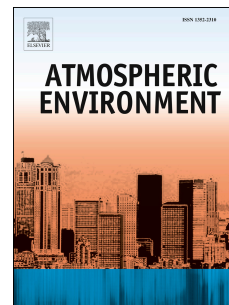


# Accepted Manuscript

Observation and simulation study of atmospheric aerosol nonsphericity over the Loess Plateau in northwest China

Pengfei Tian, Xianjie Cao, Lei Zhang, Hongbin Wang, Jinsen Shi, Zhongwei Huang, Tian Zhou, Hui Liu



PII: S1352-2310(15)30219-3

DOI: [10.1016/j.atmosenv.2015.07.020](https://doi.org/10.1016/j.atmosenv.2015.07.020)

Reference: AEA 13956

To appear in: *Atmospheric Environment*

Received Date: 8 February 2015

Revised Date: 9 July 2015

Accepted Date: 13 July 2015

Please cite this article as: Tian, P., Cao, X., Zhang, L., Wang, H., Shi, J., Huang, Z., Zhou, T., Liu, H., Observation and simulation study of atmospheric aerosol nonsphericity over the Loess Plateau in northwest China, *Atmospheric Environment* (2015), doi: 10.1016/j.atmosenv.2015.07.020.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

1 Observation and simulation study of atmospheric aerosol nonsphericity  
2 over the Loess Plateau in northwest China

3 Pengfei Tian<sup>a</sup>, Xianjie Cao<sup>a</sup>, Lei Zhang<sup>a,\*</sup>, Hongbin Wang<sup>b</sup>, Jinsen Shi<sup>a</sup>, Zhongwei Huang<sup>a</sup>, Tian  
4 Zhou<sup>a</sup>, Hui Liu<sup>a</sup>

5 <sup>a</sup>Key Laboratory for Semi-Arid Climate Change of the Ministry of Education, College of  
6 Atmospheric Sciences, Lanzhou University, Lanzhou 730000, China

7 <sup>b</sup>Key Laboratory for Aerosol-Cloud-Precipitation of China Meteorological Administration,  
8 Nanjing University of Information Science and Technology, Nanjing 210044, China

9 **Abstract:** Aerosol nonsphericity, which is not well depicted in model calculations,  
10 seriously affects aerosol optical properties and subsequently alters the radiative  
11 forcing of the earth-atmosphere system. Based on aerosol backscattering linear  
12 depolarization ratio data observed by a polarization lidar at the Semi-Arid Climate  
13 and Environment Observatory of Lanzhou University (SACOL) from September 2009  
14 to August 2012 and numerical computations, the spatial and temporal distribution of  
15 the aerosol depolarization ratio, parameterization of the derived aspect ratio and  
16 influence of water vapor on aerosol nonsphericity were investigated. Aerosol  
17 nonsphericity varied considerably by season, with a pronounced maximum in the  
18 spring, when more nonspherical aerosols were transported upward to the free  
19 troposphere; moreover, the column-averaged lidar depolarization ratios were 0.13,  
20 0.09, 0.08 and 0.10 for the spring, summer, autumn and winter, respectively. The  
21 derived aerosol aspect ratio, a simplified parameter that describes the particle  
22 nonsphericity, ranged from 1.00 to 1.30 and peaked at approximately 1.06. A modified  
23 log-normal function, which was fitted to the frequency distribution of the derived  
24 aspect ratios, yielded a log-normal distribution parameterization for this parameter  
25 and provided a better shape input for the aerosol optical modeling. The monthly  
26 averaged aspect ratios reached a maximum of 1.13 during the spring and a minimum  
27 of 1.04 in autumn. The depolarization ratios decreased significantly with

---

\* Corresponding author.

Email address: zhanglei@lzu.edu.cn (L. Zhang).

Download English Version:

<https://daneshyari.com/en/article/6337745>

Download Persian Version:

<https://daneshyari.com/article/6337745>

[Daneshyari.com](https://daneshyari.com)