Reference

Map (classification)

	F-F	F-NF	NF-F	NF-NF	Total	p_{FF}	Var (p_{FF})
F-F	14	5	2	1	22	0.64	$0.010 + \sigma^2$
F-NF	9	12	2	3	26	0.35	$0.009 + \sigma^2$
NF-F	4	5	7	1	17	0.24	$0.011 + \sigma^2$
NF-NF	3	2	3	8	16	0.19	$0.010 + \sigma^2$
Total	30	24	14	13			

Design-based inference

- Select a probability sample
- Observe the response variable for the sample units
- Estimate the sampling variance using a design-based estimator

Design-based inference

- Select a probability sample
- Predict the response variable for the sample units
- Estimate the sampling variance using a design-based estimator

Design-based inference

- Select a probability sample
- Predict the response variable for the sample units
- Estimate the sampling variance using a design-based estimator
- Estimate the model prediction variance using a model-based estimator

Design-based inference

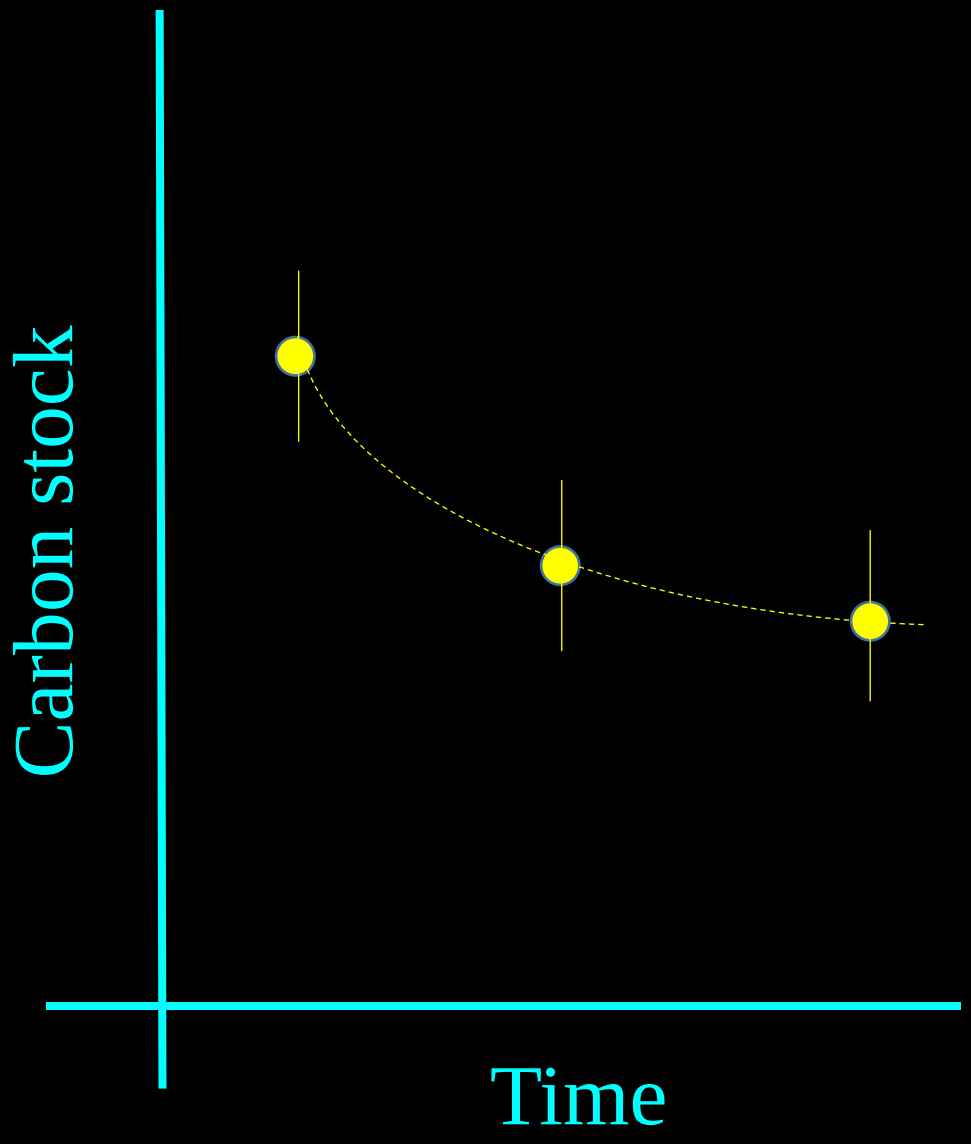
- Select a probability sample
- Predict the response variable for the sample units
- Estimate the sampling variance using a design-based estimator
- Estimate the model prediction variance using a model-based estimator
- Combine the two variances

