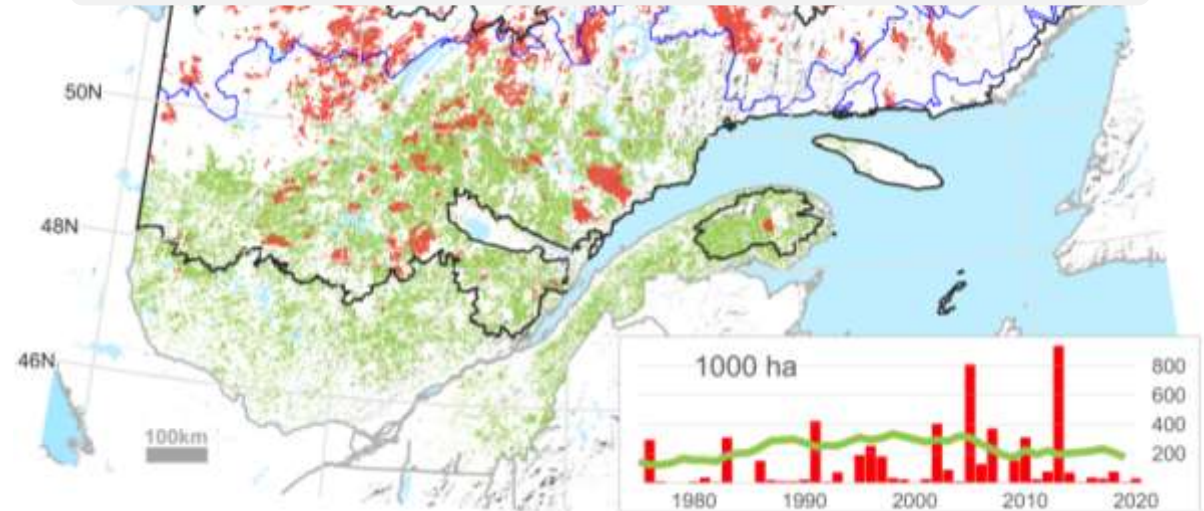
Roussel et al. (2020) *Remote Sensing of Environment*

