



6TH ASIA-OCEANIA GROUP ON EARTH OBSERVATIONS (AO GEO) WORKSHOP

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National Civil Space Infrastructure Satellite Aerosol Product Validation Network (SIAVNET) measurements: Supporting satellite aerosol product validation for different surface types over China

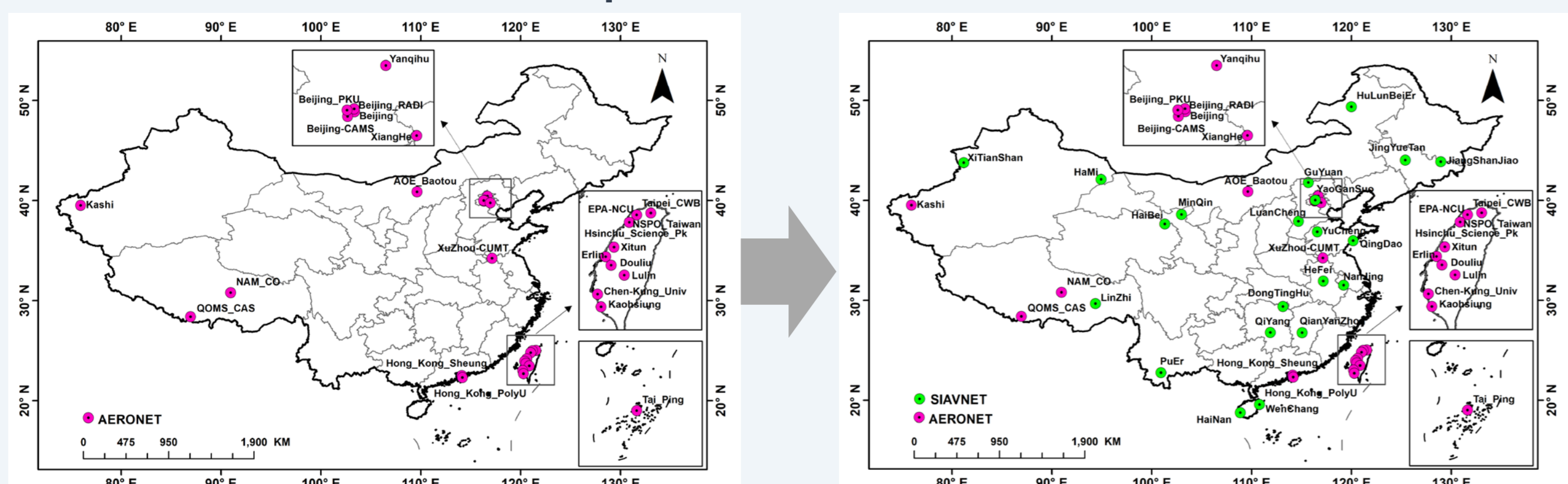
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1 Introduction

- Understanding the uncertainty of satellite aerosol products for different surface types in China is very important for algorithm optimization and related applications.
- AERONET are most often used to validate satellite aerosol products, but the highly uneven site distribution at different surface types in China leads to limitations in the validation process.
- In 2019, the SIAVNET is constructed to complement ground-based aerosol observations for multiple surface types in China and support the validation research of satellite aerosol products.



