

An observational study of urban air pollution with GOSAT/CAI

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Introduction

In recent years, there is increasing concern about air pollution caused by particulate matter and its effect on human health.

Most populated prefectures are located in the Pacific side in Japan. It seems that anthropogenic particles are constantly floating around in these areas, coming from the smoke of factories and car exhaust fumes. In order to investigate relation between air pollution levels and scale of each city and the characteristics of each area in Japan, ground monitoring data and GOSAT/CAI aerosol products are used.

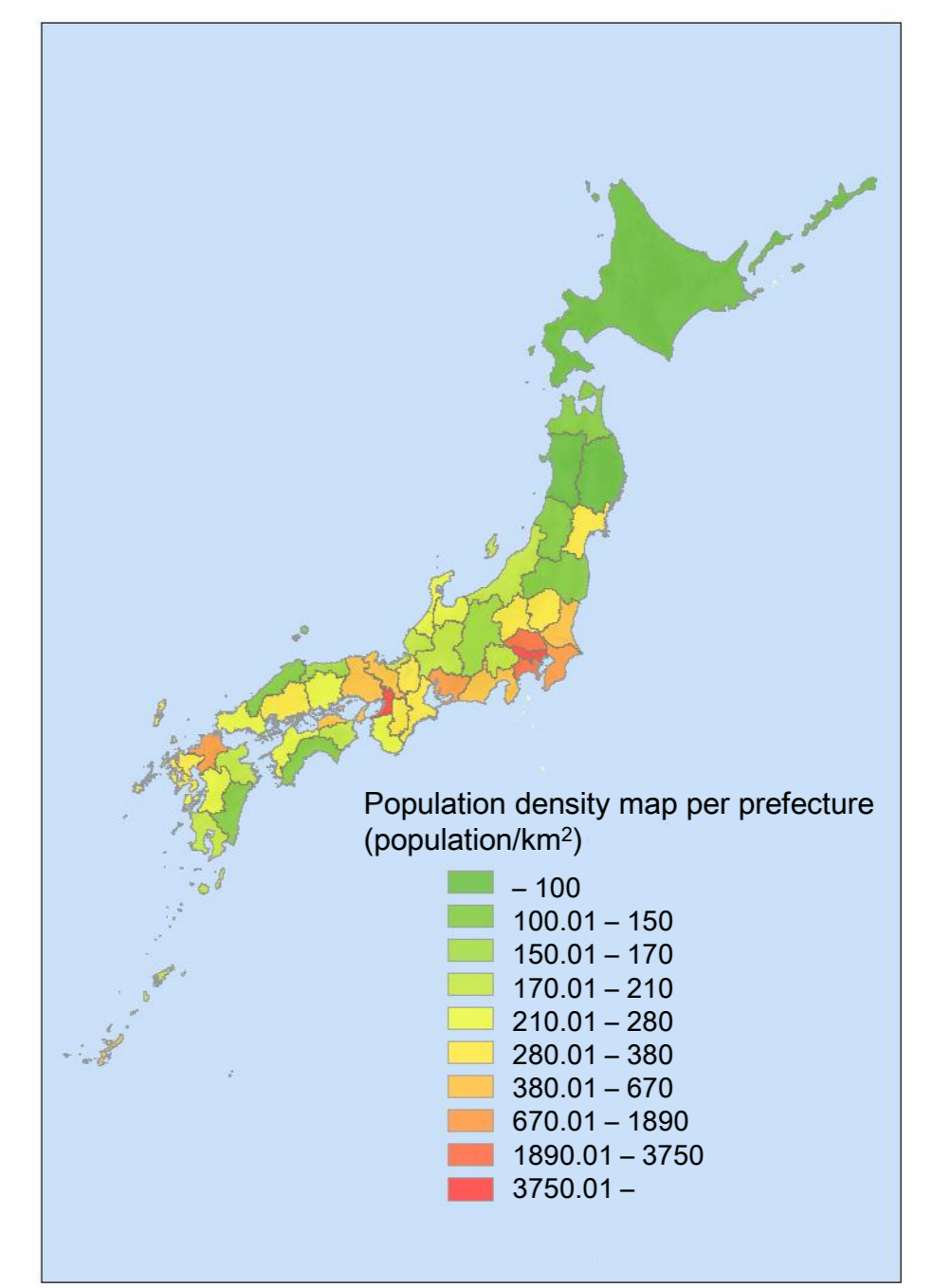
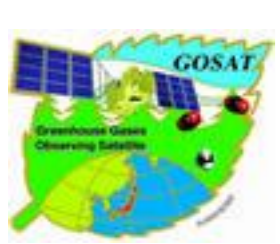


Fig.1 Population density map per prefecture in Japan (2010).