Notre approche générale

Année d'acquisition des données LiDAR



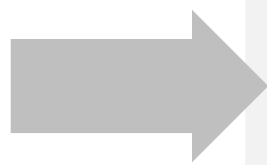
Année de la dernière perturbation



Caractéristiques structurelles

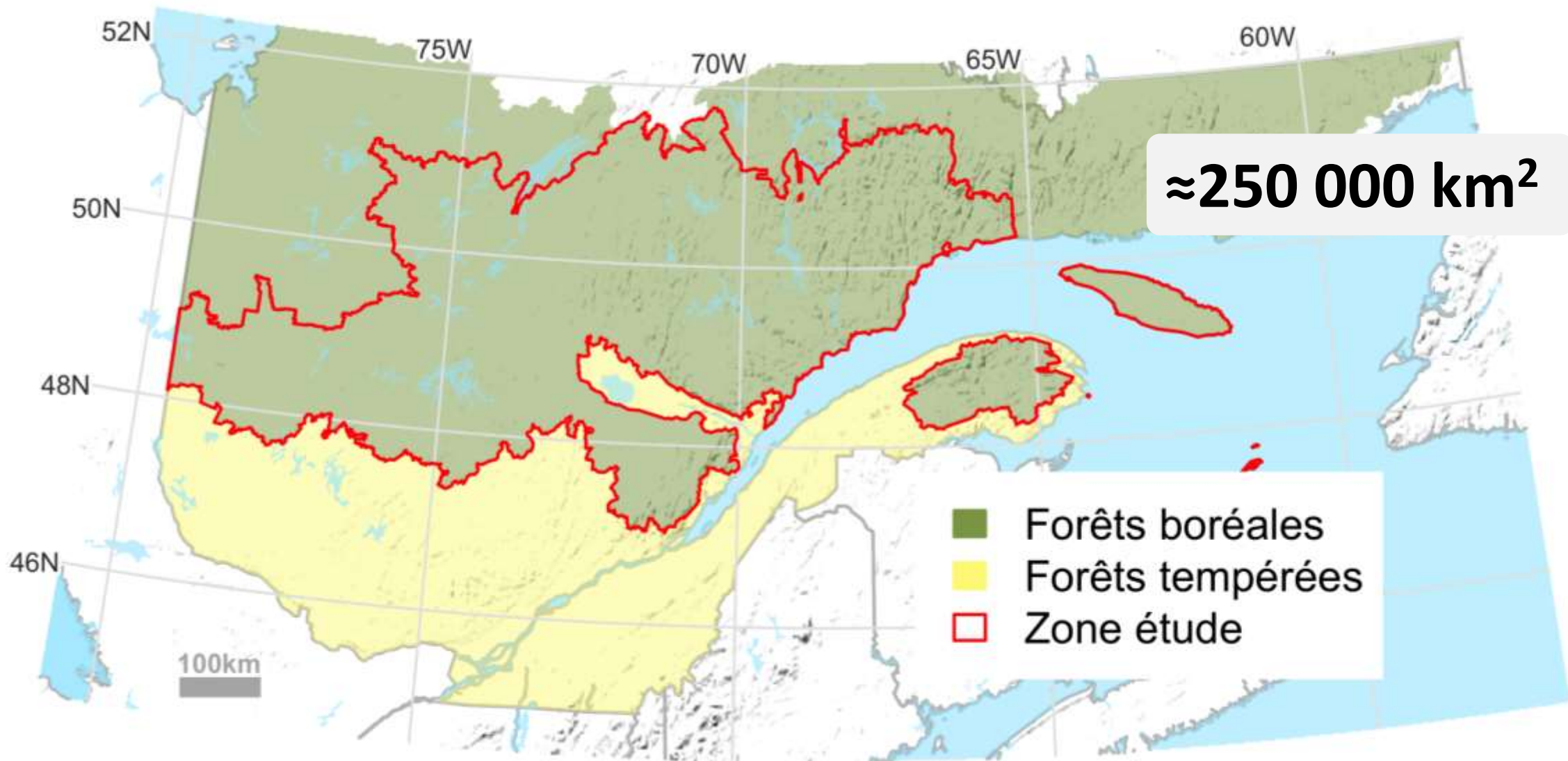


Temps depuis la dernière perturbation



Modélisation/suivi de la dynamique structurelle au cours du temps

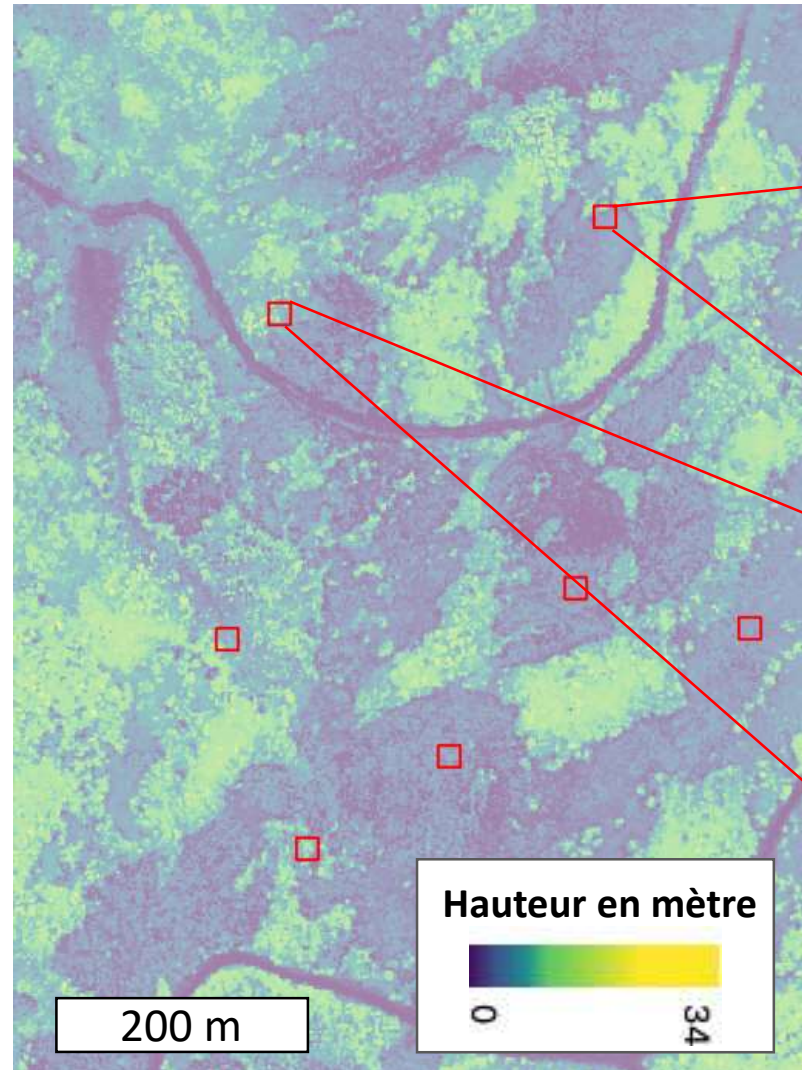
Zone d'étude



Le concept de placette virtuelle

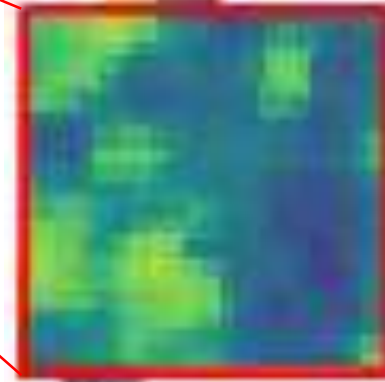
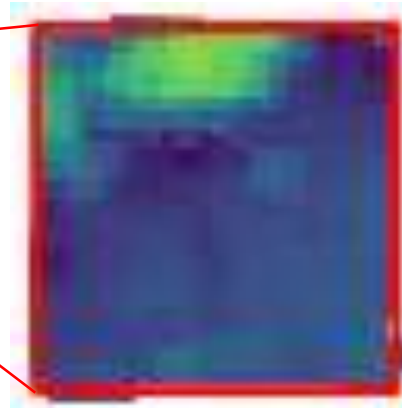
Modèles de hauteur de canopée

(1m de résolution rasters)

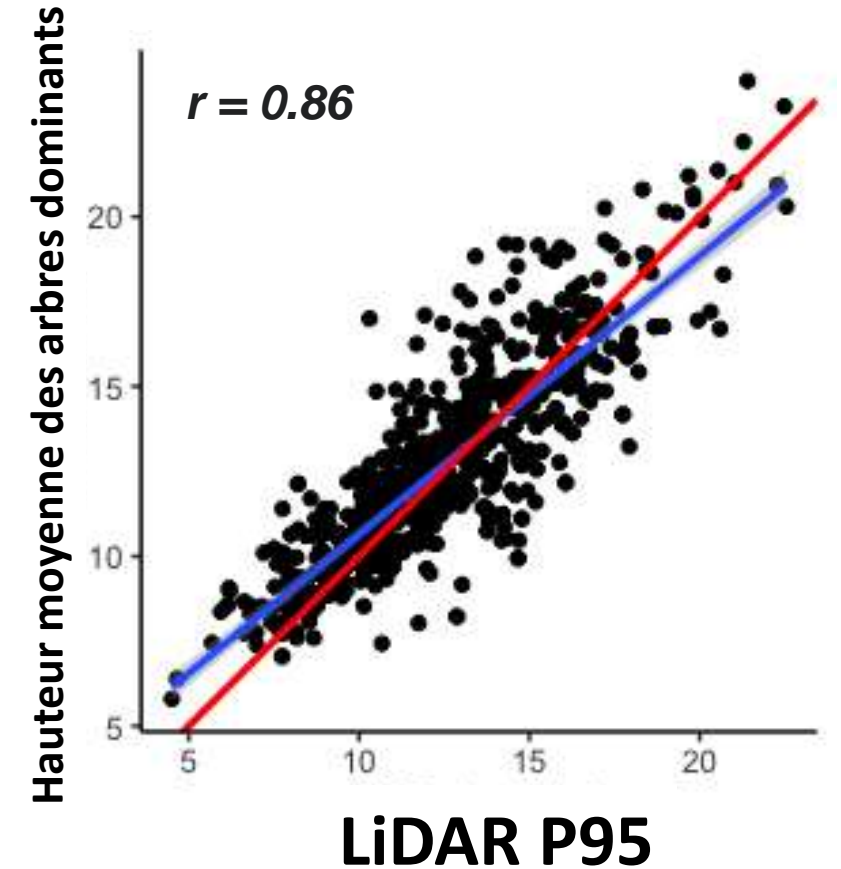


20m x 20m

P95, moyenne, variance, etc.