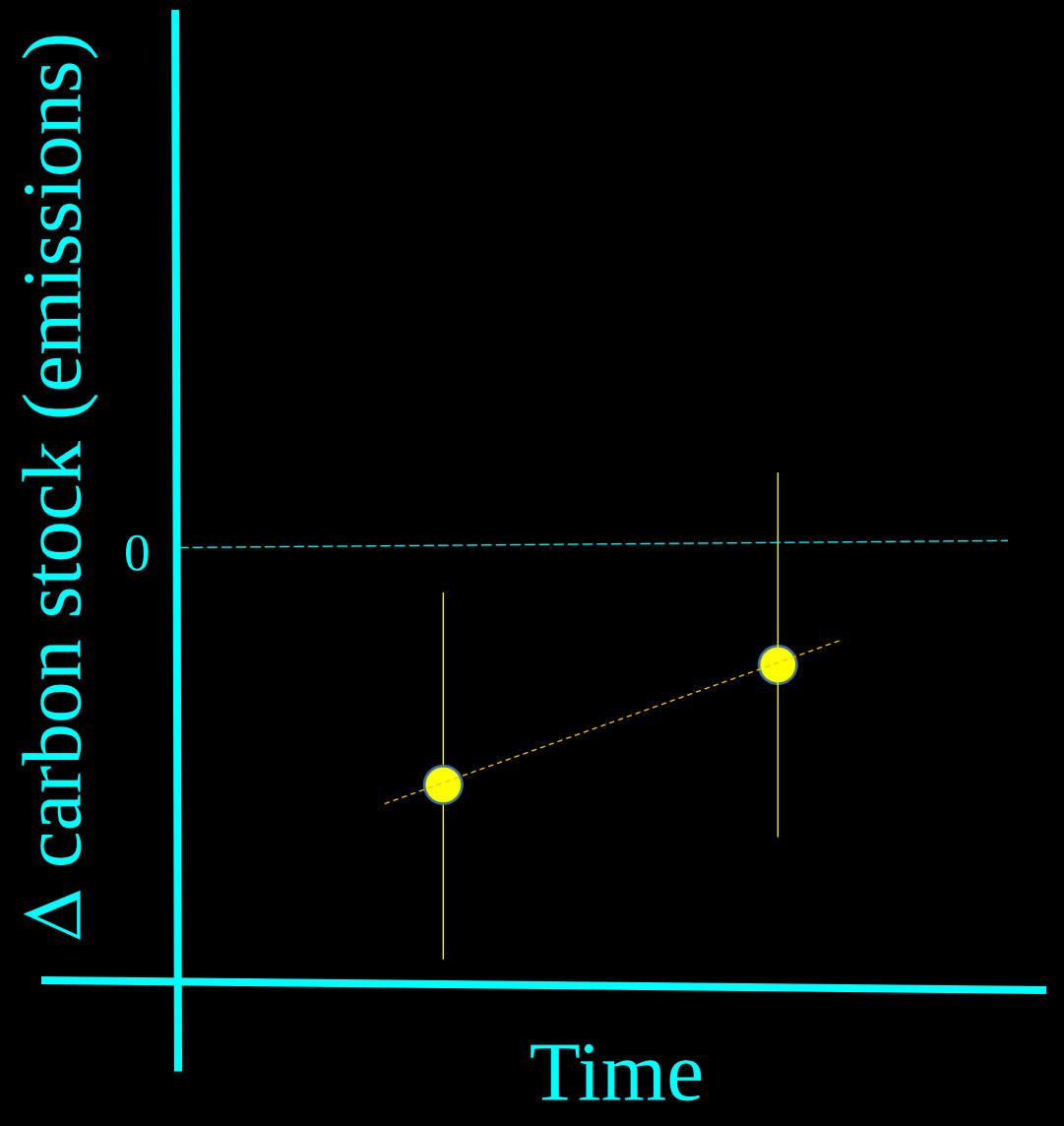
Hybrid inference

- Select a probability sample
- Predict the response variable for the sample units
- Estimate the sampling variance using a design-based estimator
- Estimate the model prediction variance using a model-based estimator
- Combine the two variances

Trends

- Is there a statistically significant temporal “trend” in emissions estimates?

