

## ***Interactive comment on “Modeling of severe persistent droughts over eastern China during the last millennium” by Y. Peng et al.***

**Anonymous Referee #2**

Received and published: 20 January 2014

This study compared proxy data and model simulations during the last 1000 years to examine the occurrence of persistent droughts in Eastern China. It was found that the model is able to simulate 6 persistent droughts revealed by the proxy data. The spatial extent and the possible physical mechanisms behind the 6 persistent droughts were also analyzed. I think this work will make a valuable contribution to understand the drought variations and mechanisms in China. However, parts of the results shown are not convincing and some conclusion are rough. Therefore, this manuscript may need a major revision. My comments are listed below:

1) Due to uncertainties in the climate forcing data and the model deficiency in simulating large natural sea surface temperature (SST) variations, many models are not able to simulate the precipitation patterns/variations over the land. It seems that this type of

C3176

model deficiency is also exist in CCSM 2.0. Among the 10 persistent droughts identified by the proxy data, only 6 of them were roughly in-line with the models. Are the correlations between the proxy DWI and the modeled precipitation in Eastern China significant during the last 1000 years? What are the relationships between the DWI and the proxy solar and volcanic activities during the last 1000 years?

2) Page 6353, 1st paragraph. There are large differences between the modeled spatial distribution of droughts in 1482-1489 and 1638-1641 and the proxy data. What are the pattern correlations between the proxy data and model simulations for the two events?

3) Page 6354, 1st paragraph. Though the 6 persistent droughts are associated with weak land-sea thermal contrast, there are many epochs with weak thermal contract are not associated with droughts. Therefore, the changes in land-sea thermal contrast may be not the ‘DRIVER’ of the drought. What are the correlations between land-sea thermal contrast and the proxy and modeled precipitation?

4) Page 6354, line 24. The Fig.6e-f cannot be found in the figure.

5) Page 6355, 2nd paragraph. The statements that the relationship between droughts and SST are misleading. To support your statements, you’d better compare the proxy DWI with proxy SST, or the modeled precipitation with modeled SST. Otherwise, you are comparing an orange with an apple. Additionally, did you compute the SST anomalies based on the climatology during the last 1000 years? If so, the strong warming in recent 100 years may exaggerate the cold SST anomalies during the LIA. Maybe it is better to remove the centennial SST signals before computing the SST anomalies for Fig.7.

6) Fig.6a. I am wondering how the control run was made. Usually, the forcings (e.g., solar and volcanic activities) remain unchanged during the model run, therefore, the control run does not contain any meaningful calendar years (e.g., year 1440 AD). It is thus misleading to compare the control run with the proxy data to examine the model performance (see page 6355, lines 27-29).

C3177

