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# The Variations and Trends of MODIS C5 & C6 AOD Products' Errors in the Recent Decade over the Background and Urban Areas of North China

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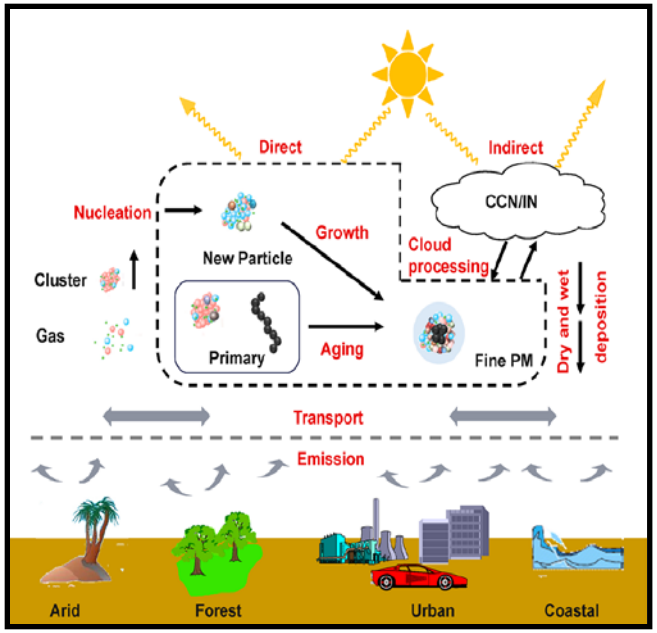
# Introduction




satellite remote sensing

mutual help

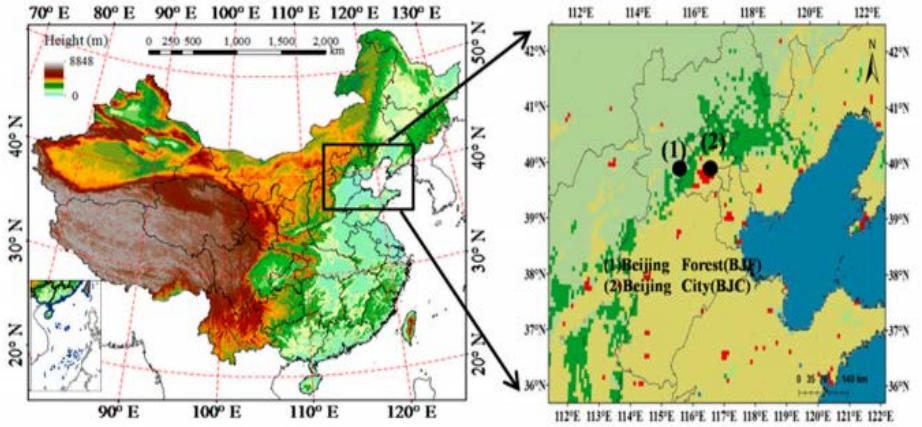
ground-based observations


➡ Questions:

How is the performance of the latest MODIS C6 AOD product in Northern China?

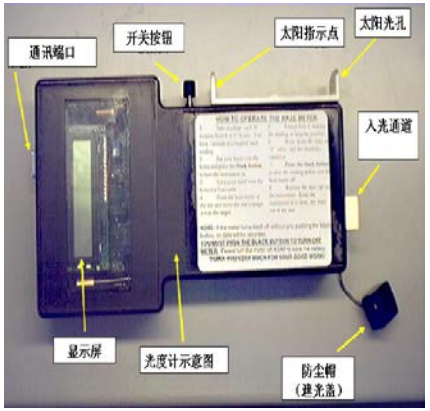
How much do the MODIS aging issues influence AOD product?