Comparaison avec des données terrain



Modèle de croissance en hauteur post-coupe

240K placettes

- Secteurs coupés

Random forest

Machine-learning

Interactions non-linéaires

Hauteur de canopée

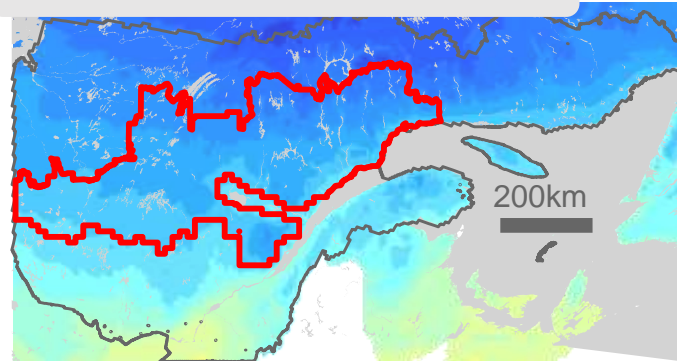
Temps depuis la dernière coupe



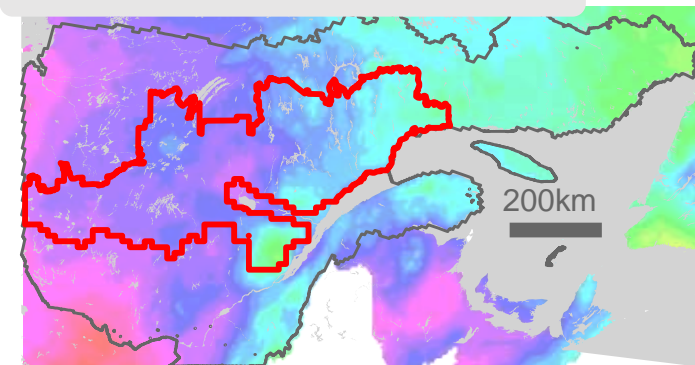
Composition (% feuillus)



Temperature annuelle moyenne



Indice d'humidité climatique



Topographie : Altitude, pente, TWI & dépôts de surface

Modèle de croissance en hauteur post-coupe

240K placettes

- Secteurs coupés

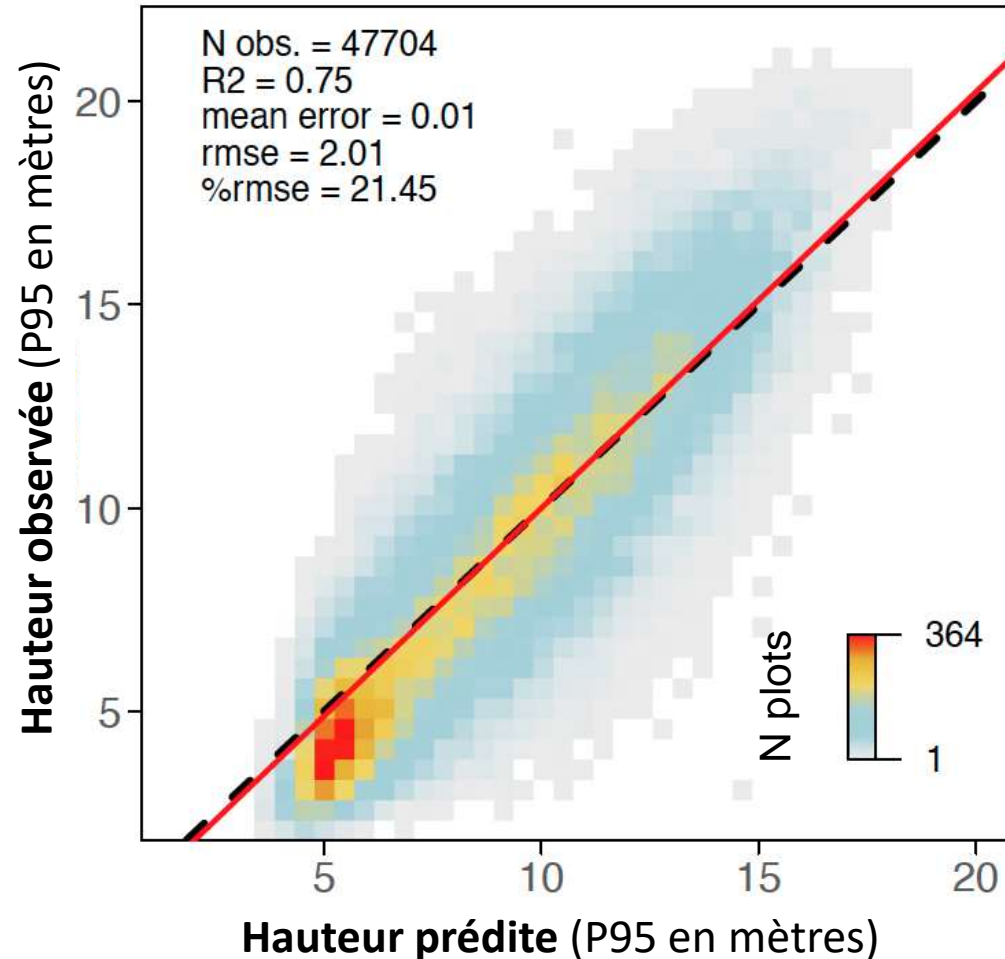
Random forest

Machine-learning

Interactions non-linéaires

Hauteur de canopée

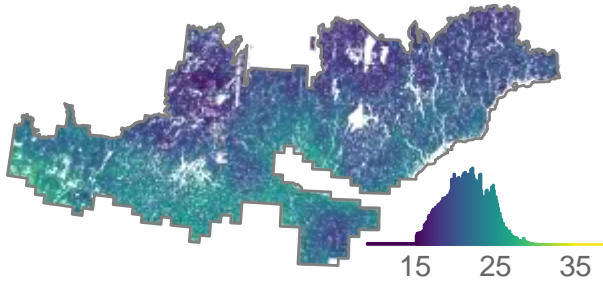
Performances prédictives du modèle
(20% des données; $N \approx 47000$)



