

Response to Anonymous Referee RC 2

I thank the referee for the careful reading and the useful comments and will adapt the manuscript accordingly. Below is a point by point reply with the referee's comments in bold font, my reply in italic font and the changes in manuscript in normal font.

1. Comment of the referee:

In Eq. (6), the state vector X_t should be replaced by the difference with the deterministic steady state, say Y_t , defined as $Y_t = X_t - x^*_n$

Author's reply:

That is indeed better.

Changes in text:

Formula will be adapted.

2. Comment of the referee:

Define MOC before it appears first (in page 6). What has been defined in page 5 is AMOC. The relationship between the two acronyms would be quite evident for most readers, but could be confusing for the ones less familiar with this type of circulation.

Author's reply:

This was indeed unclear.

Changes in text:

The explanation of the acronyms will be checked and corrected.

3. Comment of the referee:

Page 7: principle component -> principal component

Author's reply:

Agreed.

Changes in text:

Text will be corrected.

4. Comment of the referee:

Page 5: '... only four bifurcations can occur GENERICALLY when a single ...'

Author's reply:

Agreed.

Changes in text:

Will be corrected.

5. Comment of the referee:

I am not happy with the nomenclature of 'critical transitions'. The reason is that the expanding tendency in environmental applications is to use it in the sense of 'abrupt', 'discontinuous', which is exactly the contrary of the much older use of the word in several fields of physics, qualifying phase transitions. Perhaps a less ambiguous name would be 'dangerous transition' (Thompson et al. (1994) Phys. Rev. E 49, 1019 ; Int. J. Bif. Chaos (2011) 21, 399). I understand that the use of 'critical' is now prominent in many fields of science and I do not request the author to correct all the paper with this respect. But there is one place, the sentence '... the saddle-node is a critical transition, the Hopf bifurcation is not ...' in page 5, in which changing 'critical' to

'discontinuous' or some related word would make it less strange to readers with some particular backgrounds.

Author's reply:

Agreed.

Changes in text:

Text will be adapted.