**Responses to the comments of reviewer 1**

The authors really appreciate the valuable comments and constructive suggestions from the reviewer. The suggestions and comments of reviewer are listed in black font, and responses are highlighted in blue. The changes made in the revised manuscript are marked in red font.

**Comments from reviewer 1:**

Experimental studies like this one are still rare and should be encouraged. This is a useful paper and can be published largely as is. I would only suggest to expand the motivation for this study in the introduction by pointing out that satellite retrievals of dust-aerosol characteristics such as, e.g., the optical thickness are strongly affected by particle nonsphericity (e.g., [1]), and so reliable knowledge of the phase function (or, more generally, the scattering matrix) for real dust aerosols is essential.

[1] Mishchenko, M. I., I. V. Geogdzhayev, L. Liu, J. A. Ogren, A. A. Lacis, W. B. Rossow, J. W. Hovenier, H. Volten, and O. Munoz, 2003: Aerosol retrievals from AVHRR radiances: effects of particle nonsphericity and absorption and an updated long-term global climatology of aerosol proper ties. J. Quant. Spectrosc. Radiat. Transfer 79/80, 953-972.

Response:

Thank you very much for reviewing our manuscript and the constructive comments. We have expanded the motivation of our study in the Introduction in the revised manuscript:

"It is well known that dust particles have distinct non-spherical shapes, thus retrievals of dust aerosol properties, like optical thickness, based on Lorenz-Mie computations will lead to significant errors (Herman et al., 2005; Mishchenko et al., 2003). Optical modeling of dust particles with non-spherical shapes has been an essential subject. Dubovik et al. (2006) employed a mixture of spheroids with different axial ratios as well as spheres to reproduce laboratory measured angular light scattering patterns of dust aerosols presented by Volten et al. (2001), and the best fitted shape distribution of spheroids was obtained and proposed. Subsequent studies on the retrievals of dust aerosol properties from space-based (Dubovik et al., 2011), airborne (Espinosa et al., 2019) and ground-based (Titos et al., 2019) remote sensing observations were all based on this shape distribution. However, the application of a same shape distribution of spheroids for different kinds of dust is somewhat too arbitrary (Li et al., 2019) and may not be suitable for simulating optical properties of loess dust with different size distributions. Furthermore, more precise optical models which are more complex than spheroids and similar to real dust morphology are still needed. Laboratory measurements of angular scattering patterns as well as basic physical features, like size distribution, refractive index and micro structure, of loess dust with different sizes are essential and beneficial to the development of more precise models for loess dust. These

models will further useful for more accurate retrievals of dust aerosol properties over both source and downwind regions from remote sensing observations, and more accurate assessments of radiative forcing at different regions."

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