

General comments:

The study by Chavan et al. discusses the transport pathway of Asian biomass burning aerosol to the UTLS during boreal spring and its radiative impacts using a CCM coupled an aerosol module. The topic is of great interest and of scientific importance. However, I have some doubts in the design of the experiments and the relative interpretations of the results, which will be mentioned in detail in the major comments. Besides, there are some missing information and improper presentations throughout the paper, which gave readers difficulty to understand. Thus, I would suggest the authors to reconsider the design of experiments and clarify the missing information before a more detailed revision. In general, I would suggest a major revision before publication.

Major comments:

Based on the description of configuration of two runs and “We performed 10-member ensemble runs ... starting between 1 and 10 January 2012 and ending on 31 December 2013...”, I would guess that the BB aerosol should also be treated differently for two runs (“on” and “off”) during the “spin-up” year 2012 (if I understand it wrong, please correct me). Therefore, the simulated aerosols and its effects during MAM 2013 should be combined and accumulated results of the whole simulation period beforehand. Here the aerosol transport time-scale from PBL to UT/LS and shallow BDC, the circulation changes related to the radiative effect from aerosol and water vapor as well as the complicated feedbacks should be all relevant. The whole paper is, to a large extent, misleading, which attributes the complex effects of BB aerosols only to the spring Asian BB.

Thus, one possible solution is to revise the design of experiments to isolate the effect of carbonaceous aerosols from Asian BB during the spring; another idea is to make some discussions that clarify the accumulated effects.

Minor comments:

1. L105, some references or a website should be added for “AEROCOM-ACCMIP-II”.
2. L107-108, why there are three datasets for BB emissions (GICC, RETRO and GFED V2)? What is the indeed used in the simulations?

3. L113-114, the first level and second level is not an accurate description because the model level has not been introduced. “The first/second model level (\sim *hPa)” would be better.
4. L125-126, how did you vary SST and SIC? And for the sentence, I would suggest not to use “explore” since the effect from varying initial conditions are not discussed.
5. It seems to me that the Figure 3 (c) and (d) should be relevant: one is the AOD excluding the effect from dust; one is the AOD from carbonaceous aerosols. Could you comment on this point?
6. The description of longitude range in Figure 5 (85-140E) is not consistent with main body (L304).
7. L363, it should be “Fig. 6a-h”.

Comments on Figures:

1. Figure 2 is not well organized. I would suggest : 1) add “BMAeroon” and “OSIRIS” to the titles of (e) and (f) respectively and use the same color bar; 2) plot the locations of the ten sites on the map in (c) and avoid the repeat of the longitudes and latitudes of them in the figure description since they are already mentioned in the paper; 3) the names of sites and their bars are not well aligned in subfigure (d).
2. Figure 3: 1) why the range of map in (b) is different from others? 2) what are the vectors shown in (b), wind anomalies? and clearly the upright vector symbol is in a wrong scale. 3) I suggest unifying the colorbars.
3. Please specify what is the vectors in Figure 5 (c-d) and Figure 6 (a-h).
4. In Figure 5(c), the upwelling (if it is the meridional circulation from BMAeroon) can be found from 10N-20N, not exactly from 10S-10N. Why did you choose 10S-10N as the range for Figure 5 (d)?
5. “seasonal mean” are used in a lot description of figures. I suggest changing them to “spring mean (MAM)”.