Analysis of critical transitions at the Global Forest

Power laws are ubiquitous in nature [1] and much of them are related to vegetation, like patch patterns in semi-arid regions [2] photosynthetic biofilms [3], savanna forest transitions [4] and tree size structure in tropical forest [5]. Several of these power laws are related to patch sizes which define fragmentation [6]. Fragmentation is a global issue and have multiple impacts on ecosystems from reducing biodiversity to changes on nutrient cycling [7]. The concept of percolation shows that there is a critical threshold where suitable habitat patches are essentially isolated [8]. Here we analyzed forest at a global scale to determine if some regions are close to the fragmentation threshold. Following percolation theory, if a system is near a threshold its patch structure must follow a power-law, beside this is not a proof is a necessary condition []. If we are near the fragmentation threshold the biggest patch will have major fluctuations, because the addition or loose of a small patches will change its size the fluctuations must be also be power-law and that if we are approaching the threshold fluctuations will increase with time. We observed that the forest patch structure follows power laws in four major continental biomes: Africa, North America, South America, South East Asia; and it follows a log-normal distribution in Eurasia. Fluctuation of biggest patch are all power law reveals that Africa, and South East Asia are near a fragmentation threshold, North America and South America are not approaching it thus the power laws could be the results of fire and facilitation. Eurasia is also in a pattern of increasing fluctuations.

1 Results

2 Related papers

- About fitting power laws [9] [10]

- About global maps [7] [11] [12]

- About cluster statistics [13] [14]

3 Bibliography

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