Data description



AOT: Aerosol optical thickness (GOSAT CAI L2)

Any CAI observations within 15km of each prefectural capital are selected from 2009 June to 2010 May.

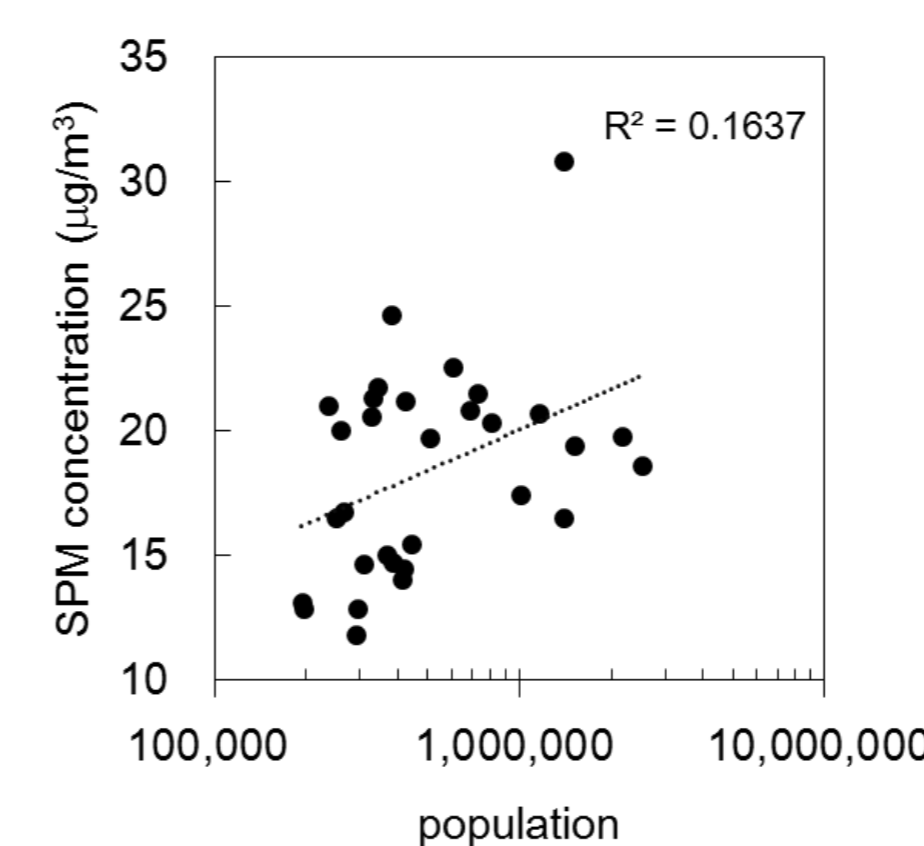


SPM: Suspended particulate matter (Atmospheric environmental regional observation system)

SPM concentrations observed at general environmental air pollution monitoring stations in each prefectural capital from 2009 June to 2010 May are used.