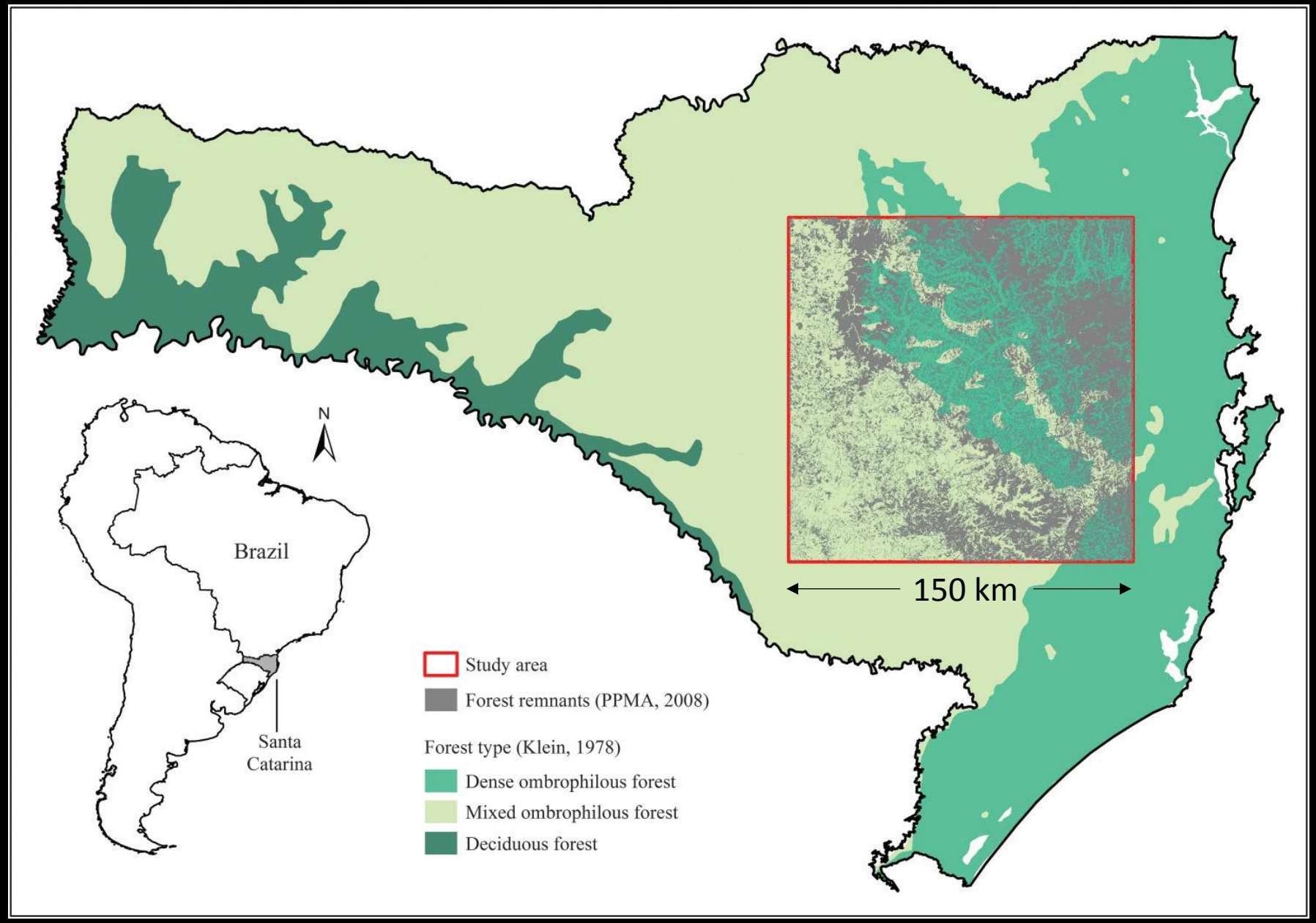

Carbon stock
Time


Δ carbon stock (emissions)
0
Time

Combining multiple forest/non-forest maps

Ronald E. McRoberts
Christophe Sannier
Erik Næsset
Matthew C. Hansen

Santa Catarina, Brazil



Four local maps:

- LCF/SAR:
  - 30-m x 30-m Landsat
  - Atlantic forest remnants

- PROBIO:
  - 30-m x 30-m Landsat
  - Atlantic forest native vegetation

- Atlas
  - 30-m x 30-m CBERS
  - Atlantic forest remnants

- PPMA
  - 30-m x 30-m SPOT
  - general thematic map

Global Forest Cover map

- University of Maryland (Matt Hansen)
- 30-m x 30-m Landsat
- Percent maximum tree canopy cover

Reference data:

- 225 plot Brazilian NFI/Santa Catarina plots
- 1000 m^2
- 10-km x 10-km grid
- forest/non-forest observations
  - minimum area of 0.5 ha
  - minimum canopy height of at least 10 m
  - minimum basal area of 10 $m^{2/}$ha

Combine maps:

- Fit model: $p_i = \frac{1}{1+\exp\left(\beta_0 + \beta_1 \cdot x_{i1} + \cdots + \beta_{ip}\right)} + \varepsilon_i$

  where X_i is the forest/non-forest observation from the local maps or percent tree canopy cover from the GFC product.