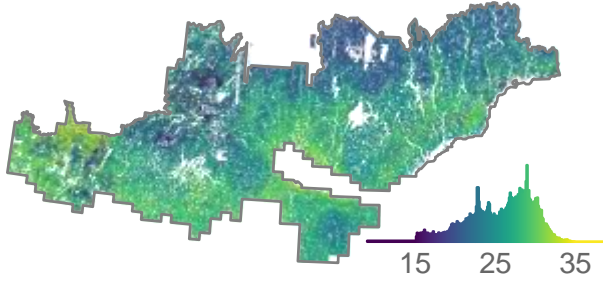
Modèle de croissance en hauteur post-coupe

Climat actuel (1980-2020)

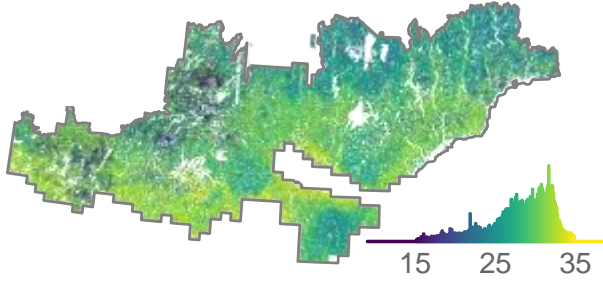
Conifères



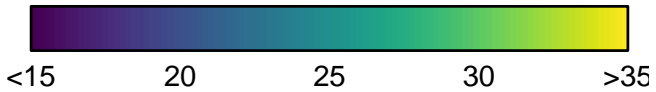
Mixtes



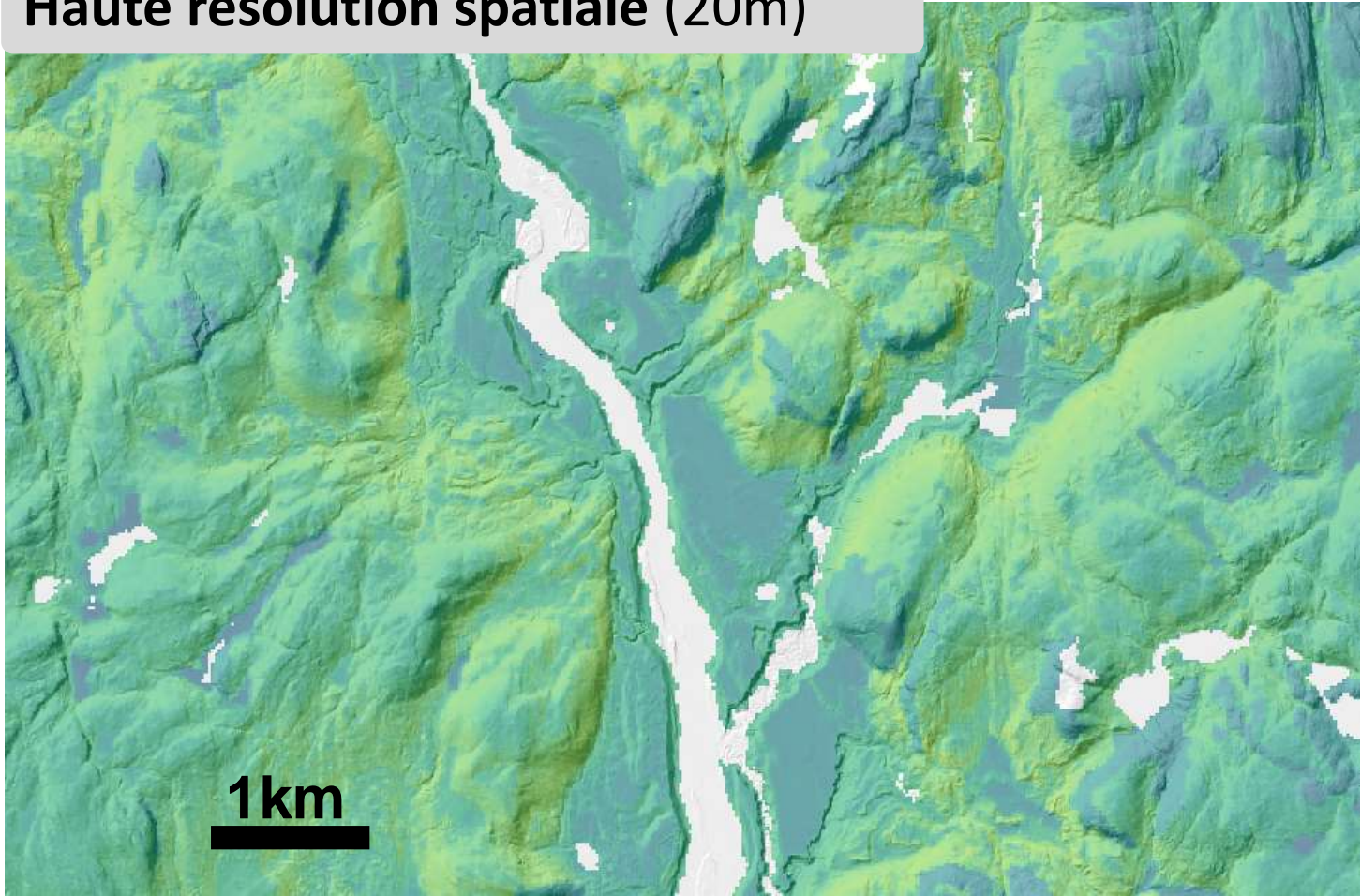
Feuillues



Baseline growth rates (cm/year)



Haute résolution spatiale (20m)

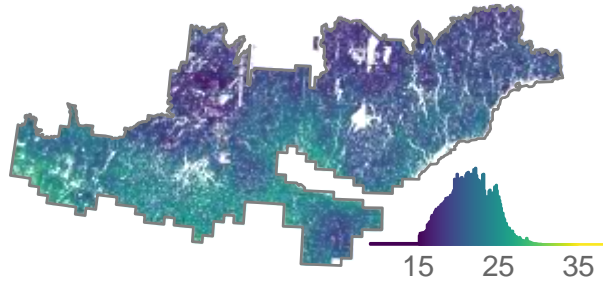


Effets des changements climatiques sur la croissance

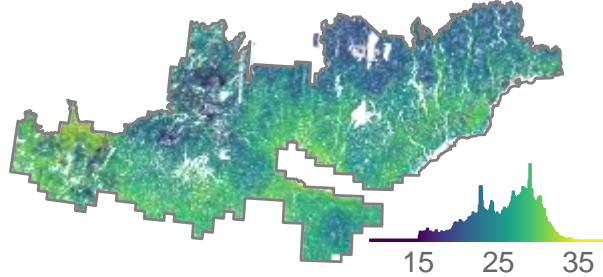
Climat actuel (1980-2020)