Population and Air pollution

SPM vs population



AOT vs population

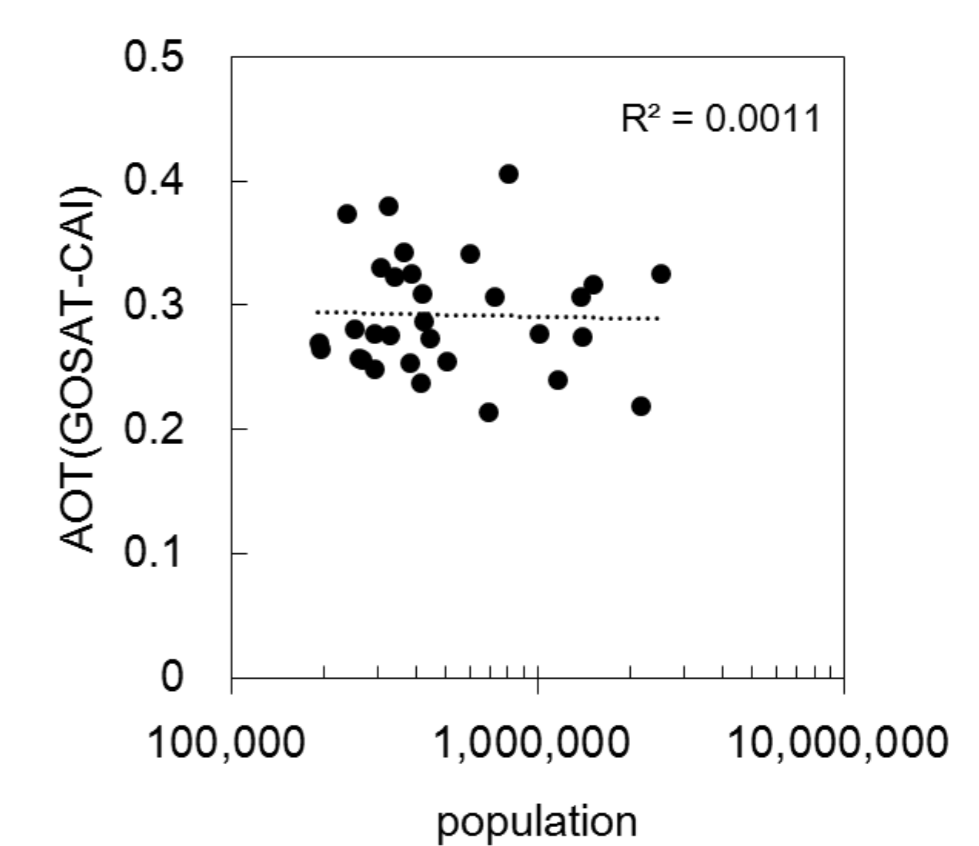


Fig.2 Relation between population and annual mean SPM concentration and annual mean AOT in each prefectural capital.

- ✓ SPM concentration increases with population.
- ✓ There is poor correlation between AOT and population.