- Select a threshold for p_{thresh}

- For the i^{th} pixel, predict $\begin{cases} \text{non} - \text{forest} & \text{if } \hat{p}_i < p_{thresh} \\ \text{forest} & \text{if } \hat{p}_i \geq p_{thresh} \end{cases}$

Map	p_{thresh}	OA	PA		UA	
			NF	F	NF	F
Atlas	—	0.76	0.71	0.56	0.92	0.86
LCF/SAR	—	0.75	0.74	0.69	0.70	0.75
PPMA	—	0.82	0.84	0.84	0.80	0.79
PROBIO	—	0.75	0.72	0.65	0.84	0.78

Map	p_{thresh}	OA	PA		UA	
			NF	F	NF	F
Atlas	—	0.76	0.71	0.56	0.92	0.86
LCF/SAR	—	0.75	0.74	0.69	0.70	0.75
PPMA	—	0.82	0.84	0.84	0.80	0.79
PROBIO	—	0.75	0.72	0.65	0.84	0.78
SC	0.50	0.82	0.85	0.84	0.80	0.79

Map	p_{thresh}	OA	PA		UA	
			NF	F	NF	F
Atlas	—	0.76	0.71	0.56	0.92	0.86
LCF/SAR	—	0.75	0.74	0.69	0.70	0.75
PPMA	—	0.82	0.84	0.84	0.80	0.79
PROBIO	—	0.75	0.72	0.65	0.84	0.78
SC	0.50	0.82	0.85	0.84	0.80	0.79
GFC	0.95	0.69	0.76	0.79	0.61	0.65

Map	p_{thresh}	OA	PA		UA	
			NF	F	NF	F
Atlas	—	0.76	0.71	0.56	0.92	0.86
LCF/SAR	—	0.75	0.74	0.69	0.70	0.75
PPMA	—	0.82	0.84	0.84	0.80	0.79
PROBIO	—	0.75	0.72	0.65	0.84	0.78
SC	0.50	0.82	0.85	0.84	0.80	0.79
GFC	0.95	0.69	0.76	0.79	0.61	0.65
SC+GFC	0.57	0.83	0.84	0.83	0.83	0.81