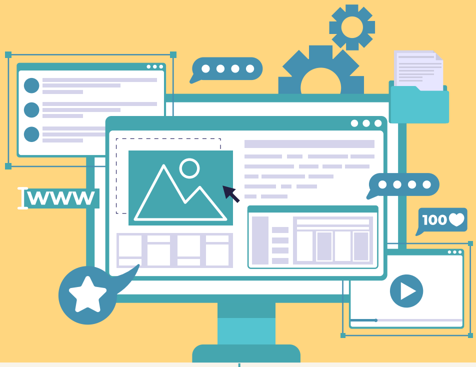
Article structure draft

Use of CLVs for determining regime change in coupled maps and continuous systems



1 OUR RESEARCH QUESTIONS

- Do the CLVs carry information about the regime change in coupled maps and continuous systems?
- How many CLVs are necessary to have this information?
- Can this small number of vectors be used to train a machine learning algorithm to predict the regime change?

2 OUR TOOLS

A section of the article should be dedicated to a review about:

- What is intermittency
- Lyapunov exponents and vectors
- Machine learning

3 CONTINUOUS SYSTEMS

L63

1) Small description of intermittency in the system and attractor dimension
2) Global analysis of CLVs
3) Local analysis of CLVs with statistic and tests
4) ML for change in wing

L96

1) Dynamical features of the system
2) Attractor merging crises
3) Global analysis of CLVs
4) Local analysis of CLVs

4 COUPLED MAPS

Single site:
CLV: burst -> laminar
ADJs: Laminar -> burst

Multi site: (num of sites)
CLV: burst -> laminar
ADJs: Laminar -> burst

SIMILAR RESULT FOR COUPLED MAPS

5 WHAT KIND OF STORY DO WE WANT TO TELL

We want to show that the CLVs are good indicators for change in regime in continuous dynamical systems and coupled maps. In particular we show that in the simple case of the change of wing in L63, where we also show how this can be use with ML to have prediction signal; in the type-I intermittency in the same system, in the L96 system through the attractor merging crises and in coupled maps. We show that the number of vectors we need to obtain this kind of info is in general less with the respect of the dimension of the system we are dealing with. We explain that these result seem to be generalizable to other kind of intermittency due to the very nature of CLVs.
We can speculate that this may be the springboard for the use of these methods in geophysical systems to predict abrupt regime shifts and to develop early warnings for extreme events

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