Comparison of city size

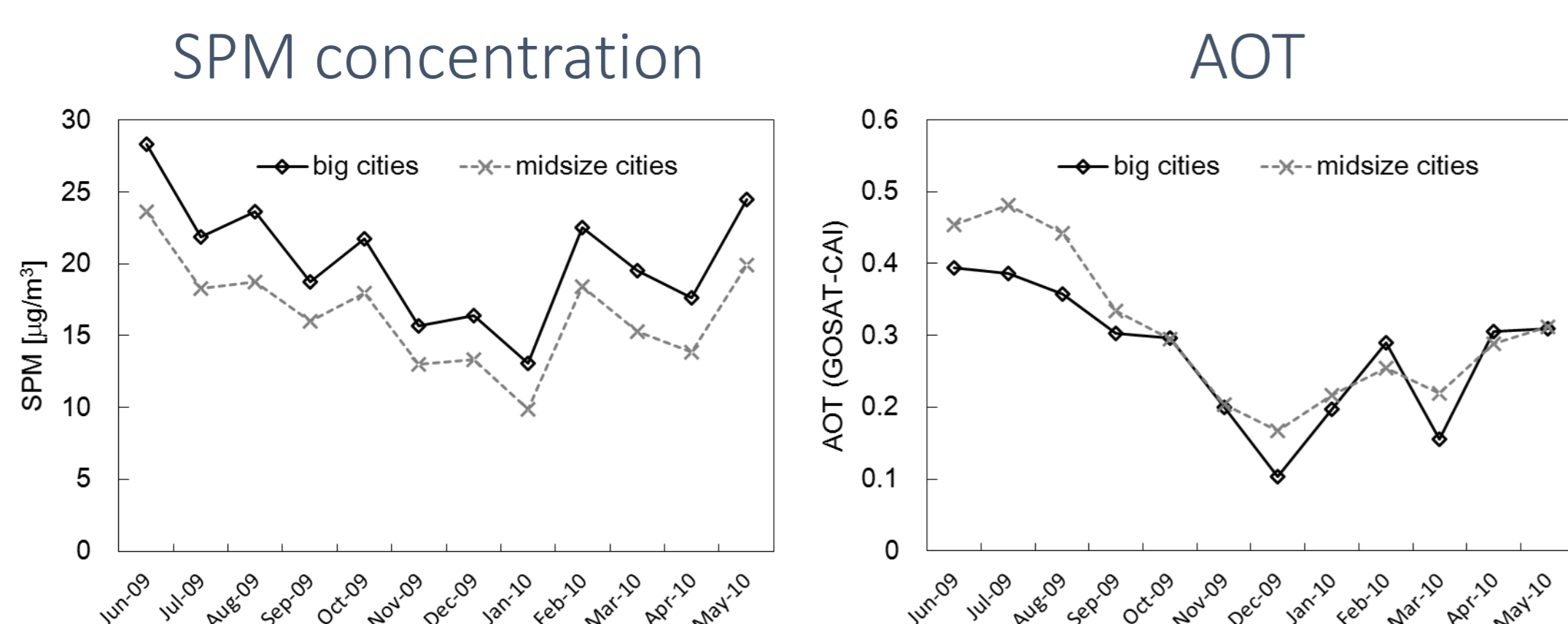


Fig.3 Monthly mean SPM and AOT.

big cities: Prefectural capital with population in excess of one million
midsize cities: Prefectural capital with population less than one million

- ✓ SPM concentration and AOT increase from spring to summer.
- ✓ It is clear that SPM concentration in big cities is larger than that in midsize cities.

