

# Soil-landscape patterns and fractal parameters of deforestation: a case study of Continental Ecuador Biosphere Reserves

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## Aim of the study

Analyse and describe deforestation patterns occurred between 1990 and 2016 in two Continental Ecuador Biosphere Reserves (CEBRs) located in Ecuador (South America) and to explore the linkage of these patterns accordingly to different soil types

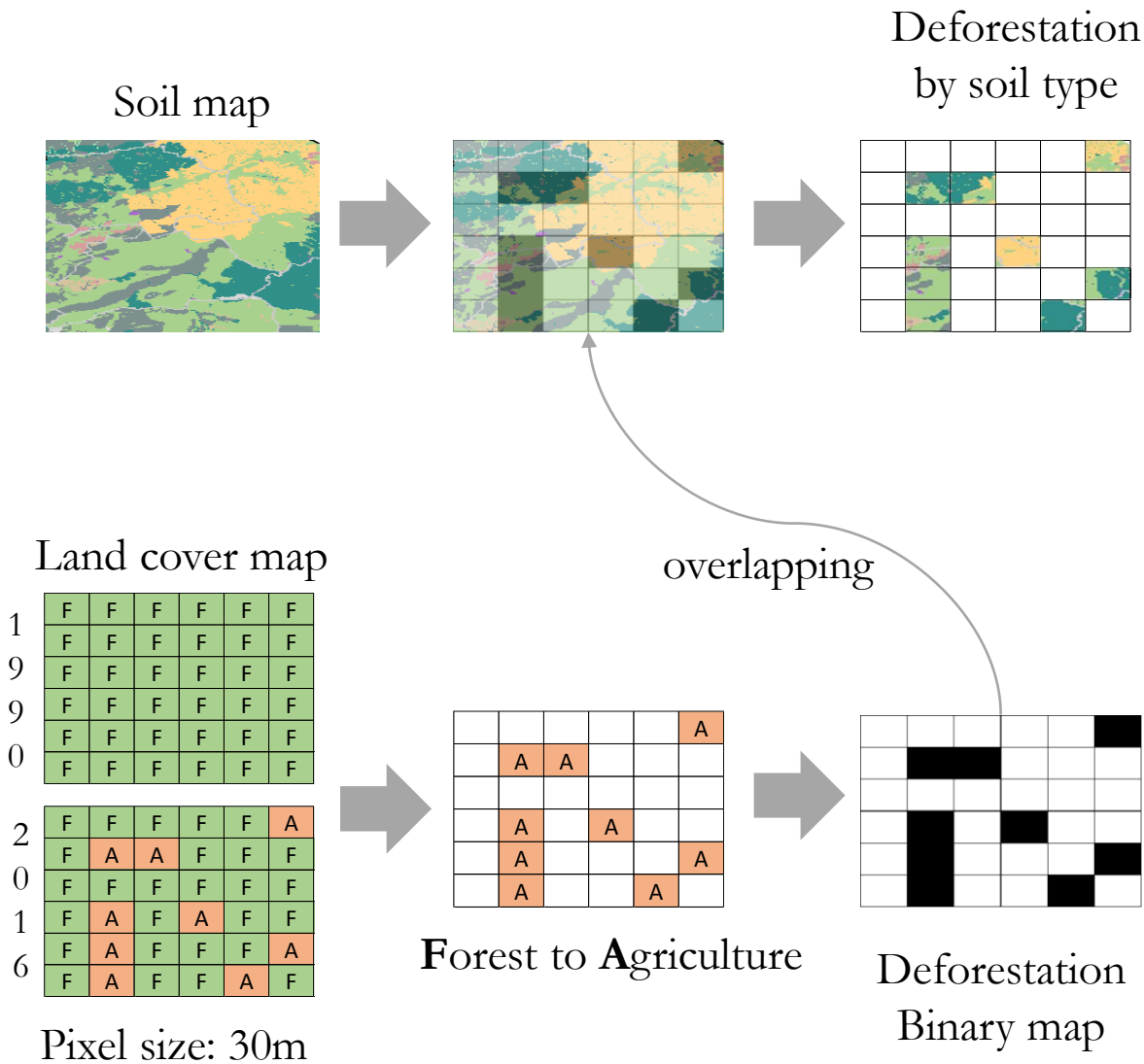
# Case study



- Expansion of the agricultural, hydrocarbon, and mining frontier
- Illegal trafficking of wood and wildlife
- Territorial planning deficiency
- There is little reliable scientific and technical information of the deforestation process for decision making.