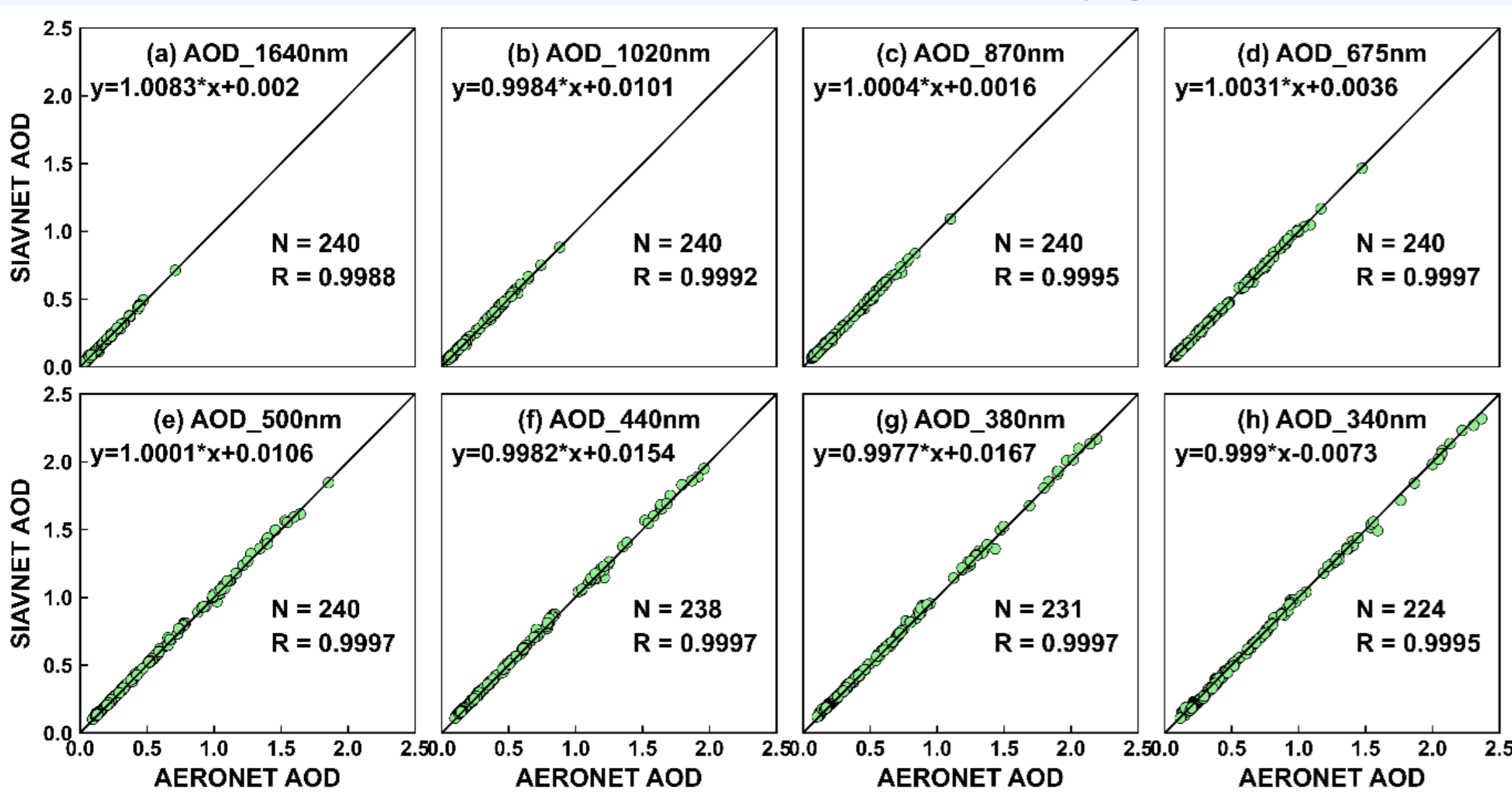
3 SIAVNET

- SIAVNET contains 21 monitoring stations with various underlying surface types.
- SIAVNET is equipped with the same measurement instruments as AERONET, namely the CE-318 solar photometer.



