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

### **Anonymous Referee #3**

Received and published: 12 October 2015

The authors of "Breeding vectors in the phase space reconstructed from time series data" presented an interesting approach to detect the behavior of breeding vectors using only a one-dimensional time series. The authors use the well known embedding technique to observe the growth rate and the spatial structure of perturbations starting from a fixed distance.

The paper is interesting but I have two main issues:

a) in a seminal work of Lyapunov exponents determination starting from one-dimensional time series

Brown, Bryant and Abarbanel, PRA 43, 2787 (1991) "Computing the Lyapunov spec-

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trum of a dynamical system from an observed time series"

the authors discuss in detail the importance to use two dimensions in computing the exponents. This is probably related to the choice of the integer  $m$  discussed at page 1306. Please discuss the relation between the choice of this paper and that given by Brown et al. namely the first minimum in the mutual information.

I think that the authors should discuss the effect of changing  $m$  in their findings.

b) The example given on the standard Lorenz model is, in my opinion, not sufficient. The authors should test their technique on more complicated models like, for example, the Lorenz 96 model where the system dimension is larger than 3 and the embedding technique becomes more difficult to be applied.

After the authors address the two points I raised the paper can be considered for publication.

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Interactive comment on Nonlin. Processes Geophys. Discuss., 2, 1301, 2015.

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