Based on observations and model simulations, the authors examined transport, mixing, and feedback of dust, biomass burning and anthropogenic pollutants in late March 2015 over the Yangtze River Delta (YRD) region. They found that fossil fuel aerosols (FF) mainly accumulated near surface mixed with dust and biomass burning aerosol (BB) from the Southeast Asia were transported by westerlies around the altitude of 3 km. They also found solar absorption aerosols from FF, BB and dust could cause significant feedback with MLT meteorology. The topic is interesting and could contribute to the current knowledge of aerosol pollution in eastern China. However, there are still some issues need to be addressed before it can be considered for publication.

My major concern is the inconsistency of proxies for FF, BB and dust between observation and model. For the observational data, the authors used concentrations of $PM_{2.5}$ and $PM_{2.5-10}$ as proxies as FF and dust in Figures 2 and 4, which is fair. But in the following part, the authors introduced BB, which is also in $PM_{2.5}$ and $PM_{2.5-10}$. In addition, the author only used data for SO4, NO3, NH4, Ca2+ without BC and OC. For the model simulations, the authors did simulations with all emission, no anthropogenic CO emission from eastern China, no dust emission, and no BB emission from Indochina. They used CO as proxy of FF and only turned it off in eastern China. First, CO is not a good proxy for FF/$PM_{2.5}$. Second, turn FF off in eastern China includes information of both source sector and source region, which should be analyzed separately. I suggest conducting simulations as with all emission, no anthropogenic emission (all FF aerosol and precursor, e.g., SO_2, NH_3, NOx, BC, OC), no dust emission, and no BB emission. This will give a clearer result and then FF $PM_{2.5}$ (sum of SO_4, NH_4, NO_3, BC, OC) and BB $PM_{2.5}$/BC can be used as proxies for model.

Minor comments:

Method mentioned AQI but not used.

Page 8 Line 11: ‘In the ground level the regional polluted continental aerosols mainly accumulated by the local anthropogenic emissions mixed with polluted dust.’ What does this mean? Aerosols are mainly contributed by local anthropogenic FF emissions and dust?

Page 10 Line 1: ‘CO concentration exceeding 300 ppbv in the south YRD in the early morning on 23 March’. Why CO showed high value here (proxy of FF/PM2.5) and PM2.5 showed low value in Figure 4c

Page 11 Line 20: ’BC calculated from BB emission in South Asia’. How did the authors calculate this value? Or BB emission in Southeast Asia/Indochina?

Both surface measurement, satellite data and model simulation have uncertainties. The authors should discuss these uncertainties and the potential influences to the results in this study.

Some other studies also examined sources and transport of anthropogenic aerosols in China (e.g., Yang et al., 2017, 2018) and feedbacks of dust on monsoon meteorology (e.g., Lou et al., 2017). The authors may give credit to these studies.

Reference:

Yang, Y., H. Wang, S. J. Smith, P.-L. Ma, and P. J. Rasch, Source attribution of black carbon and its direct radiative forcing in China, Atmos. Chem. Phys., 17, 4319–4336, doi:10.5194/acp-17-4319-2017, 2017.

Yang, Y., H. Wang, S. J. Smith, R. Zhang, S. Lou, Y. Qian, P.-L. Ma, and P. J. Rasch, Recent intensification of winter haze in China linked to foreign emissions and meteorology, Sci. Rep., 8, 2107, doi:10.1038/s41598-018-20437-7, 2018.

Lou, S., L. M. Russell, Y. Yang, Y. Liu, B. Singh, and S. J. Ghan (2017), Impacts of interactive dust and its direct radiative forcing on interannual variations of temperature and precipitation in winter over East Asia, J. Geophys. Res. Atmos., 122, 8761–8780, doi:10.1002/ 2017JD027267.