

*Comments on the manuscript entitled “Comparison of key absorption and optical properties between pure and transported anthropogenic dust over East and Central Asia.” by J. Bi et al.*

**General comments:**

Dust aerosol is one of the major aerosol types over East and Central Asia, and the total amount and absorptive intensity of dust are crucial for determining its direct and indirect climate forcing. Thus far, the absorptive capacity of dust aerosol generated from Asian desert region is still an open question. Based on multi-year and multi-site quality assured datasets of the Aerosol Robotic Network (AERONET Level 2.0 products), the authors proposed two threshold criteria to discriminate two types of Asian dust: Pure Dust (PDU,  $\alpha < 0.2$ ) and Transported Anthropogenic Dust (TDU,  $0.2 < \alpha < 0.6$ ). The overall average of single-scattering albedo, asymmetry factor, real part and imaginary part of complex refractive index at 550 nm for PDU are  $0.935 \pm 0.014$ ,  $0.742 \pm 0.008$ ,  $1.526 \pm 0.029$ ,  $0.00226 \pm 0.00056$ , respectively, while corresponding values are  $0.921 \pm 0.021$ ,  $0.723 \pm 0.009$ ,  $1.521 \pm 0.025$ , and  $0.00364 \pm 0.0014$  for TDU. The results of this paper are valuable and hold promise of improving accuracies of Asian dust characteristics in present-day remote sensing applications and climate models. Overall, both the English-written and grammar are well and appropriate for publication. I recommend this manuscript is accepted and published in the Journal of ACP (Atmospheric Chemistry and Physics) after minor modifications.

**Suggestion:**

1. How to distinguish and separate the natural and anthropogenic contributions for climate variability, has become one of the most intractable problems in current global climate change. The authors proposed two threshold criteria to identify two types of Asian dust: Pure Dust (PDU,  $\alpha < 0.2$ ) and Transported Anthropogenic Dust (TDU,  $0.2 < \alpha < 0.6$ ), and explore the key absorption and optical properties. These results are

encouraging and helpful to update the essential parameters of Asian dust in current remote sensing applications and climate models. As mentioned in the manuscript, it is still a huge challenge to discriminate between natural and anthropogenic components of dust aerosols by using current technology, AERONET products or in-situ measurements. However, the reviewer encourages the authors to explore detailed morphology, mineralogy, and chemical compositions by means of in situ measurements, laboratory analysis, active and passive remote sensing methods (e.g., multi-wavelength lidar, AEROENT, MODIS) as well as model calculations in the future work.

⇒ The authors don't need to response this.

**Minor comments:**

1. **Abstract**, Page 2, line 54: “OPAC”

⇒ Change to “Optical Properties of Aerosols and Clouds (OPAC)”. When an abbreviation firstly appears in the manuscript, please give the full name.

2. Page 3, line 80: “are about 6 times larger than at 660 nm”

⇒ Change to “are about 6 times larger than that at 660 nm”

3. Page 4, line 114: “theory calculation”

⇒ Change to “theoretical calculation”

4. Page 8, line 209: “compared to”

⇒ Change to “compared with”

5. Page 8, line 219: “literatures”

⇒ Change to “literature”

6. Page 9, line 247: “linked to”

⇒ Change to “linked with”

7. Page 17, line 494: “PUD”

⇒ Change to “PDU”