**Earth System
Dynamics**
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Discussions

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Interactive comment on "Imprints of climate forcings in global gridded temperature data" *by* J. Mikšovský et al.

Anonymous Referee #1

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The submitted paper (by Miksovsky et al) provides a useful information and I suggest that the paper be accepted for publication after a major revision.

I have three major concerned (A, B, and C) and a few minor ones. I believe that the three major concerned should be dealt with in the revision. The minor points I would leave for consideration of the authors.

(A) The paper shows qualitatively the differences between four different gridded global temperature data. However, we learn very little about the causes of these differences. The authors miss the opportunity to analyze and compare two data sets that could clearly identify the cause of potential differences between them. I mean specifically the NASA GISS data sets with 1200 km smoothing radius (data used in the paper) and data set with 250 km smoothing radius. I consider it essential that the 250 km

smoothing set be included in the analysis and differences (between 1200 km and 250 km smoothing) of estimated contributions of individual predictors to local temperature be shown. Special attention should be paid to polar region where the differences might be significant. I think this could be the only case where the explicit action (smoothing) could be connected to temperature differences. (B) The regression coefficients and consequently contribution of individual predictors to temperature depends on the all other predictors present in regression model. How does the contribution of individual predictors change with decreasing complexity of regression model? How they change if you use only the most effective predictors like GHG, volcanic aerosol, and AMO (perhaps also PDO) based on results shown in your Fig. 4? (C) The important topic – the collinearity of GHG and anthropogenic aerosols – is discussed fully only in the conclusion section. It should be brought in early stages of the paper. Instead of GHG forcing perhaps the sum of GHG+aerosol should be considered (similar to Lean and Rind) and emphasize that in the second half of the 20th century GHG warming cannot be distinguished from aerosol warming (decrease of sulfate aerosols in line with Booth et al).

1. P2341 line 10: It is not clear what you mean by the second half of the sentence "...although linear trend...." 2. 2343, 3: Are the linear correlations sufficient to quantify the match? Some justification is needed or inclusion of some other variable. 3. 2343, 10: Why are station based indices preferred over ones deduced from principal components? 4. 2344, 11: Anthropogenic aerosols played an important role in forming the 20th century temperature profiles. Why can we ignore them? How would be results modified by inclusion of anthropogenic aerosols? This is essential; I expect considerable changes in results when aerosol are included. 5. 2344, 16: The reference for stratospheric aerosol is to Sate et al 1993. How were data updated to 2010? 6. 2346, 2: The reference to time delayed correlations is to Wu et al 2011. However, the original paper on the time-delayed correlations was published earlier by R. Zhang et al. 7. 2346, 8: We need some information concerning the correlation between the predictors. Find the way how to provide some information. 8. 2346, 14: You use

the GISTEMP data with 1200 km smoothing. However, Hansen and Lebedeff (1987) warn that there may be significant differences on local and regional scales between the 1200 km and 250 km smoothing. Why not use the 250 km smoothing as another set of gridded temperature data? This could be an important contribution. 9. 2346-2347: I cannot find the latitudinal range of used gridded temperature data. I see a full globe or 60S to 75N for 20CR but not for observed temperatures. 10. 2348, 8, 21: The statistical regression is relatively simple and un-expensive method. Can you justify the references here to "..high computational cost . . ."? 11. 2349, 15: You say the results for the first and second half of date are presented in Supplement. It would be nice to indicate here by one sentence how different or not the results are. 12. 2349, 18: "..outcomes of regression analysis are provided . . .." I do not see any information concerning the regressions. Are all predictors kept for all regions of the globe, even when predictors are significantly correlated? 13. 2376, Fig. 2: What are the latitudinal limits of figures? 90S to 90N? Please, add GISTEMP1200 km smoothing vs GISTEMP 250 km smoothing. This is essential since this would be the only case where you clearly know the differences between the treatments. 14. 2378, Fig. 4: Does the global mean from 90S to 90N? Why solar irradiance has no effect on the temperature? Is the solar variability imprinted on the AMOI? If you use the predictors without the AMOI would the solar variability become significant? 15. 2379, Fig. 5: It looks like you are keeping all predictors at all locations. Due to probable significant correlations in some regions, the regression coefficients will be uncertain and contribution of individual predictors to total temperature equally uncertain. Atmospheric aerosols are highly correlated to GHG. How would aerosols change the GHG contribution? Similarly the solar activity is correlated to GHG – why is solar activity mostly cooling the NH? Is this to compensate the too strong warming by GHG? 16. 2379, Fig. 5: An inclusion of the GISTEMP data with 250 km smoothing (as the forth column) will be important here to see the differences especially in polar region. The color scheme is not well chosen. The GHG contribution is just red, even the hatching is not visible. 17. 2353, 4: The correlation between GHG and solar variability should to be mentioned here. Such correlation affects inter-

pretability and makes conclusions difficult. 18. 2357, 8: The conclusion concerning a weak solar influence depends on other predictors that are collinear with the solar variability (GHG and AMOI?). Does solar influence increases when AMOI is deleted from predictors? Is not a long time solar variability also collinear with increasing GHG? The collinearity makes generally the interpretation difficult.

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Interactive comment on Earth Syst. Dynam. Discuss., 6, 2339, 2015.

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Interactive Discussion

Discussion Paper