

# Modeling biodiversity patterns with EO

**A)**

## Conceptual

$$Y = F(X_1, X_2, \dots, X_n, \beta)$$

Assess training data distribution, model calibration

Training data

EO feature  $X_1$  (grain 1)  
EO feature  $X_2$  (grain 2)  
EO feature  $X_n$  (grain n)

Model form

Test data

Model testing

Predicted response var. (Y)

fine

Grain size

coarse

Sensitivity analysis, scale selection

## Legend

- Discrete data
- Continuous data
- Small extent
- Full extent
- Community composition
- Ecosystem function
- Ecosystem structure
- Species populations
- Species traits
- Topography
- Climate

**Mendenhall et al. (2011)**

Modeling bird community composition from LUC  
Extent: Coto Brus, Costa Rica

**B)**

$$\text{Bird community composition} = F(\text{Ecosystem structure})$$

Bird community similarity (Sørensen index)

Tree cover (70 m)

Linear model

Model calibration

Independent test data

Modeled community similarity (70 m)

$R^2$  of model applied to independent data

fine

Grain size

Sensitivity analysis, scale selection

coarse

**C)**

**Saatchi et al. (2007)**

Modeling tropical biomass distributions  
Extent: Amazon Basin

$$AGB = F(\text{Ecosystem function}, \text{Ecosystem structure}, \text{Topography})$$

Biomass plots

Decision tree classifier

Model calibration, bootstrapping

MODIS LAI/VCF (500 m)  
JERS-1 backscatter (100 m)  
QSCAT backscatter (1 km)  
SRTM elevation (100 m)

Independent plot data

Classification and spatial accuracy assessment

Modeled biomass (1 km)

fine

Grain size

coarse

Spatial resampling, scale selection

**Saatchi et al. (2008)**

Modeling five tree species distributions  
Extent: Amazon Basin

$$\text{Species distributions} = F(\text{Ecosystem function}, \text{Ecosystem structure}, \text{Topography}, \text{Climate})$$

Species occurrence records

MODIS LAI/VCF (500 m)  
QSCAT backscatter (1 km)  
SRTM elevation (100 m)  
TRMM rainfall (30 km)

MaxEnt

Model calibration, jackknifing

Holdout data

Modeled species distributions (1 km)

Extrinsic omission testing, AUC

fine

Grain size

coarse

Spatial resampling, scale selection