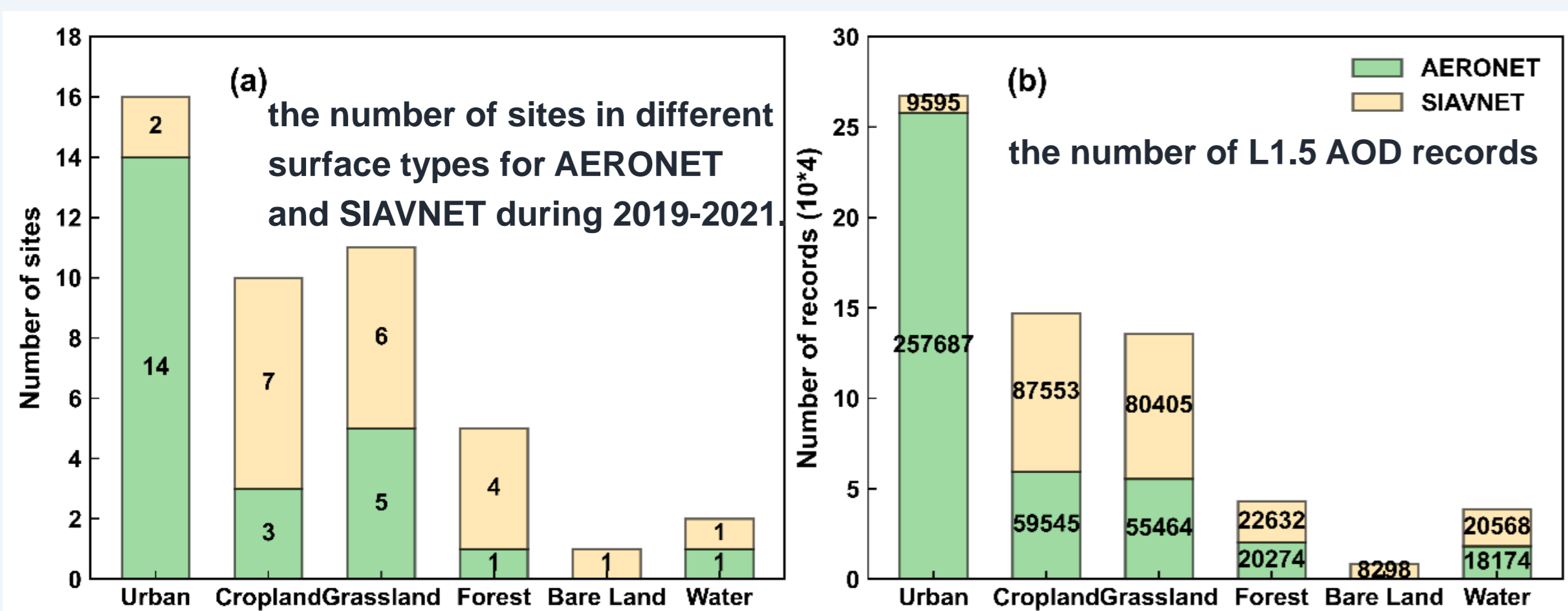
Data quality assessment

Scatterplot of simultaneous AOD measurements between YaoGanSuo site and Beijing_RADI site in 2019-2021.



- The AOD measurements provided by SIAVNET and AERONET are in excellent agreement, with correlation coefficients greater than 99% at all eight bands.

