Analysis of critical transitions at the Global Forest

The idea is to do a global analysis using insights from percolation theory to detect signals of ecological transitions [1]

Thus the question is how near/far is the global forest from a catastrophic transition?

We will use the MODIS vegetation continuous field, so we can analyse temporal changes.

- Most probably multiple process influence the distributions of patch size at a continental scale, so we are trying to extract the main generic ones.
- How scaling laws are related to ecosystem function?
- Hypothesis: two power laws, small patches related to deforestation dynamics, large patches related to forest inner dynamics.

Methods

- The United Nations' International Geosphere-Biosphere Programme definition of forest (Belward 1996) defined forest as pixels with tree cover equal or greater than 30%
- We should define areas with different levels of degradation to apply the spatial indicators [Very difficult because is not possible to establish reliable controls]
- The distribution of patches is continuous but the data is discretized so we discard the lowest values and start fitting patch sizes greater than 10.
- MODIS VCF
- Fitting four models
- Consecuences of each model
- Rates of growth an shrink of patches [2]
- Portfolio concept relating [2] and [4]

Results

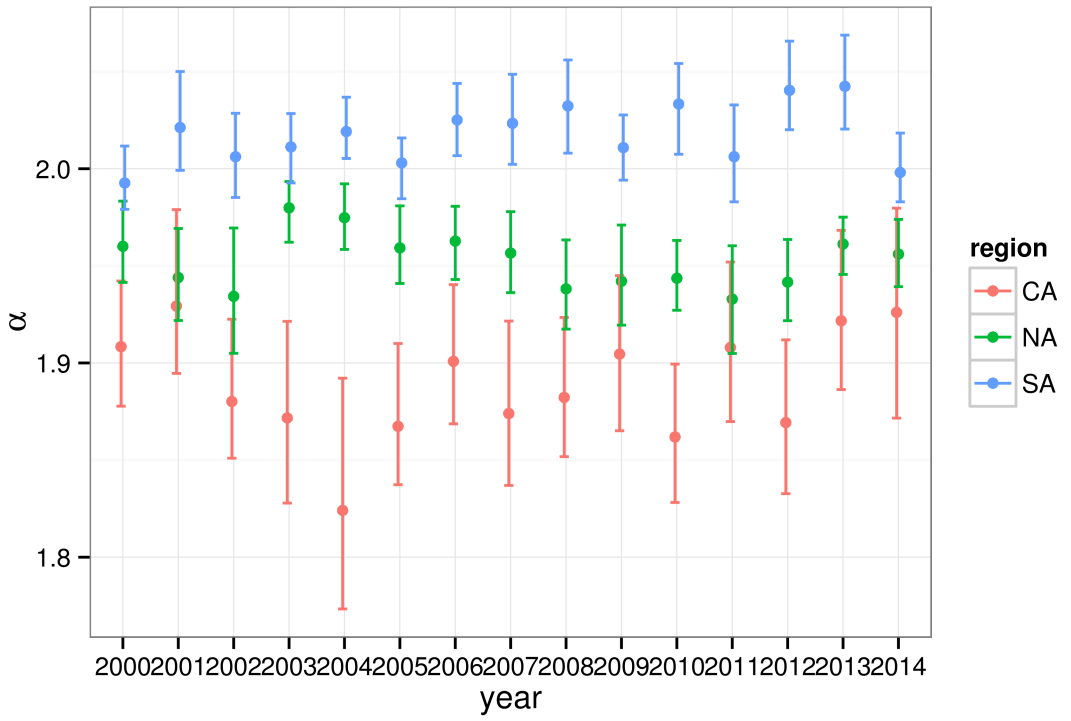

Figure 1: Power law exponent of best models by year and with different data sets: **<Xmin* the data is less than the extimated minimum patch size, *Estimated Xmin* the minimum patch size was estimated from data, and only patch sizes greater than or equal to Xmin was used.