Projections (2041-2070)

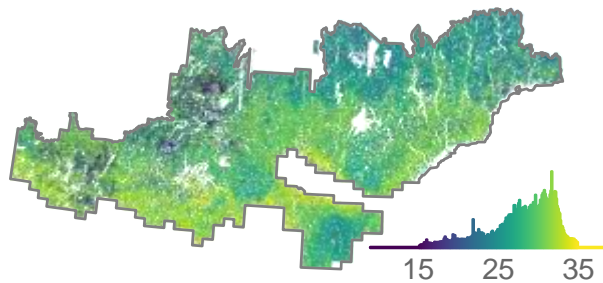
Conifères



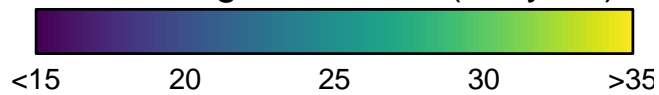
Mixtes



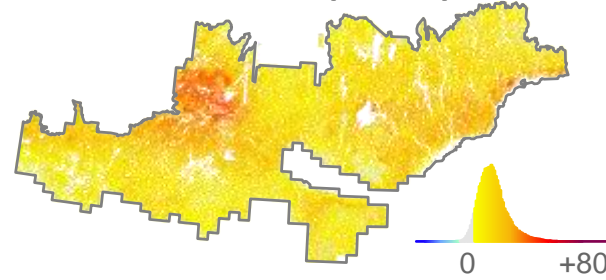
Feuillues



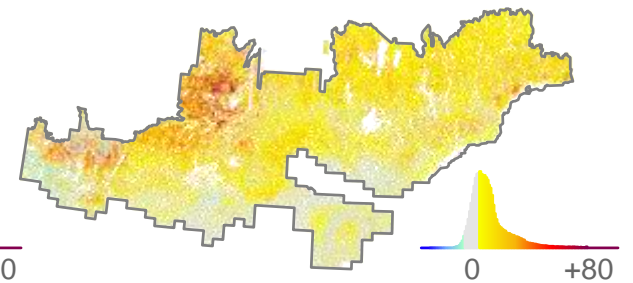
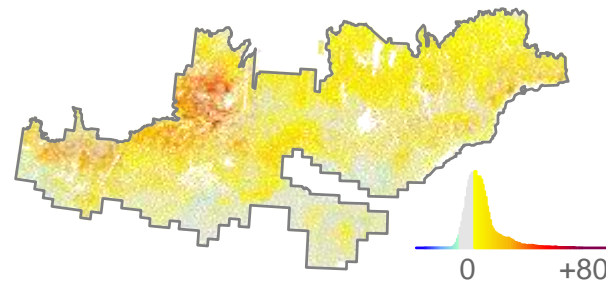
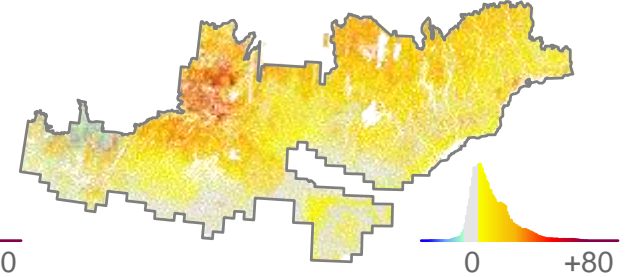
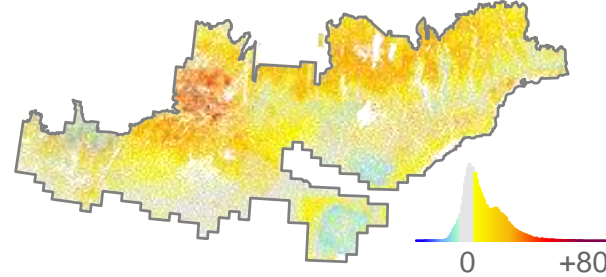
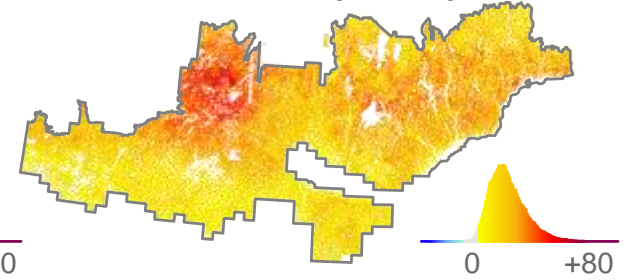
Baseline growth rates (cm/year)



RCP 4.5 (+2°C)

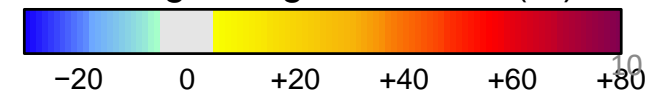


RCP 8.5 (+3°C)