Geographical distribution of sites



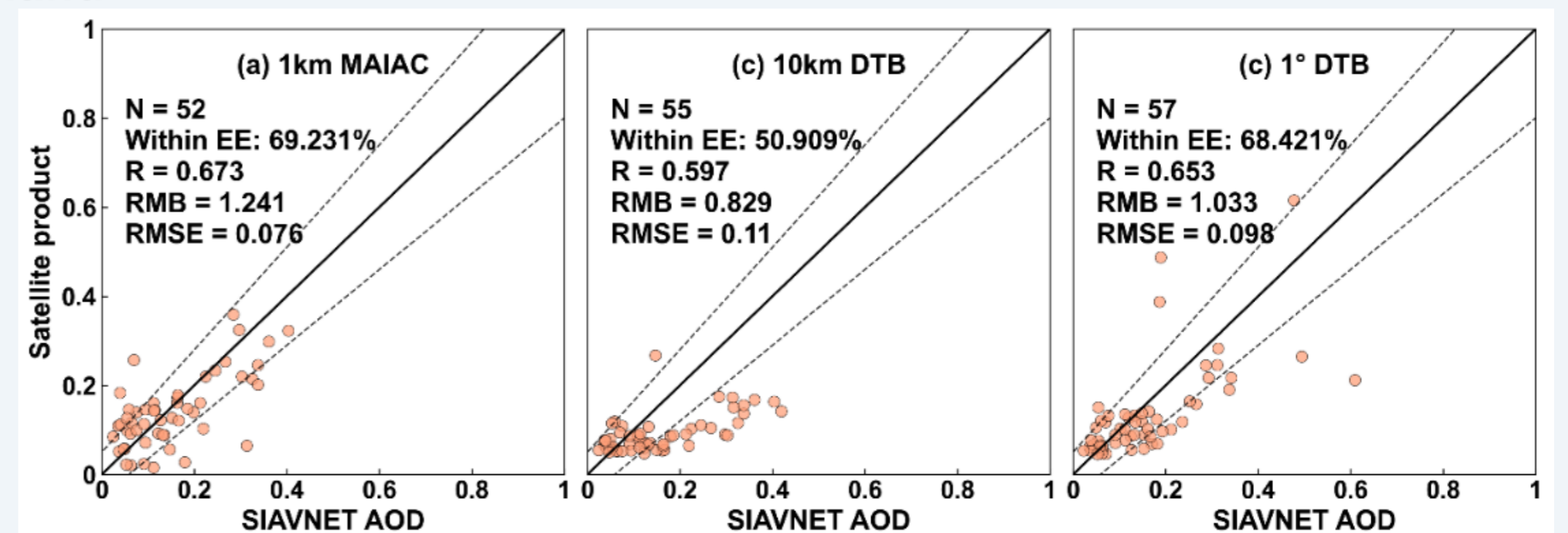
- In China, more than half of the AERONET sites are distributed in urban areas, with 62.68% of the total number of records. In contrast, AERONET has no sites in bare areas and only one site in forest and water areas.
- SIAVNET adds one site in the bare land and water areas, respectively. The gap in ground-based observations in bare land is filled.
- Secondly, the observation of vegetated areas is mainly increased.

2 Overview

- First, a detailed description of SIAVNET is provided, including the measurement accuracy and the spatial distribution of the sites.
- Then, the complementary role of SIAVNET observations is analyzed by validating four MODIS products with different resolutions (1 km, 3 km, 10 km and 1°) for different surface types.