# Sites and instruments on the ground




Chinese Sun Hazemeter Network(CSHNET)

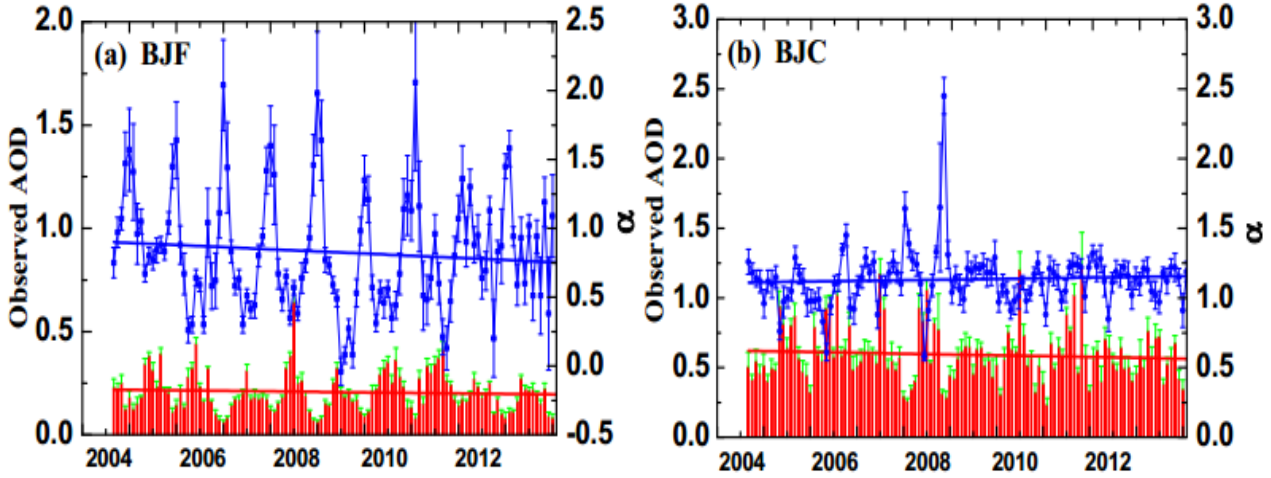
- Beijing Forest site (BJF) located at Donglingshan Mountain (39.97 ° N, 115.43 ° E, 1130 m)
- Beijing City site (BJC) located in IAP and was close to the northern third ring of Beijing (39.98 ° N, 116.37 ° E, 58 m)