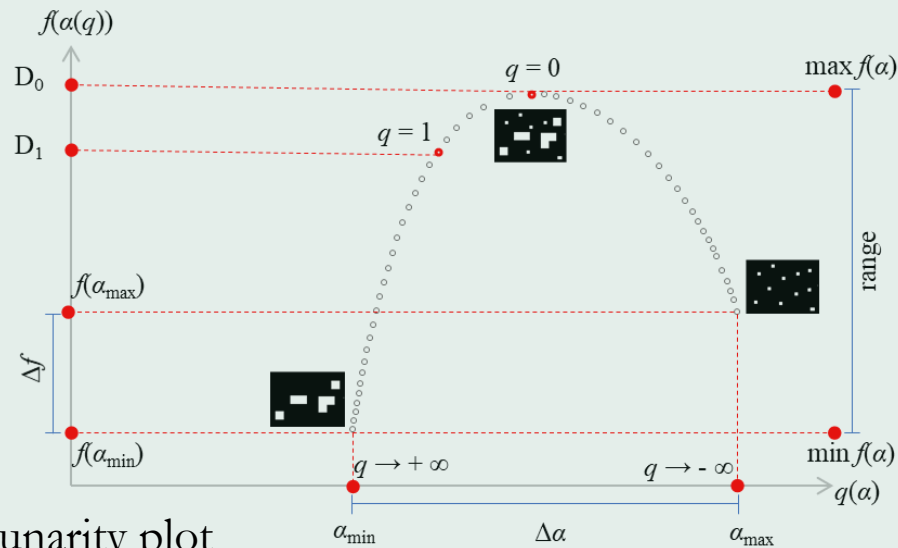


# Method

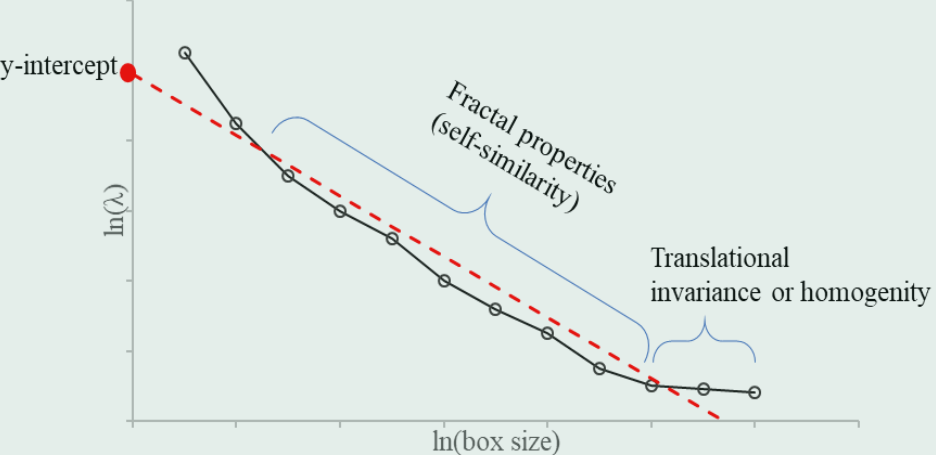


## Analysis

### Multifractal spectrum

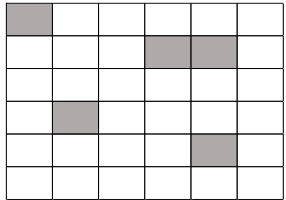


### Lacunarity plot

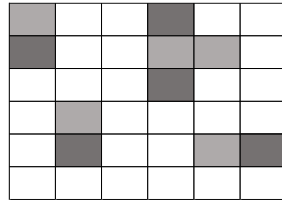


## Interaction of three deforestation patterns:

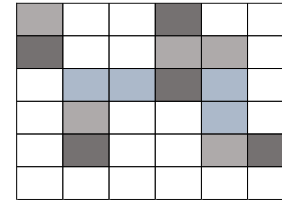
Initial spatial arrangement  
of deforested patches