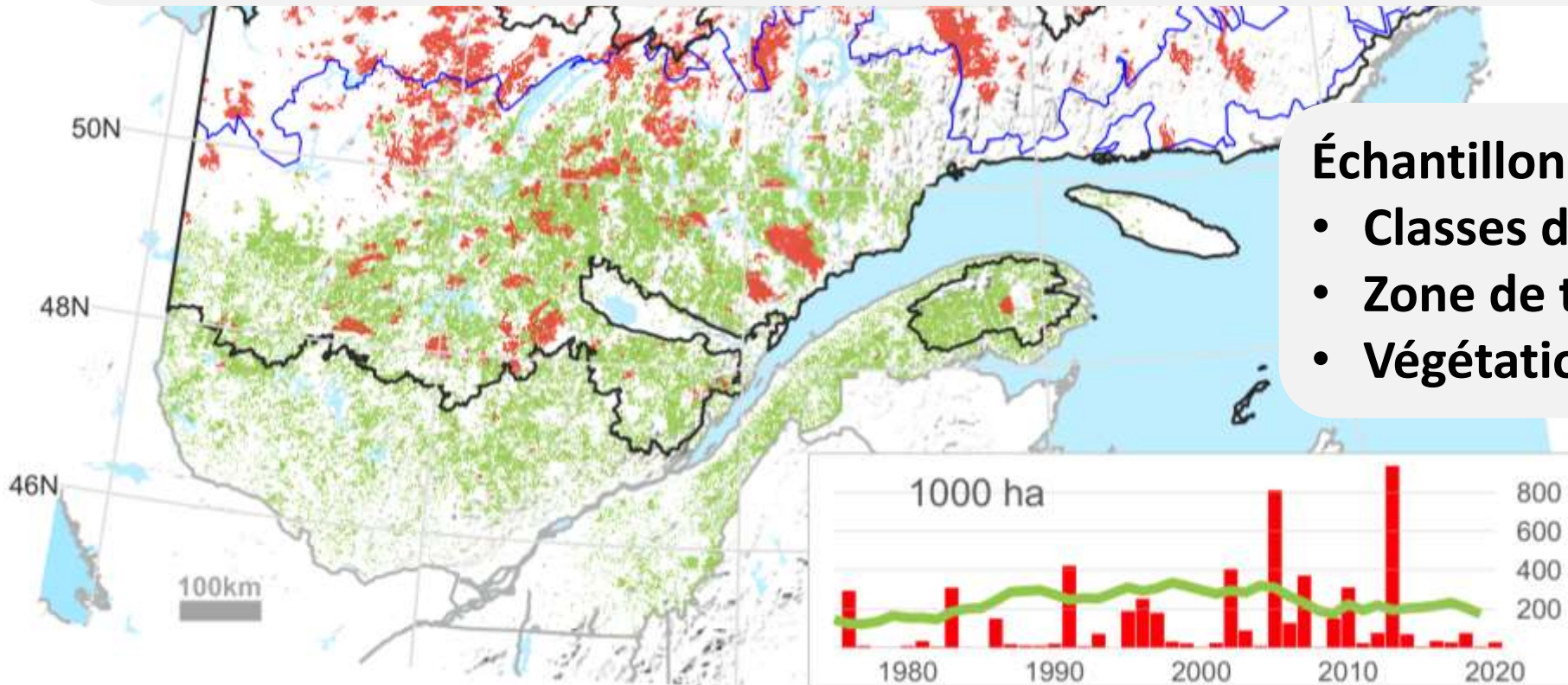
200km

Changes in growth rates (%)



Et les feux ?

Les changements structurels après feux sont ils comparables à ceux observés après les coupes ?

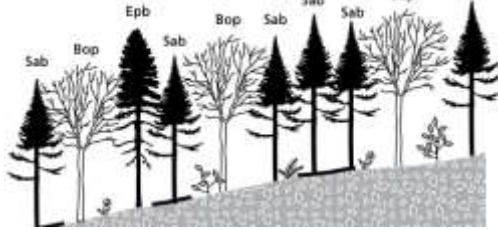


Échantillonnage aléatoire stratifié :

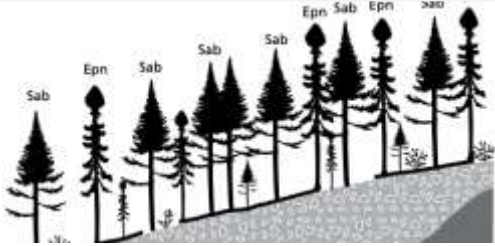
- **Classes d'âge**
- **Zone de température**
- **Végétations potentielles**