Comparison of region

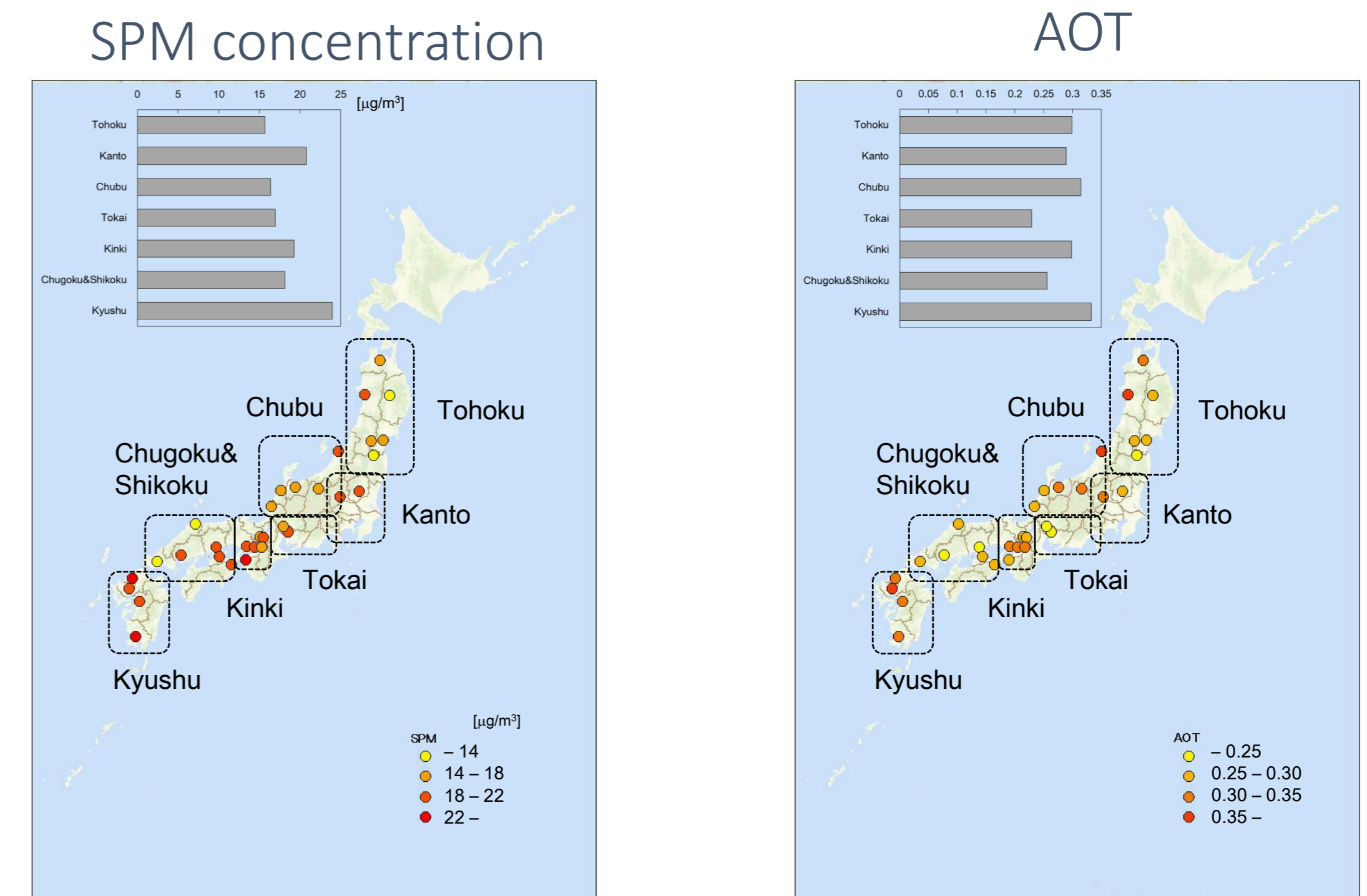


Fig.4 Distribution of annual mean SPM concentration and AOT in each capital. The bar graphs show the regional average of SPM concentration and AOT.

Relation between AOT and SPM

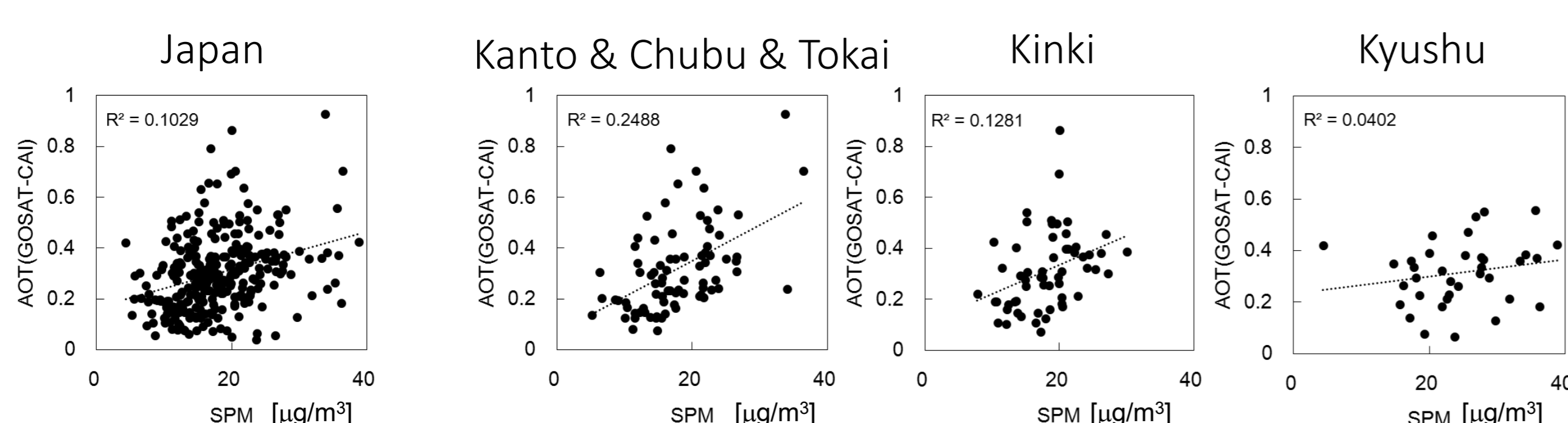


Fig.5 Relation between monthly mean AOT and SPM at prefectural capitals in all over Japan and each region.

- ✓ There is correlation between SPM concentration and AOT
- ✓ The low correlation coefficient is thought to be due to pollutants from outside of region.

Summary

In this study, the concentration of particulate matter in urban areas is analyzed using GOSAT/CAI aerosols and the concentration of SPM observed on the ground in each prefectural capital in Japan, considering the differences in aerosol properties depending on the scale of each city and the characteristics of each area.

The results of the investigation into the SPM concentration from ground observations showed an obvious tendency for higher values in big cities than in smaller cities. The volume of aerosols in Japan's cities showed a tendency for high values of AOT in areas of western Japan and the sea of Japan side. However, no real differences in AOT could be seen in big and smaller cities. From these results, we can see that although AOT is affected by pollutants from outside of cities as well as those from within, ground SPM concentration is more greatly affected by city air pollution.