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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Role of radiatively forced temperature changes in enhanced semi-arid warming over East Asia" *by* X. Guan et al.

Anonymous Referee #1

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The manuscript under consideration here is publishable in principle. The analysis is sound, the figures are well constructed, and the authors effort to develop scientific arguments is acknowledged. The article addresses the role of dynamical and thermodynamics processes in producing the observed enhanced semi-arid warming of East Asia over the past several decades. Dynamical forcing scare treated in a brief, albeit sound manner, and discussed in terms of decadal variability. Radiative forcing some are considered residuals after removing dynamical effects. These are assumed to include the effects of well-mixed greenhouse gases, aerosols, land use and land use change, and anthropogenic waste heat. The authors conclude that most of the ESAW is attributable to radiative forcings, which in turn are the result of a combination of large scale and local factors.

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Interactive Discussion
Discussion Paper

There remain a variety of issues, some major, some minor, that should be resolved before the manuscript is accepted for publication in ACP. These issues may be grouped into scientific and editorial issues. In my comments that follow, I separate them accordingly. I will refer to page number with a capital P and line number with a capital L.

Scientific comments: Title: since the manuscript focuses exclusively on the cold season, the authors should consider adding "cold season" to the title, perhaps before "temperature changes".

P22976-L26: it is unclear what the authors mean by "The non uniform of population and economic distributed in this area led to an obvious change discrepancy to the environment." Needs clarification.

P22978-L1: probably best to refer to the method as "dynamical adjustment".

P22979-L10: (MAJOR) since there are large trends in the data, I suggest that the authors high pass filter or detrend the predictand time series prior to calculating the cross-correlation maps used in Step (1). This follows Smoliak et al. (2015) and ensures that you are not fitting trends in the PLS regression process. Bear in mind that this detrending or high pass filtering need only be applied to the predictand. If the authors analysis is fitting trends, this methodological change will influence the results. If not, the authors can be confident that their dynamically influenced temperature (DIT) reflects the influence of month to month and year to year changes in the atmospheric circulation.

P22980-L4: the authors should probably state that non-radiative factors resulting from thermodynamic processes will also be lumped into the RFT. They may be able to argue that thermodynamic effects are small over the semi-arid regions.

P22980-L9: define the cold season length (calendar months) here or in section 2 or 3.

P22980-L10: why did the authors choose the period 1902-2011. This should be justi-

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fied.

P22981-L24: is it appropriate to use annual-mean precipitation as a basis for classifying climate regions for a cold season analysis? Why?

P22982-L7: how does this result improve on previous studies? "Confirm" may be a strong word here. I believe the results are more of a "suggestive" nature.

P22983-L13: what does this sentence mean? "A relative homogenization of temperature" is confusing and could be reworded.

P22983-L15: where are the teleconnection indices obtained? This should be stated explicitly in the text.

P22983-L17: why did the authors correlate an 11-year running mean with the teleconnection indices? Were the SAT data and teleconnection indices filtered like this? Why did the authors select 11-years as the averaging period? Are the results not significant otherwise? This should be clarified. I understand and accept that these patterns play a role in the DIT, but more could be done to establish their relationship.

P22984-L19: how were these correlations computed? The ensemble mean time series with the DIT and Arafat time series? Was any filtering employed? Were the time series detrended? The ensemble mean will tend to downplay randomly phased dynamical variability in each of the model runs, whereas the external forcing is highly similar between the models, so the ensemble mean will primarily reflect the RFT. I find this comparison somewhat disingenuous.

P23000: how many degrees of freedom were used in this two-tailed students t test? Were the running mean time series used in the t-test? If so, the effects of autocorrelation should be considered. This could be done by computing the so called "effective degrees of freedom". This reduces the degrees of freedom based on the lag-1 autocorrelation of the time series being considered.

Editorial comments: In general the manuscript needs copy-editing to improve the En-

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glish prior to publication. I will highlight a few particular areas for improvement here:

P22976-L4: I suggest the authors insert "regional" between "investigate" and "surface temperature change"

P22976-L21: to say that Asia is the most sensitive area to climate change is an extremely strong statement. I would accept "Asia is arguably the most...", but additional references are necessary to back up this strong introductory claim.

P22978-L7: this sentence is awkward and should be rephrased. For example, "This study uses monthly precipitation, maximum daily temperature, and minimum daily temperature data from the land-only TS3.21 dataset obtained from the Climatic Research Unit at the University of East Anglia...".

P22978-L17: I suggest rephrasing "which almost covers the most area of East Asia" to "which comprises much of East Asia."

P22979-L11: I suggest rephrasing following past references, "...based on partial least squares (PLS) regression using sea level pressure (SLP) to predict SAT."

P22981-L4: remove "ly" from "radiatively"

P22982-L6: do the authors mean "previous knowledge"? "previous acknowledge" does not make much sense in this sentence.

P22982-L17: typo, "cover" should be "over"

P22984-L11: remove "obvious". Too casual of a word.

P22984-L19: typo, "modes" should be "models"

P22985-L8: I suggest that the authors rephrase "...the NAO, PDO, and AMO took a decadal variability" as "...the NAO, PDO, and AMO on decadal time scales."

P22993: the figures all look nice in general; Figure 4 could be improved by scaling the color bar to the data better. There are no values below about 30%, so this could be the

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bottom of the color scale.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 22975, 2015.