Évolution de la structure des forêts après feux

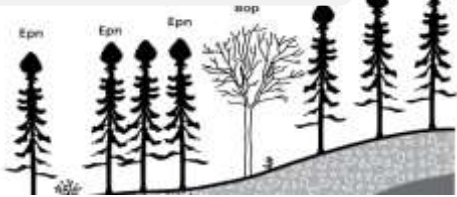
Sapinières à bouleau blanc



Sapinières à épinette noire



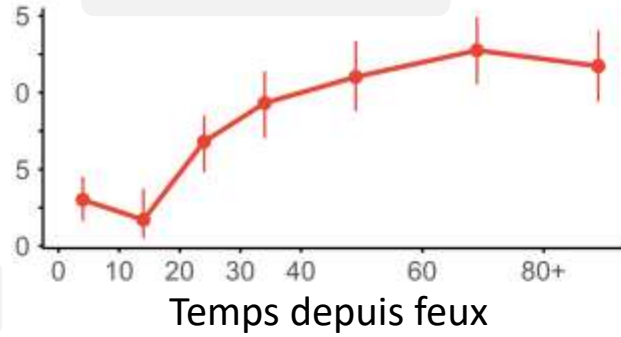
Pessières à mousse



Pessières à sphaignes

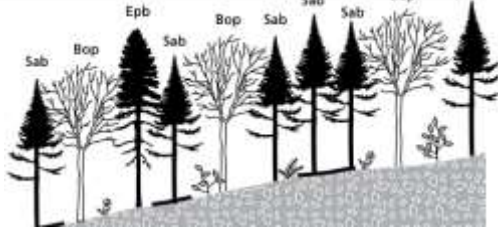


Hauteur moyenne

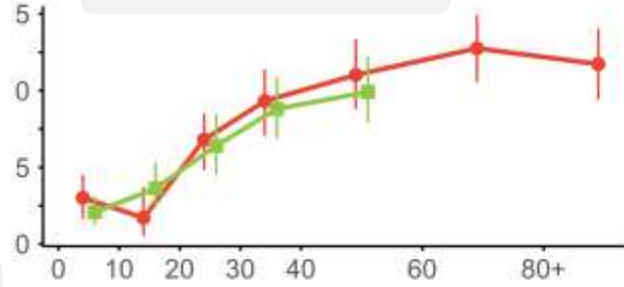


Évolution de la structure des forêts : coupes vs. feux

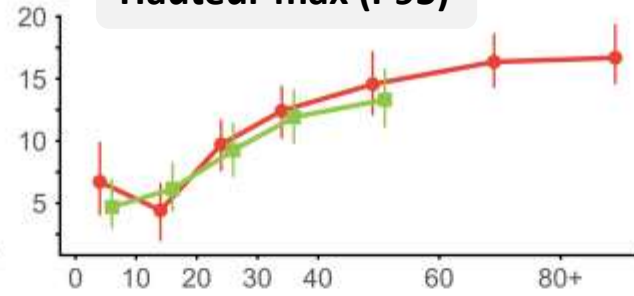
Sapinières à bouleau blanc



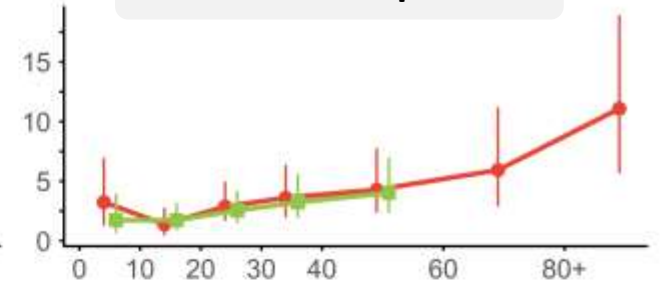
Hauteur moyenne



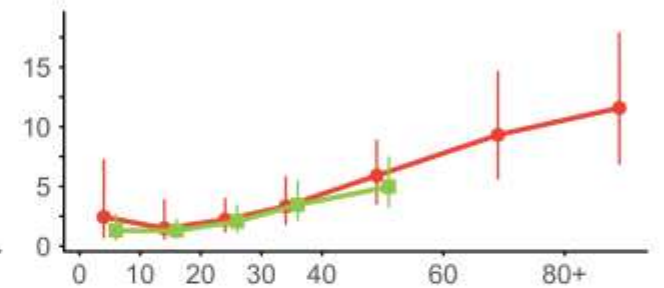
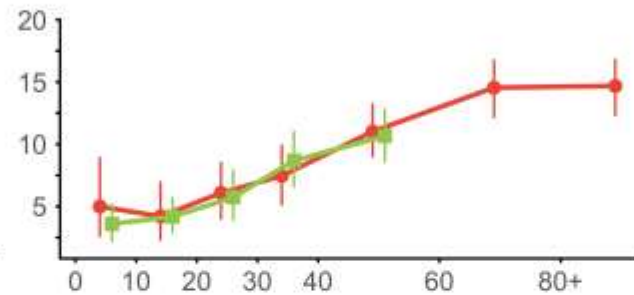
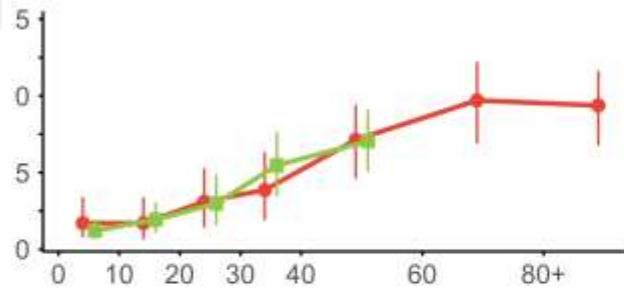
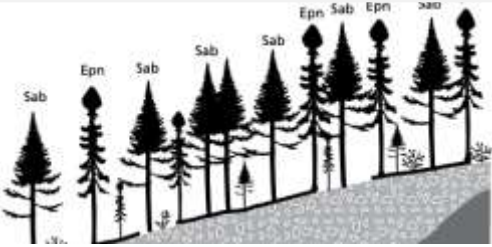
Hauteur max (P95)



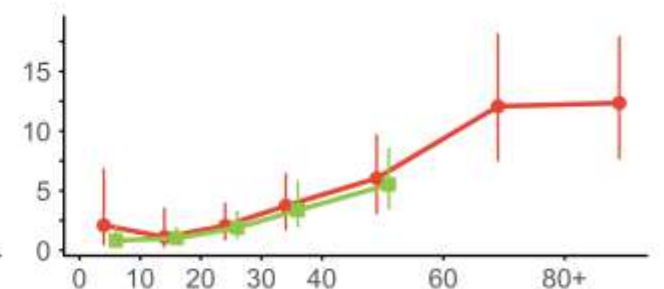
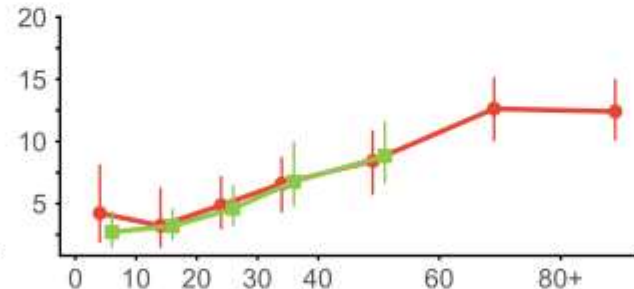
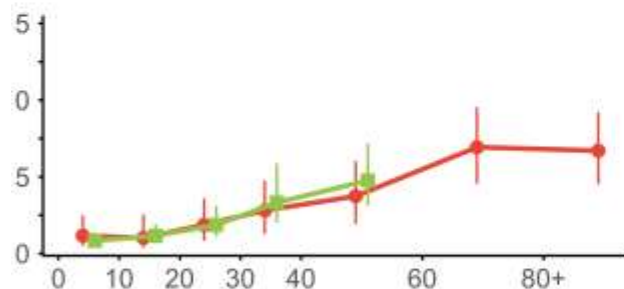
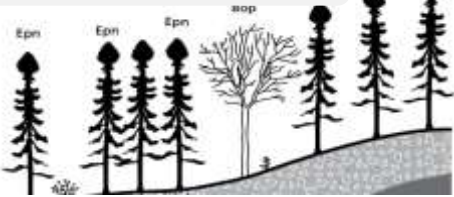
Variance intra-placette



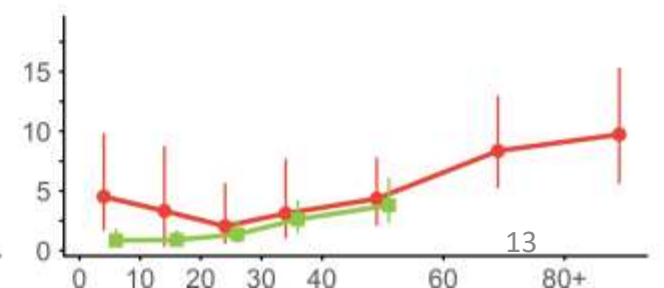
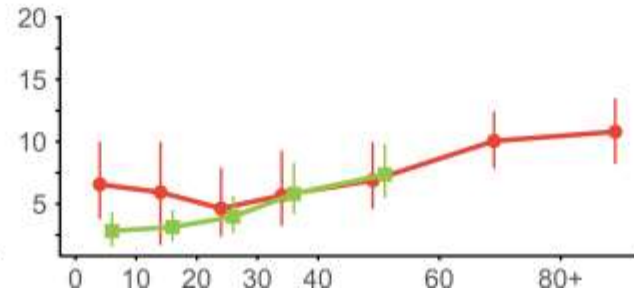
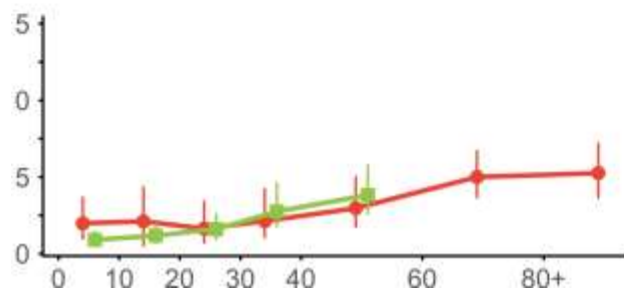
Sapinières à épinette noire



