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Title: Ground based characterization of spectral optical properties of haze and Asian dust episodes under Asian continental outflow during winter 2014

Authors: Jinsang Jung et al.

Responses to the reviewer's specific comments and questions:

Reviewer #1 (Comments):

General comments:

Aerosol is very important to impact atmospheric cycle and climate system by direct and indirect effects, a hot issue of scientific researches internationally. Haze is a typical heavy pollution in East Asia, mainly caused by fine particles named as $PM_{2.5}$. The growth of emissions and human activities with rapid urbanization is the most important reason for the increase of air pollution in this region. Also, the East Asia is an important source of dust, with large implications of regional environment and climate changes in downwind areas. The paper presents an intensive measurement of aerosol optical properties during one typical haze and Asian dust episodes in Korea, and analyzes these optical properties and compares their difference between these two periods. In fact, high aerosol burden regions such as urban areas in Asia are still not well characterized in terms of particle amount. The topic of this paper is of common interest within the scientific community. Although the manuscript includes some important data, however, the quality is not sufficient in the current state to be directly published. The authors should take the suggestions made here into consideration for revision.

Specific comments:

1. As for the title, it should be changed as “: : :: : :of aerosol (spectral) optical properties: : :: : :”.

Response: Thank you for the suggestion. The term “[aerosol](#)” has been added in the title of the MS. Please see line 1 in the revised MS.

2. In section 3.1, Figure 2 gives a temporal variation of wind, PM_{10} , etc. the paper should address the time resolution of these values clearly, such as $PM_{2.5}$, PM_{10} , at hourly? Daily?

Response: Following sentence has been added in lines 152-153 in the revised MS.

“Hourly averaged mass concentrations of PM_{2.5}, Ca, OC, and EC were used in this study.”

Following sentence has been added in lines 178-179 in the revised MS.

“Hourly averaged light scattering and absorption coefficients were used in this study.”

Following sentence has been added in line 196 in the revised MS.

“Daily average water-soluble ions were used in this study.”

The term “hourly average” has been added in Figs 2 and 3 captions.

3. There are so many ground-based measurements of aerosol optical properties in East Asia. In fact this paper uses normal instruments, data and analyses as prior, however no clear new points. Although some available data, I suggest that the paper should add more deep analyses for aerosol mixing or aging due to transport using optical properties.

Response: Thank you for the comments. We analyzed deeply about aerosol optical properties of the LRT haze and their aging under the stagnant atmospheric condition using aerosol chemical composition in chapter 3.3.2. Following paragraph has been added in lines 393-403 in the revised MS.

“Because the LRT haze from the Asian continent reached to the Korean Peninsula on 14 January as shown in Fig. 6, aerosol optical properties on 14 January can be used to investigate aerosol mixing state or aging during the atmospheric transport. When intensive optical properties of aerosols on 14 January was compared those obtained at the air mass source regions in China, no big difference between them was observed. For example, MSE₅₅₀ of PM₁₀ ($1.73 \pm 0.40 \text{ m}^2 \text{ g}^{-1}$) on 14 January was similar to those ($1.4 \pm 0.89 \text{ m}^2 \text{ g}^{-1}$) during relatively clean condition in Beijing, China but much lower than those ($3.1 \pm 0.9 \text{ m}^2 \text{ g}^{-1}$) during relatively polluted condition (Jung et al., 2009a). ω_{550} (0.81 ± 0.07) on 14 January was also similar to those (~ 0.75) during relatively clean condition in Beijing. These results imply that aerosol aging is insignificant during the atmospheric transport from China to the Korean Peninsula in winter.”

4. There is some room for revision in English.

Response: The revised MS has been proof-read by a native English speaker before submitting the revised MS.