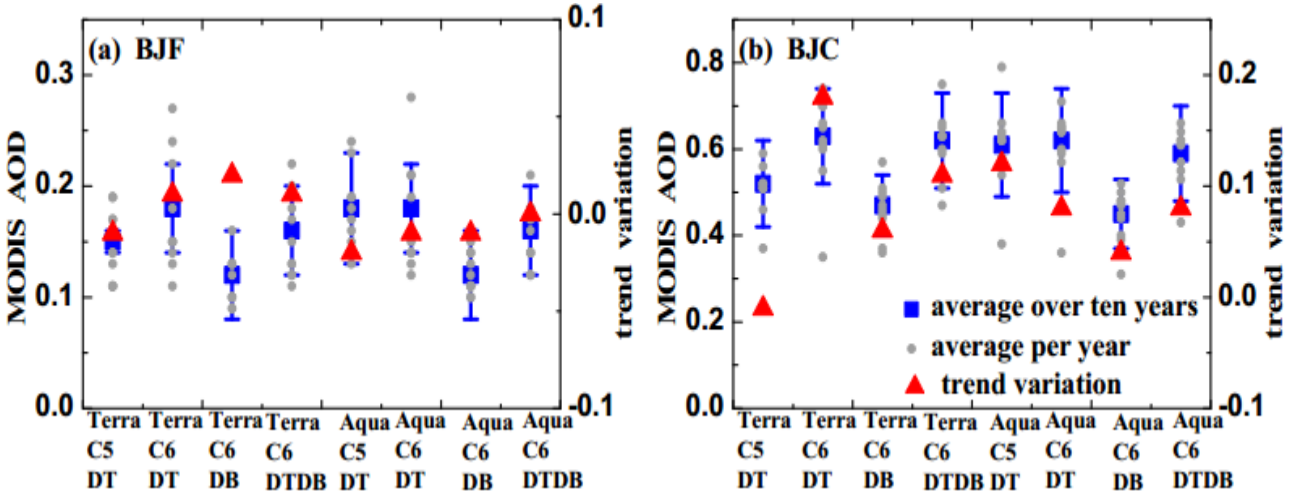


- Hand-held LED hazemeters
- Microtops II solar photometers

# AOD trends' variations during a decade



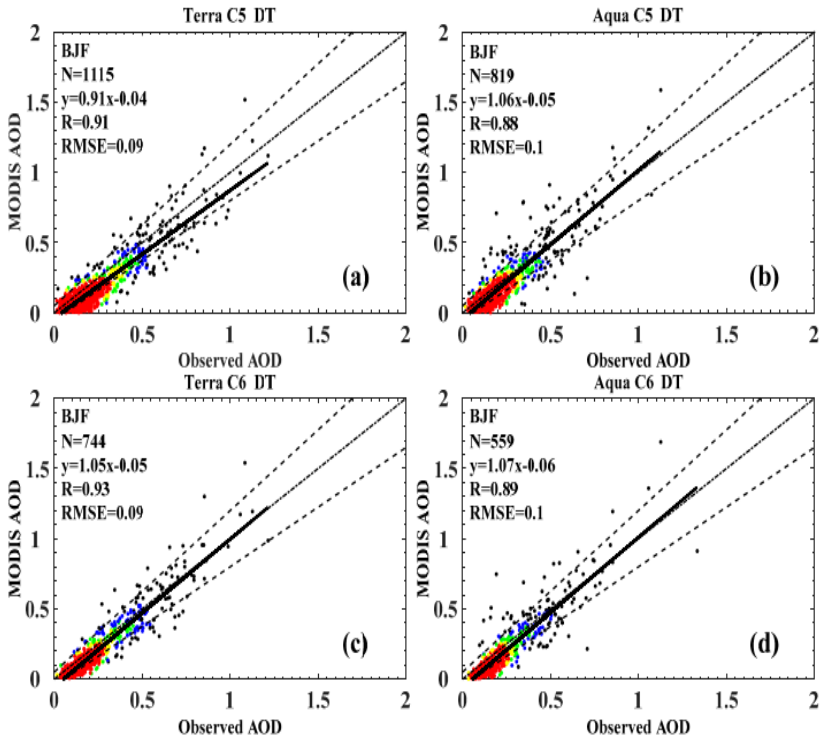

Ground-based distribution from 2004.08 to 2013.12

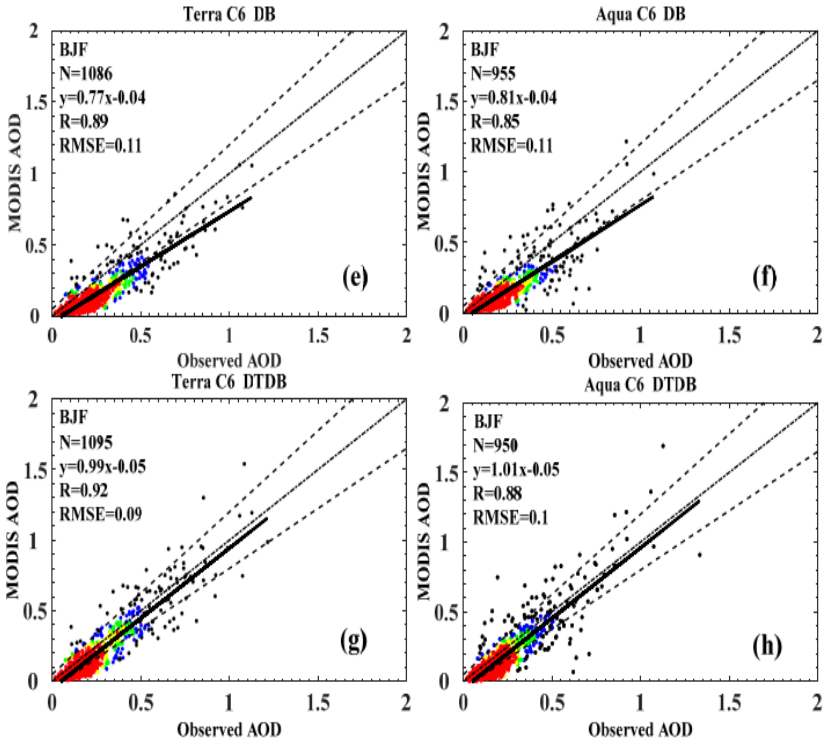