Pessières à mousse

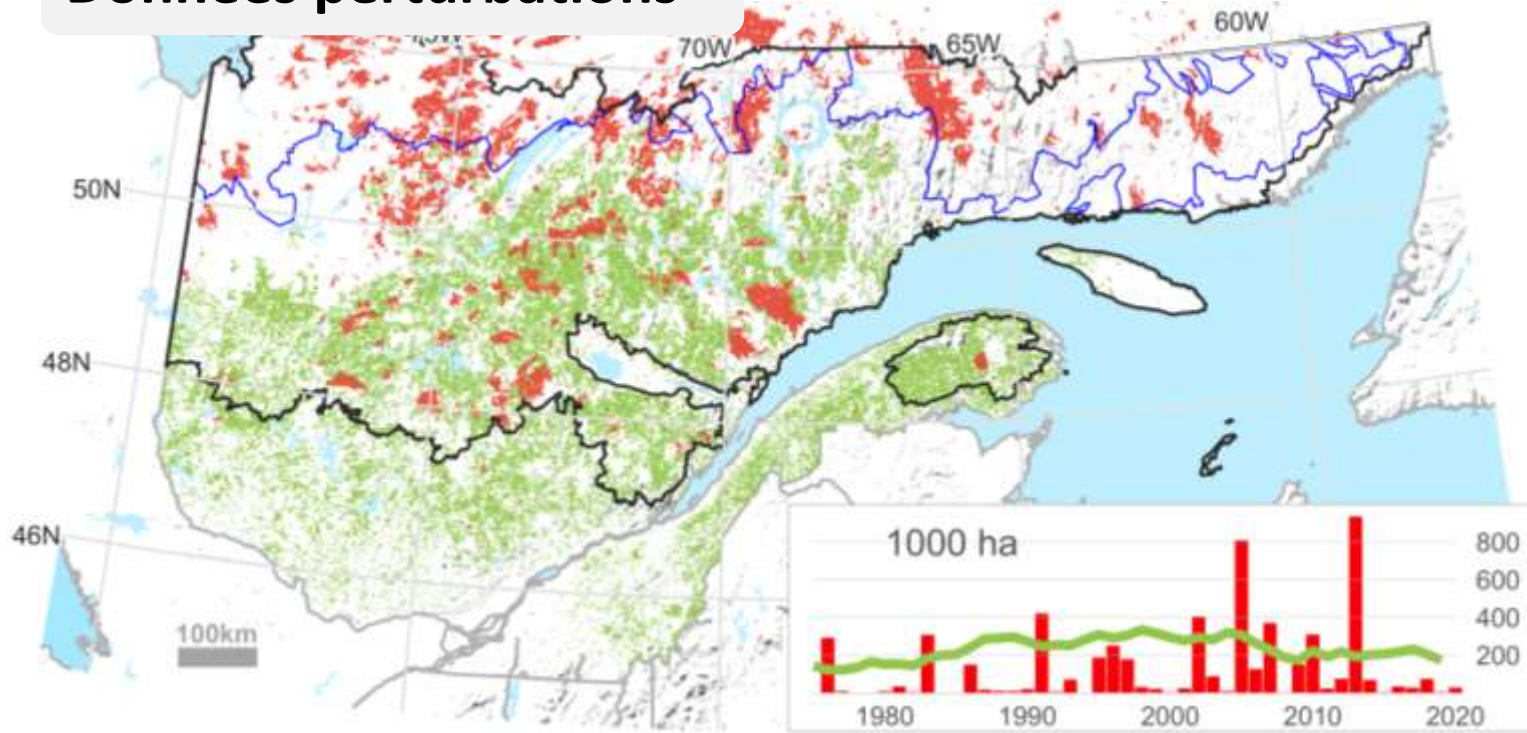


Pessières à sphaignes

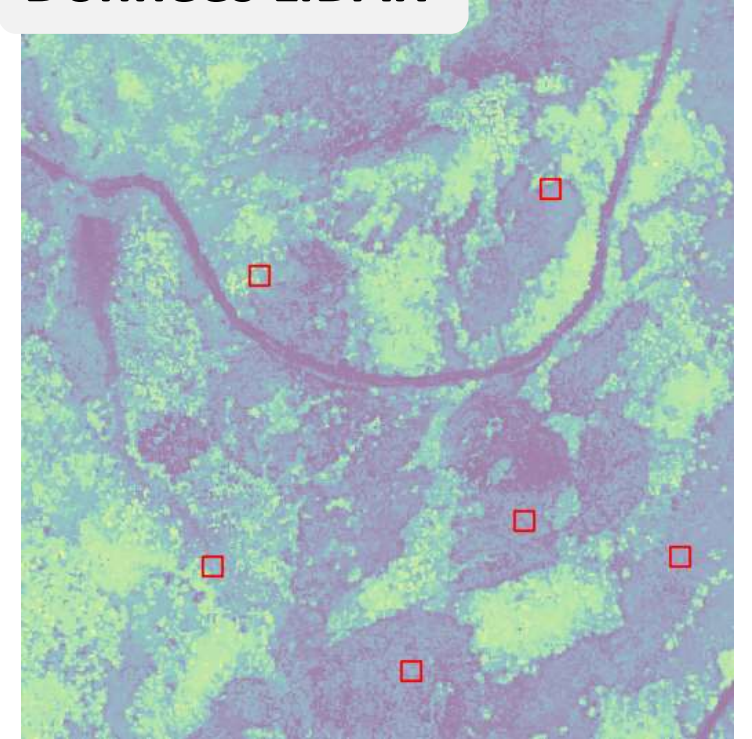


Un message pour la communauté...

Données perturbations



Données LiDAR



On a des outils...

Et des projets étudiants !

Merci pour votre attention !

