

Comments on Transition process of abrupt climate change based on global sea surface temperature over the past century

This study reports an investigation on the abrupt change in global SST over the past hundred years using the method developed by the authors of this manuscript. There are a number of similar studies in abrupt changes of global SST, but they almost did not refer the transition processes involved. Several abrupt changes have been detected in the SST, and meanwhile the properties of the changes are discussed, by which some of the changes are identified as the cusp catastrophe with a gradually decreasing duration in the process. The statistics shows that the potential function of global SST is likely a bi-stable system. The most important findings in this study is that there is approximately linear relationship between the rate and stability parameters, in comparison with the quadratic one between the rate and the magnitude of the change. It is helpful in understanding the characteristics of the abrupt changes in climate science. I recommend considering the publication of this manuscript after making a further improvement in the English writing and correct some of mistakes in it. The detail points are as following terms:

(1) In figure 4, the abrupt changes occurred in different locations of the oceans at the same time. Please discuss possible mechanism about them. Are there some teleconnections between them or just a casual one?

(2) Since the parameter x is a function of α and β , X becomes a constant if set $\alpha = 0.2$, $\beta = 0.8$. Why?

(3) The word "and" should be removed in the author list.

(4) Formula (3): The word "section1, section2, section3" may be replaced by "stage 1, stage2, stage3" or "domain1, domain2, domain3"?