

Interactive comment on “Brief Communication: Breeding vectors in the phase space reconstructed from time series data” by Lynch et al.

The authors proposed a new approach, i.e. the nearest-neighbor breeding, to model and predict sudden transitions in systems represented by time series data. Furthermore, they used the Lorenz-63 model to examine the validity of this method. The results show that the dynamical properties of the standard and nearest-neighbor breeding are similar. This validates the ability of this new approach to predict regime change in a dynamical system using the time series data of one variable. Thus, this has important implications.

However, I think that the presentation needs to be improved. Here a list of points and questions should be addressed:

1. Page 1304, line 15: The authors mentioned “the systems known to exhibit sudden regime changes in their data”. In fact, I am especially interested in these systems. In addition to magnetospheric substorms and geospace storms, are there any other systems known to exhibit sudden regime changes? As for the well-known phenomena such as the haze, rainstorm and thunderbolt, could the nearest-neighbor breeding be used to model and predict them?
2. Page 1305, lines 11-13: This sentence should be reformulated. It is not clear.
3. Page 1306, line 2: The authors said “in order to avoid selecting nearest neighbors that are on the control trajectory”. Please explain the reasons.
4. Page 1306, lines 1-4: Are there $2l+1$ points to be excluded?
5. Page 1306, lines 7-8: “the density of the trajectory points must be high enough”. That is to say, the temporal resolution of the time series Δt should be sufficiently

small. Is this right?

6. Page 1307, line 1: Is here “ $m = 3$ and $\tau = 7$ ” determined by the methods described in section 2 (Page 1305, lines 2-9)?

7. Page 1307, line 17: The authors used the breeding window size $n = 8$ with $\Delta t = 0.01$ and perturbation size $\alpha = 0.10$ in all experiments. Then, what about the sensitivity of the results in this paper on n and α ?

8. Page 1307, line 21: The authors said “excluding $l = 6$ adjacent points”. However, I think there should be $2l+1=13$ points to be excluded. Am I right?

9. Page 1307, line 25: The authors said “The left column of Fig. 1 shows the growth rates along the respective controls in the three experiments”, but not mentioned the specific points. Are the points in the left column of Fig. 1 the control trajectory points? That is to say, do these points correspond to the time series data?

10. Page 1308, line 18: The threshold value “1” seems to be unreasonable. According to Fig. 1(f), there are many red stars corresponding to the absolute value of x_1 that is greater than 1. If ignoring all these stars, some information about the regime change may not be noted and used.

11. Page 1309, lines 10-11: The first reason should be reformulated. I do not understand what you said.

12. Page 1309, lines 17-19: For the time series data of variable x when t is smaller than 10, the longer duration of the high growth rate does not indicate the next longer-lasting regime (Fig. 1d). Please clarify this phenomenon.