This paper tries to identify the climatic contribution to monthly aerosol variability over China using the GEOS-Chem model and tele-connection methodology. Though generally well written, this reviewer finds that more work needs to be done before it can be published. The major concerns include 1) model evaluation – there is a limited meteorological evaluation (against NCEP reanalysis and Hadley SST) but no evaluation of aerosol simulation at all, which makes audiences hard to gauge how meaningful the result is; 2) emissions – the authors fixed the emissions at the 2005 level to single out the climatic effect. However, aerosol has profound effects on climate through aerosol-cloud-radiation interactions. Different level of aerosol should have different feedback in the climate system. Ideally, the authors should conduct two experiments with high and low emissions to draw the conclusion. If that is not possible, the authors should at least discuss this point in the manuscript; 3) a few statements in the text were not consistent with the corresponding figures; and 4) driving meteorology – it appears GEOS-4 meteorology has been utilized to drive GEOS-Chem, which is very outdated. Why was the GEOS-5 not used?

Other specific comments include:

1. Lines 116 – 124: More details are needed for model description, e.g., driving meteorology, emissions inventories, etc. Were the biogenic emissions included in the simulation? If so, was it online calculated? Meteorology plays an important role in regulating biogenic emissions. A 2 x 2.5 degree model resolution appears very coarse for aerosol simulation. Were the results expected to change if a higher resolution simulation were conducted and analyzed?
2. Line 137: mineral dust is an important contributor to aerosol loading at least in spring over the northern China. Would exclusion of dust skew the results?
3. It is not clear why the authors correlated PC1 to Nino 3.4 index while correlated PC2 to NAOI. The explanation in lines 185 ~ 197 was not convincing. Have the alternative correlations been tried?
4. Figure 3. Is the y-axis correlation coefficient? Add this information on the plots.
5. In Lines 226-227, add something like as shown in Figure 6 to reference that figure.
6. Lines 238-242: Does the positive correlation of 3-month leading Nino 3.4 index and 700 hPa divergence mean anomalous convergence circulation?
7. Lines 246 – 247 and 270 (and in Conclusion): Should it be “not favorable for the emission of aerosol”? Are there any reference(s) for this statement?
8. Line 250: should it be Figure 9a?
9. Line 260: should it be Figure 8?
10. Line 275: should it be Figure 9b? (please make figure number consistent in the text and figure section).
11. Line 278: It appears that the positive PBLH anomalies are not significant based on Figure 9b.
12. Lines 296 – 298: Figure 10b does not support this statement.