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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Vertical distributions of aerosol optical properties during the spring 2016 ARIAs airborne campaign in the North China Plain" *by* Fei Wang et al.

Anonymous Referee #3

Received and published: 22 January 2018

General Comments: The paper describes airborne and surface measurements taken around Xingtai, Heibei Province during May-June of 2016 as part of the A2BC and ARIAS field experiments. The manuscript is generally well written and presents important observations over a densely populated area in China that describe aerosol optical properties, and their vertical distributions. For this reason the manuscript should be published. However, the manuscript lacks a clear description of the relevance and motivation for the campaign and its' data. The section (4) of the manuscript that analyzes the relationship between PBL structure and aerosol scattering coefficient is confusing and needs significant revisions.

Specific Comments:

Experimental Description:

Define the geographic limits of the North China Plain.

What is the relevance of the NCP to the rest of China and Northeast Asia (other than being densely populated and fast developing - these two characteristics could be used to describe most anywhere in China)?

What is the motivation behind the location of the surface supersite, the flight paths, locations for spirals, and the frequency of flights?

What is the relevance and motivation for the time period of the flights?

How representative are the measurements of the NCP region during these two months?

What were the general meteorological conditions during the campaign? Clear? Overcast? Stagnant? What are the prevailing winds? Do you expect long-range transport during this time period?

Section 4.1:

How was clean PBL defined? Which flights/spirals/dates were identified as clean?

What is the purpose of Eq 6? Did you calculate the scale height? What is it?

What is the significance of there being high correlation between RH and sigma_scat at low RH, but not at high RH? How many profiles are you basing this correlation off of?

In general, it is not clear what data is plotted in Figure 9.

Section 4.2:

Again, which flights/spirals/dates were identified as polluted? How did you define polluted?

It seems like you fit Eq 7 to the data. Please state this explicitly. What method did you use to derive this fit?

Does the scatter plot in Fig 9b include both dry and humid profiles? Please state explicitly.

You seem to contradict yourself, by first saying that both dry and humid profiles have good correlation between RH and σsca, then above the PBL only dry profiles are correlated. Please clarify.

Section 4.3:

Did the upper-layer and multi-layer profiles only occurs on these two days?

At which location were these profiles measured?

Figs 9c and 9d refer to these profiles, not 9a and 9b. Do you only include data from those two dates/profiles in Fig 9c and 9d. Please clarify.

Section 4 in general only considers aerosol scattering. What about absorption? Angstrom exponent? How are these aerosol properties affected by different transport patterns?

Technical Corrections:

Page 1

Line 17: shows should be show

Line 29: drastically should be drastic

Line 31: 'impact on' should be 'impacts on the'

Page 2

Line 27: 'scanty' should be 'scant'

Page 3

Line 27: Should NFS be NSF? Please define.

Page 5

Line 16: 'includes' should be 'include'

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