Nonlinear Processes
in Geophysics
Discussions

Open Access

NPGD

Interactive
comment

Interactive comment on "Transition process of abrupt climate change based on global sea surface temperature over the past century" *by* Pengcheng Yan et al.

Anonymous Referee #2

Received and published: 25 February 2016

This work apply a previously published method to detect abrupt climate changes using a logistic model. As the authors state this kind of models are profusely used to study dynamical systems that have two different stable states and are able to change and jump from one state to the other. In a previous work in this same journal the authors have applied this method to study variability of Pacific Decadal Oscillation. As the name of this mode of variability of SST in Pacific suggest this oscillation is a system that are continually changing its behaviour between positive and negative states and therefore can be studied with the method proposed by the authors and conclusions are interesting in terms of climate variability and change. But to my viewpoint we can not apply the same kind of reasoning examining every single point in the ocean.

I suggest some additional work previous to the publication of the paper:

1 . PDO index synthesize the collective behaviour of an extended area of the ocean. But having a great number of series varying we can randomly detect a possible abrupt climate change that is not real in a single point of the ocean. To avoid this possibility authors put a threshold of 1% of the points performing this abrupt changes. Nevertheless the value of SST of one grid square is not independent of the value of the SST of neighbouring grid squares. Therefore I suggest to made an interdependence test to calculate this threshold. This can be done by replacing SST series with a Gaussian noise series generated from a normal population whose mean and variance are identical to that of the series over the whole studied period, examining abrupt changes in these series and repeating the process a number of times equal to the number of grid points. In this way the number of abrupt changes can diminish and the results could be more representative of real abrupt changes.

2 . Once performed the point 1 it is possible that the number of abrupt changes diminishes. In any case I suggest to the authors to made the effort to give an explanation of the patterns in terms of climate systems. Thus for example in figure 1 the changes detected in 1976 and 1982 are related to ENSO area. The change of 1976 is a well documented phenomenon called climate shift. In 1982 one of the most important ENSO episodes took place.

3 . As a minor question I also suggest to carefully read the paper because there are some important mistakes.