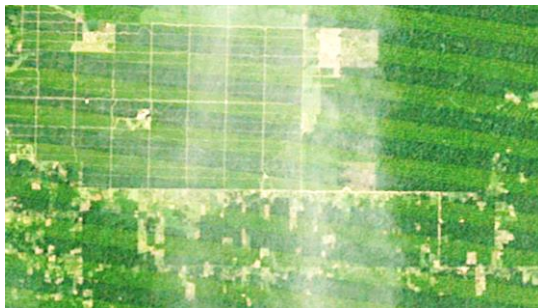
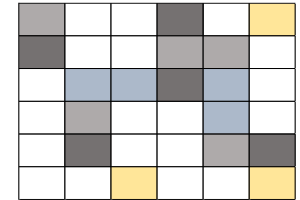
1. growth of pre-existing  
patches



2. growth and fusion of  
pre-existing patches



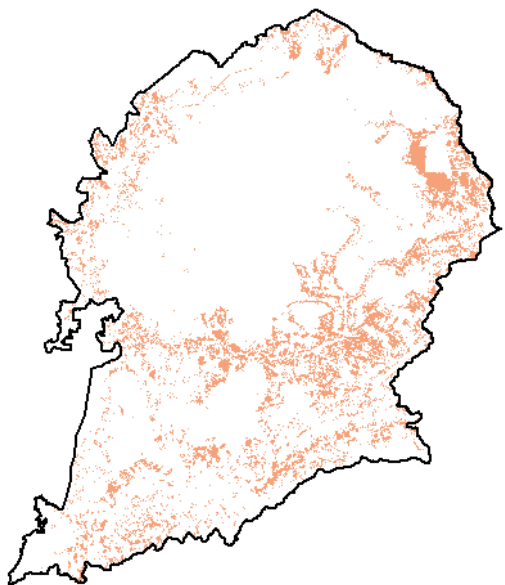
3. appearance of new deforested  
patches



