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Atmospheric Measurement Techniques
Discussions

Interactive comment on "New In Situ Aerosol Hyperspectral Optical Measurements over 300–700 nm, Part 1: Spectral Aerosol Extinction (SpEx) Instrument Field Validation during the KORUS-OC cruise" *by* Carolyn E. Jordan et al.

Anonymous Referee #1

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This paper describes the first field measurements by the spectral aerosol extinction (SpEx) instrument. The SpEx instrument measures broadband aerosol extinction at 300 - 700 nm with 0.8 nm resolution. It was deployed on a ship cruise around the Korean peninsula during May – June 2016.

The paper presents Angstrom exponents and second-order polynomial fits to the extinction data, and determines that second-order polynomial fits are a better representation.

This paper builds on previous instrument development work described in Jordan et al 2015 AMT and Chartier and Greenslade 2012 AMT.

Major comments:

1. The manuscript would be improved by examining the underlying relationship between aerosol extinction and wavelength.

As described in the introduction, the major intrinsic properties that determine aerosol extinction are the aerosol size distribution, aerosol shape, and complex refractive index. The Angstrom exponent, A (where Extinction = k wavelengthˆ-A) is an empirical expression to describe the wavelength-dependence of the aerosol extinction. Some combinations of size distribution, shape, and complex refractive index produce extinction values that are not well-represented by an Angstrom exponent.

This paper presents Angstrom exponents and an alternative second-order polynomial fit to the extinction data. The paper would be much stronger if the authors calculated the expected aerosol extinction from the size distribution, assumed shape, and complex refractive index (volume-weighted by composition). They could then describe the types of aerosol populations that they observed during KORUS-OC that were not well-represented well by a simple Angstrom exponent and why.

2. Add a figure with a schematic of the sampling inlet, instruments connected to the sampling inlet, and flows. This is described in the text, but it would be clearer with a schematic showing the SpEx, TAP, and nephelometer with the inlet system and respective flows.

3. Section 2 could be better organized for readability. The current organization of the paper is:

Introduction: Includes description of KORUS-OC field campaign

Section 2.1: Further description of KORUS-OC field campaign, shared sampling inlet, and instrument operation. TAP instrument is introduced here, but not defined.

Section 2.2: Description of absorption (TAP) and scattering (nephelometer) instruments, calibrations, ship plume interferences, and wavelength corrections.

Section 2.3: Description of SpEx instrument, modifications since Jordan et al 2015, and data filtering.

One suggestion for alternative headings and organization:

Section 2.1: Overview of KORUS-OC field campaign, ship, and ship tracks

Section 2.2: Description of three sampling instruments, calibrations, and data processing

Section 2.3: Description of shared instrument inlet with schematic

4. It would be simpler to present all of the measurements in nm or um throughout the paper, rather than changing from nm to um in Section 3.3.

Other comments:

Line 74: Add reference to Chartier and Greenslade 2012?

Line 135: Indicate that the size cut was determined theoretically.

Line 175: What does NT stand for? "Nephelometer TAP"?

Line 242: What does "Blocking" refer to? Could this be explained?

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