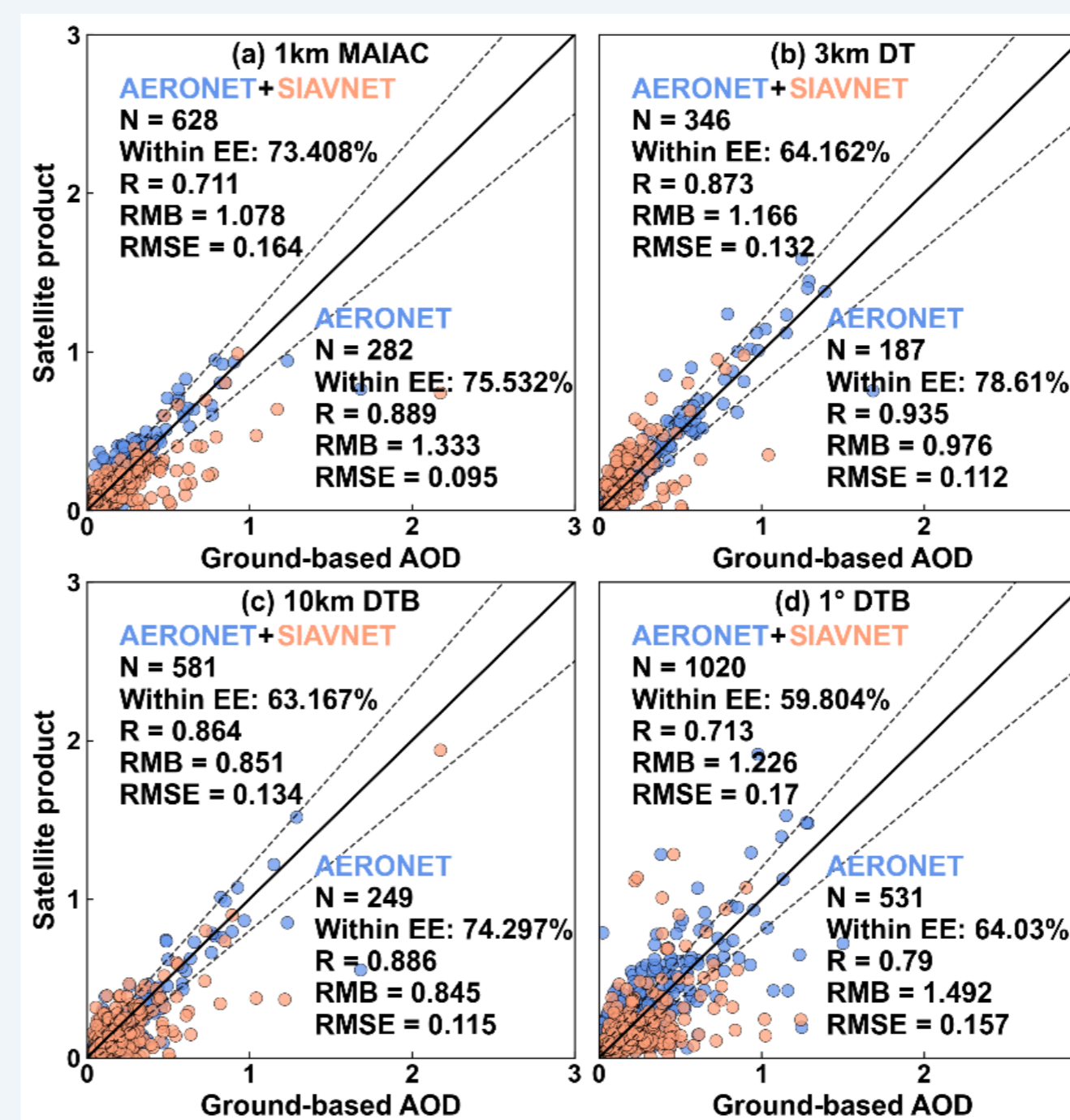
4 Validation results at different surface types

Bare land



- For bare land, the accuracy of different resolution products is obtained based on SIAVNET observations, with 50.91%-69.23% of the retrievals falling within the expected error, which fills the validation gap for bare land.

Grassland areas



- For vegetated areas, compared to the AERONET-only based products evaluation, the use of SIAVNET significantly affects the validation results in grassland for the 3km and 10km products, with the proportion of retrievals falling within the expected error decreasing from 78.61%, 74.30% to 64.16% and 63.17%, failing to reach satisfactory levels (66%).

5 Conclusions

- SIAVNET has consistent observational accuracy with AERONET.
- SIAVNET supplements 21 sites with multiple surface types, mainly supplementing vegetated areas, with 17 sites. In particular, SIAVNET places a site in bare land, which fills the gap of ground-based observation for bare land.
- Using SIAVNET observations, the performance of MODIS aerosol products with different resolutions in bare land is obtained, which fills the validation gap based on AERONET only.
- The use of SIAVNET significantly affects the validation results of the 3km DT and 10km DTB products in grassland.

6 References

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- Zhu, H., Cheng, T., Li, X., Ye, X., 2022. Comparison and evaluation of multiple satellite aerosol products over China in different scenarios under a unified criterion: Preparation for consistent and high-quality dataset construction. *Atmos. Res.*, 279, 106374. <https://doi.org/10.1016/j.atmosres.2022.106374>.