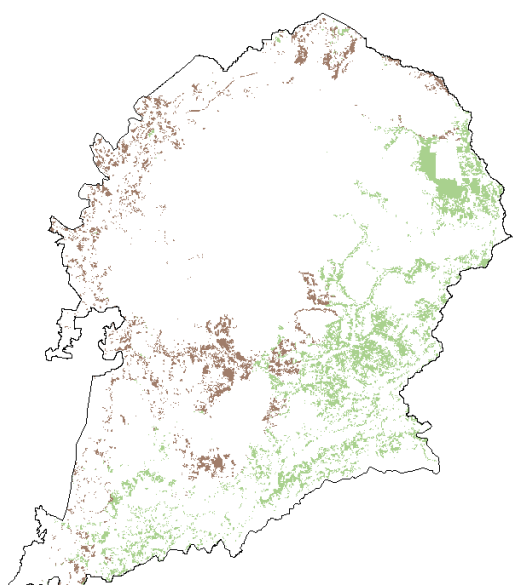
# Results

## *Sumaco*

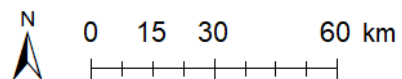
Forest to Agriculture  
1990 – 2016



Deforestation by soil type  
1990 – 2016

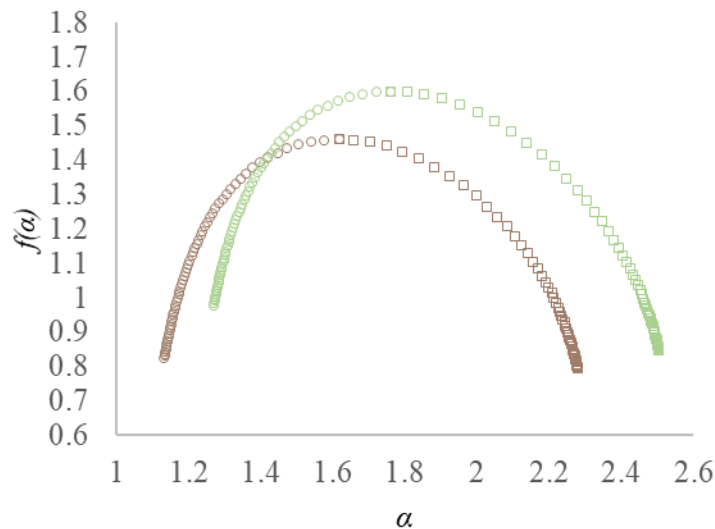


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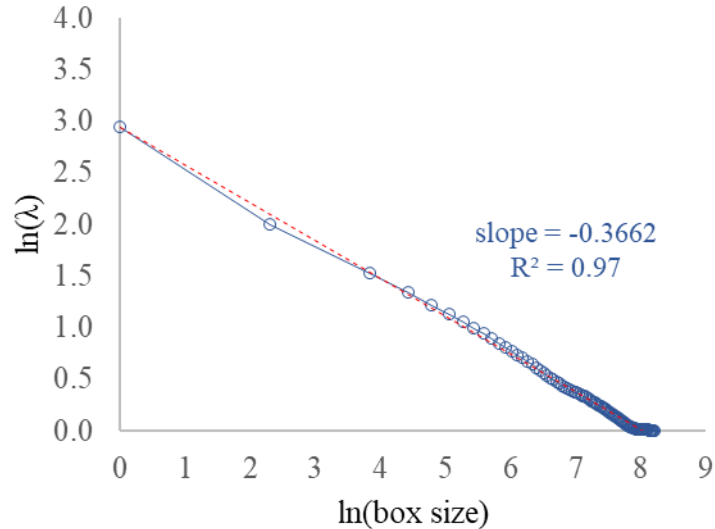


*Sumaco* area: 9,982 km<sup>2</sup>

Multifractal spectrum  
of deforestation by soil type  
1990 – 2016



Lacunarity plot  
of deforestation  
1990 – 2016



Statistics	2000	2008	2014	2016
% Primary forest*	78%	75%	74%	73%
% Deforested area*	7%	11%	14%	15%
No. deforested patches	4,866	4,779	5,140	5,313

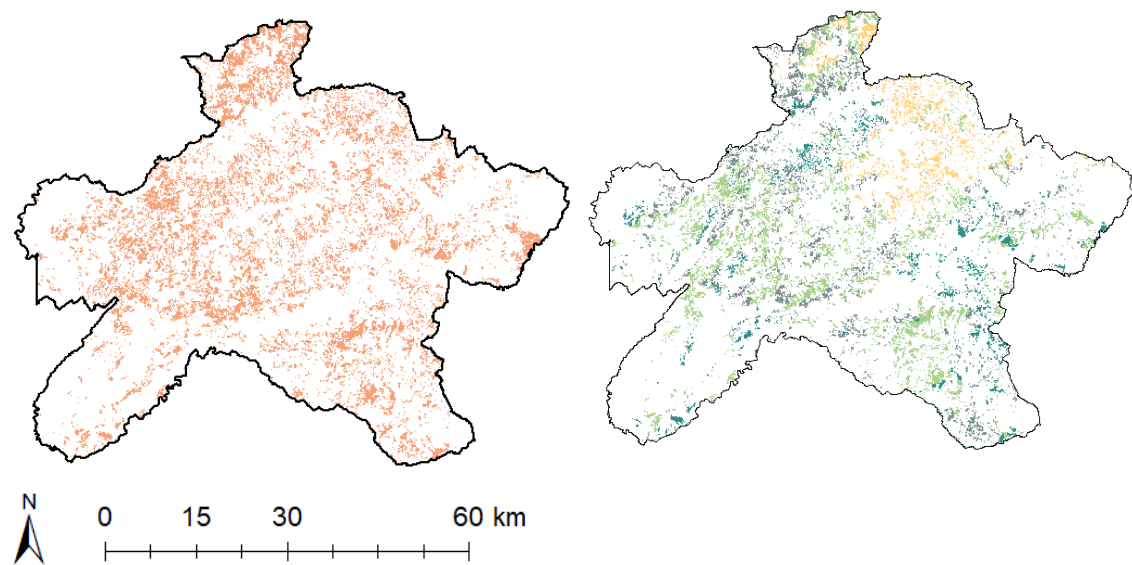
(\*) calculated with respect to the total area of *Sumaco* biosphere reserve

