**Dynamic Landscapes**

1. **Connectivity Degree as a function of distance to landscape’s center, on finite size random geometric graphs.**

On fig. LamdaVSd2center\_Stat.eps we show for each node (spot on landscape), connectivity degree (lambda) as a function of its geographic distance (D) to landscape’s center. Colors stand for different values of distance threshold (R/L).

The plots shown in this figure have been obtained on static landscapes.

Best fitting shows in all cases a linear relation:

There is a clear difference between plots above and below percolation threshold

On one hand, for , we get , on the other hand, for we get

as shown in fig. LamdaVSd2center\_Stat\_aANDbFIT.eps

We can confirm this trend by producing a collapse of all plots above percolation threshold as shown in fig. LamdaVSd2center\_Stat\_collaps.eps

As we include dynamics into landscape connectivity, Lamda VS D behaves as shown in movie: Lamda\_vs\_D.avi

1. **The impact of dynamics on Gamma.**

Let’s start from static case (GPT=1). As shown in fig ASymD\_gamma\_GPT0001.eps, Gamma seems to grow in time following a power ‘n’ that depends on a connectivity cut-off (threshold). Please pay attention to the fact that, at figure captions we show “A – GPT” for each color. GPT=1 for all simulations. “A” goes from 0.025 to 1. However, the true connectivity cut-off is in this case.

Anyway, for all cases, we get

with “” dependent on

As we turn on dynamics on landscape’s connectivity in a periodic way up to a threshold , we can immediately note changes on following dynamics frequency.

In fig. Fig\_gamma\_t\_dyn.eps we show the connectivity threshold periodicity (in green – right ‘y’ axis) with a frequency that allows 500 generations per landscape period. We also show ’s time series for the case of . We can note a general trend where the lower the connectivity, the more isolated sites and the higher , as we have already discussed many times.

However, we can note also the impact of connectivity oscillations as peaks in in coincidence with landscape’s connectivity valleys. Moreover, the highness of the peak is bigger above percolation. Than means, the impact of isolation waves is stronger on highly connected landscapes.

It remains here to calculate peak’s high as a function of connectivity threshold A/L.

1. **The impact of dynamics on Alpha.**

In fig. ASymD\_alpha\_GPT0001.eps we show the general trend for different connectivity threshold values, on static landscapes.

Best fitting is shown and seems to follow a saturated exponential behavior.

with a clear differentiation between systems above and below percolation threshold.

As we include dynamics on landscape’s connectivity, we notice an oscillating trend in following landscapes frequency. In fig. Fig\_alpha\_t\_dyn.eps we show how peaks of appear as connectivity is spread across landscape. We see also a clear difference between systems with connectivity below and above percolation threshold.

1. **Interesting remarks**

It is very interesting to notice that Gamma and Alpha respond to processes acting at different spatial scales. Alpha comes from a local process as a trade off between migrations and speciation. On the other hand, Gamma attends exclusively to global processes like speciation, in our case.

It would be really interesting to connect that scale gap with the fact that, while alpha behaves as a saturated exponential function (local processes), gamma responds as a power law increasing function (global processes). It is like saying that microscopic simple behavior leads to macroscopic complex patterns, as usual in nature!

I’m looking now on processes following to power laws, in particular those that start from local processes following exponential behavior, as shown in the article: “Power laws in economics and elsewhere” by Farmer and Geanokopolos, 2008 at Santa Fe Institute.