Annual average of MODIS AOD

- There were little decreases for both sites during the decade.
- Unfortunately, both Terra and Aqua showed the opposite increased trend (exception for Aqua product at BJF).

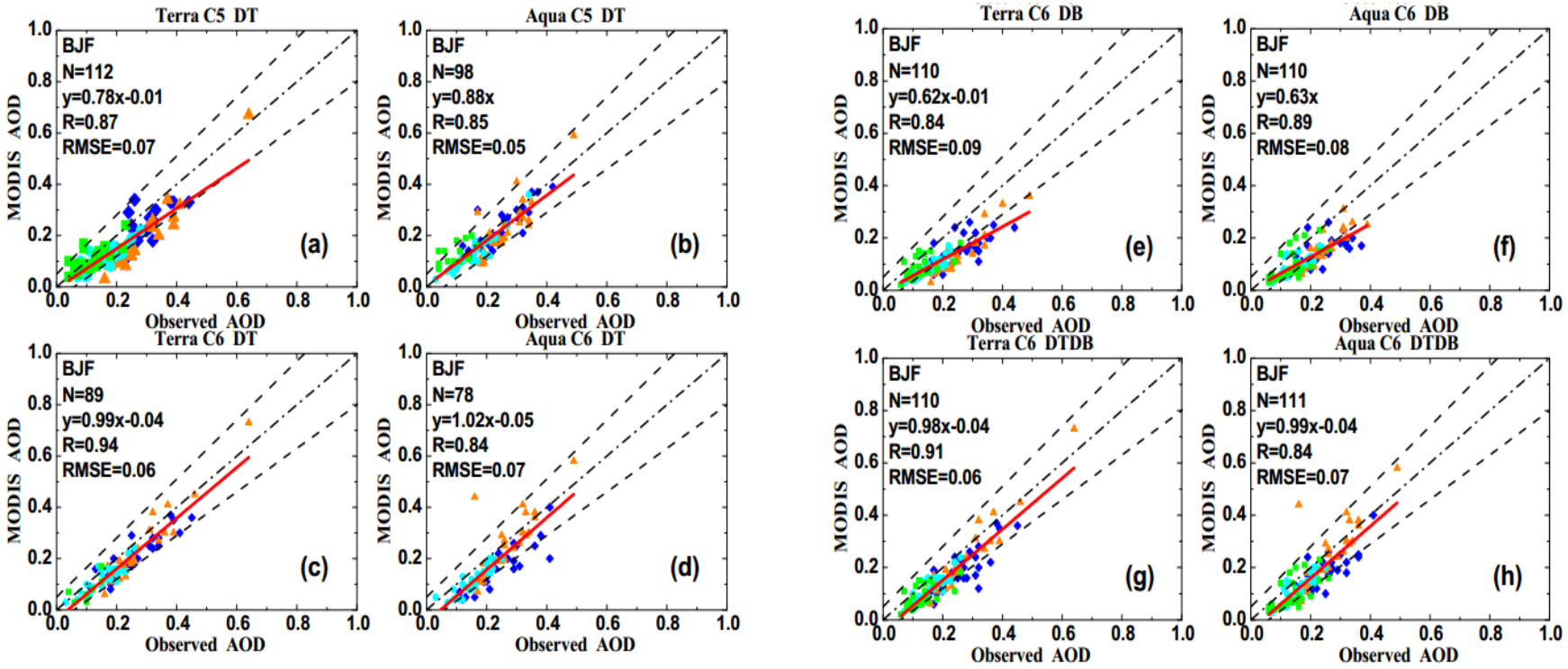
# The comparison in the background area on daily scale