# Results

## *Bosque Seco*

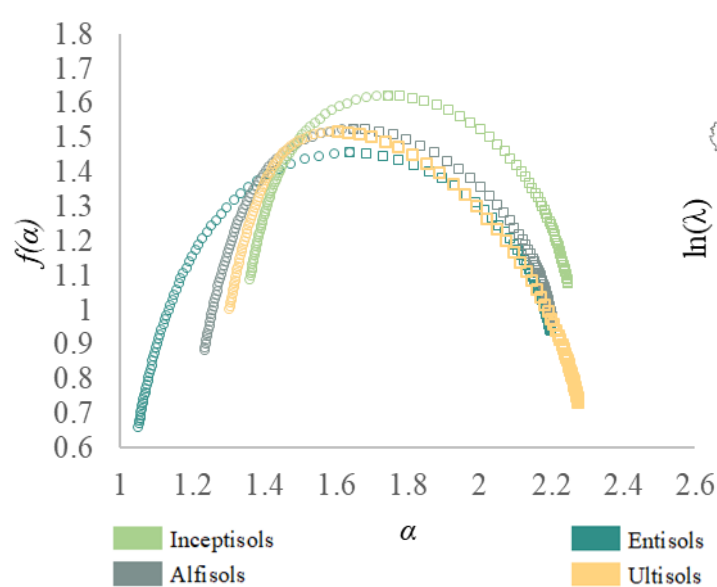
Forest to Agriculture  
1990 – 2016

Deforestation by soil type  
1990 – 2016

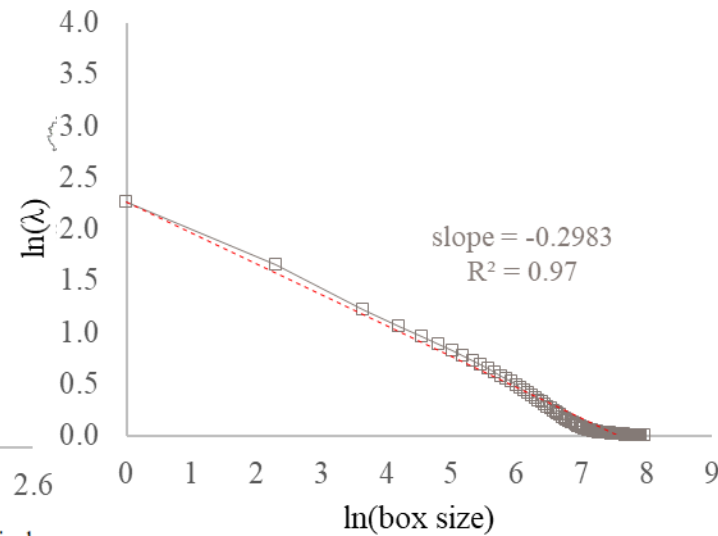


*Bosque Seco* area: 5,010 km<sup>2</sup>

Multifractal spectrum  
of deforestation by soil type  
1990 – 2016



Lacunarity plot  
of deforestation  
1990 – 2016



Statistics	2000	2008	2014	2016
% Primary forest*	55%	51%	46%	46%
% Deforested area*	8%	15%	21%	22%
No. deforested patches	7,370	7,068	6,270	6,297

(\*) calculated with respect to the total area of *Bosque Seco* biosphere reserve



# Conclusions

1.

Deforestation patterns are linked to soil types

3.

Landscape ecology, lacunarity and multifractal analyses are useful to understand deforestation patterns

2.

Deforestation patterns shows spatial self-similarity

4.

Initial patch location, distance to the nearest neighbor and soil suitability boost the deforestation expansion

# Thanks !



Ministerio  
del **Ambiente**