Related papers

- About fitting power laws [5] [6]
- About global maps [7] [8] [9]
- About cluster statistics [10] [2]

Bibliography

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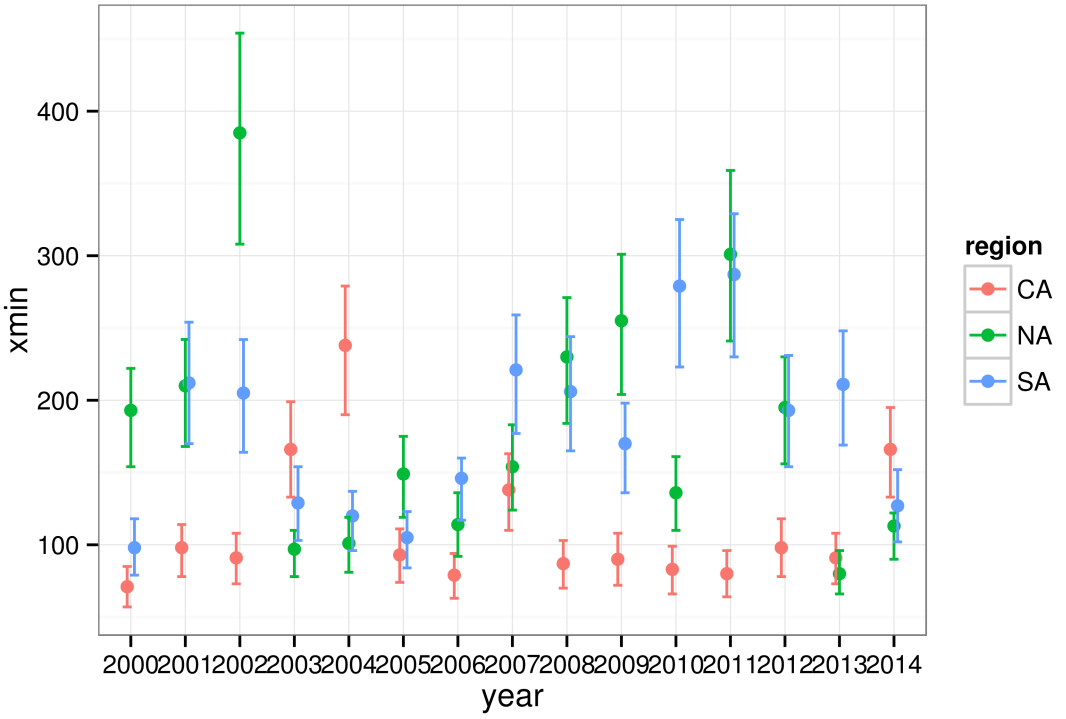

Figure 2: Estimated X_min by year.