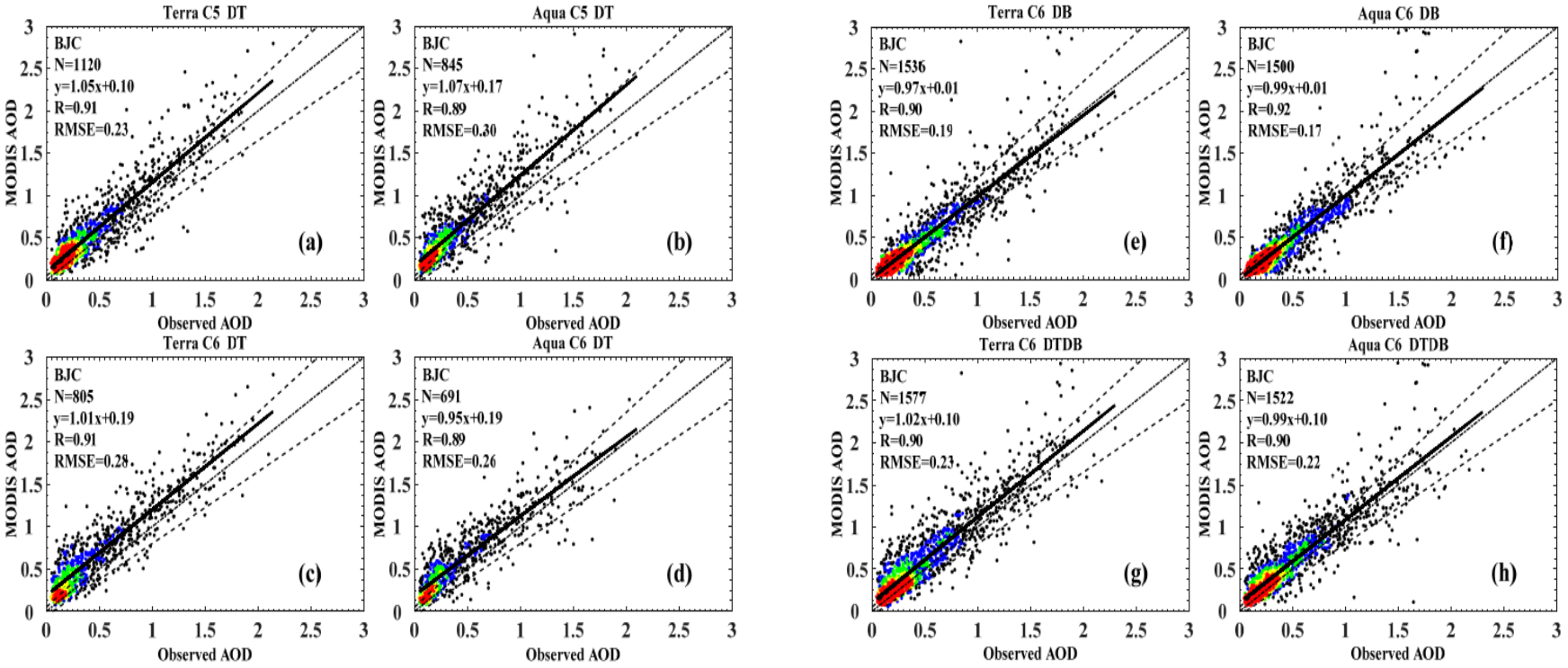

- DT and C6 DTDB performed better.
- C6 DB had a considerable underestimation caused by biases in aerosol model assumptions.
- Compared to C5 DT, the improvement of C6 DT was not obviously.