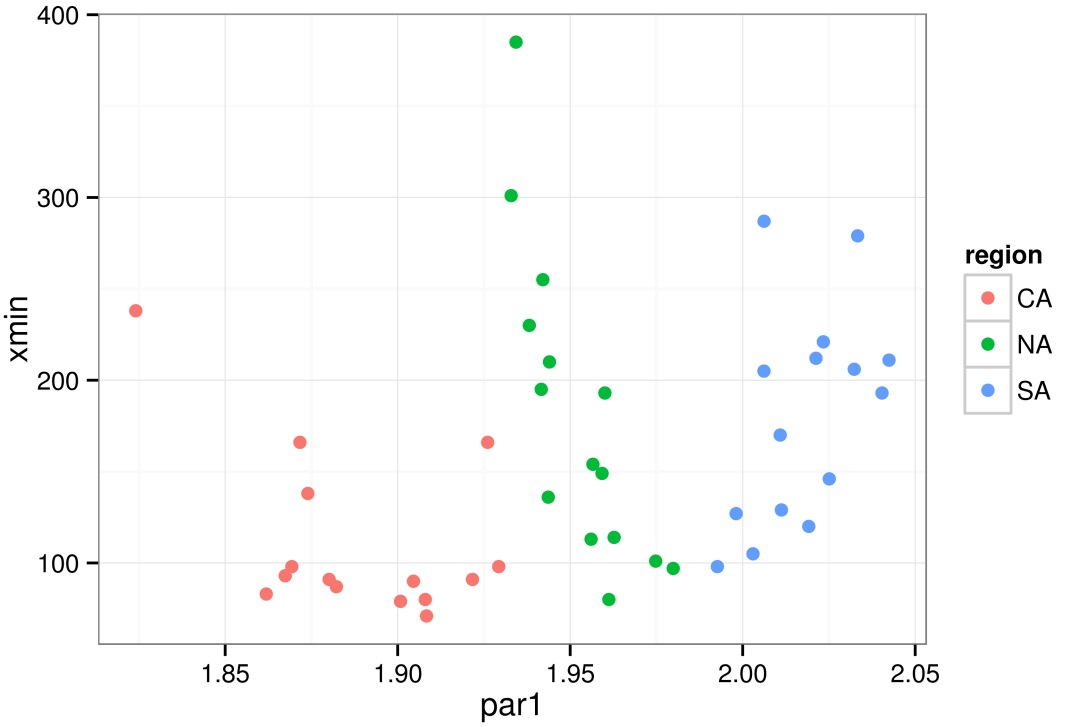

Figure 3: X_min vs power exponent

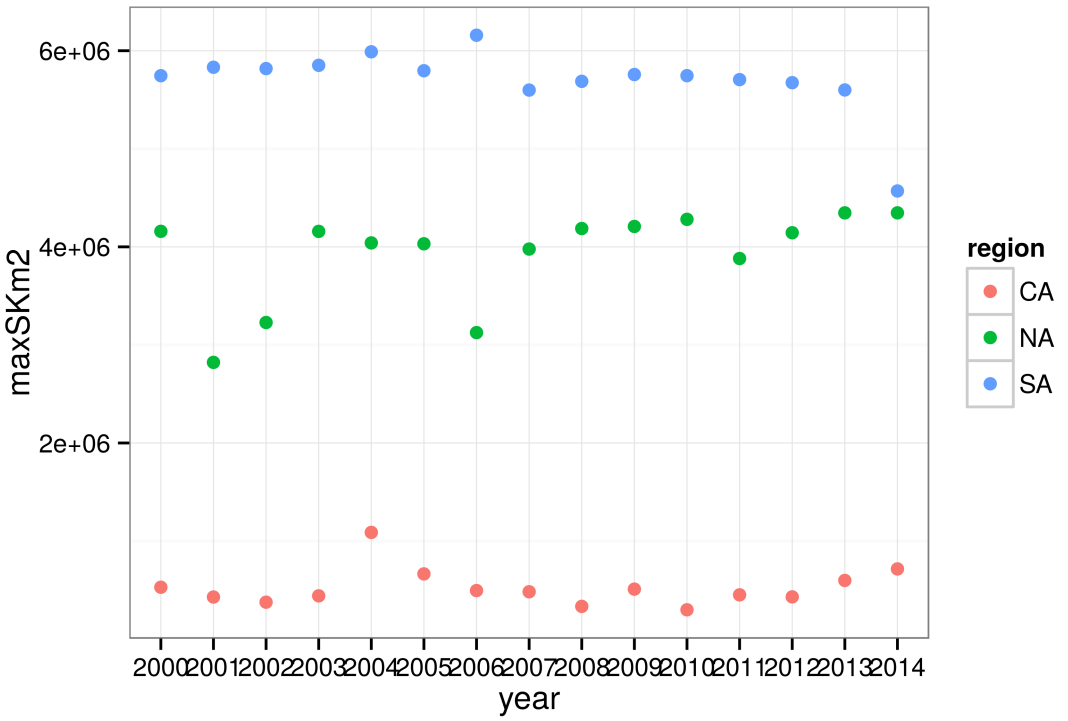

Figure 4: Biggest patch size by year

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