# The comparison in the background area on monthly scale



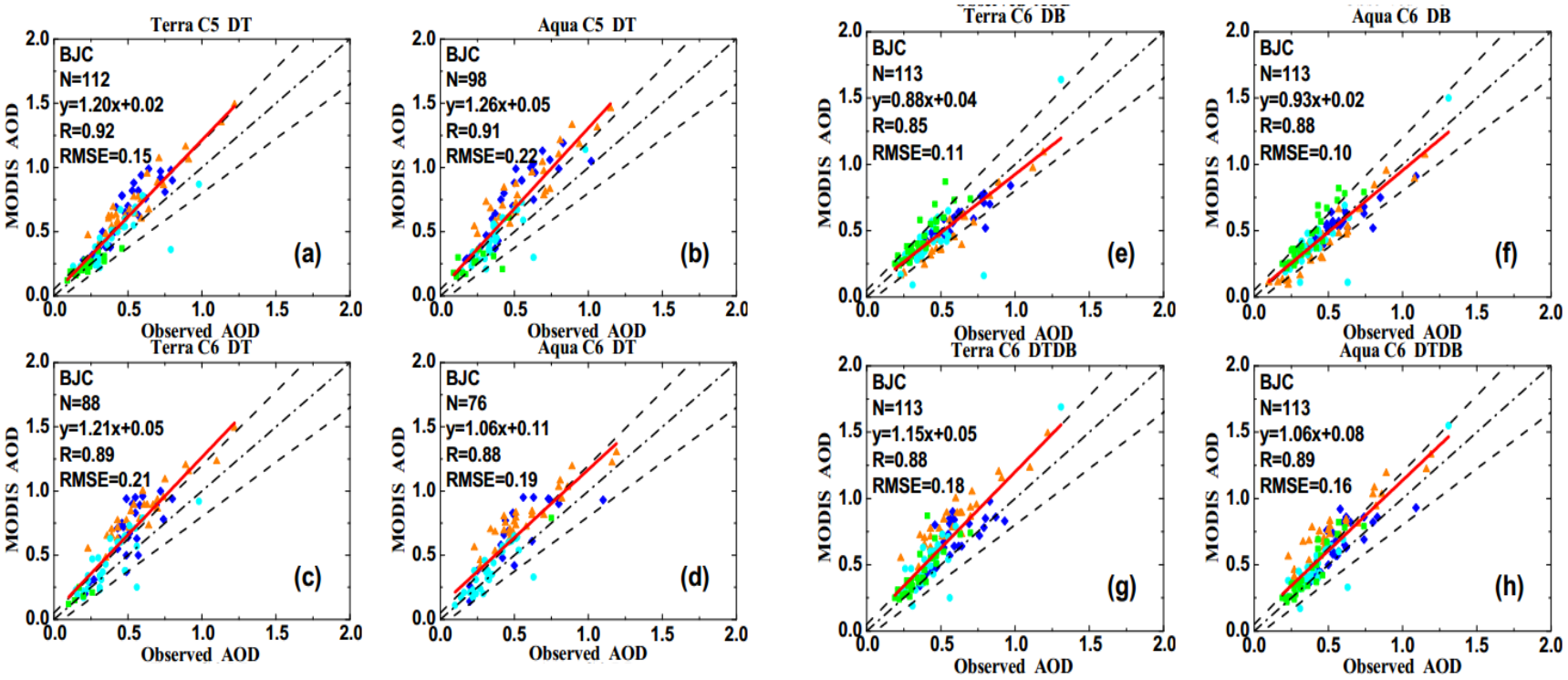

- The DT products were severely lack of retrievals in winter.
- DT, DB and DTDB retrievals usually performed best in autumn.

# The comparison in the urban area on daily scale



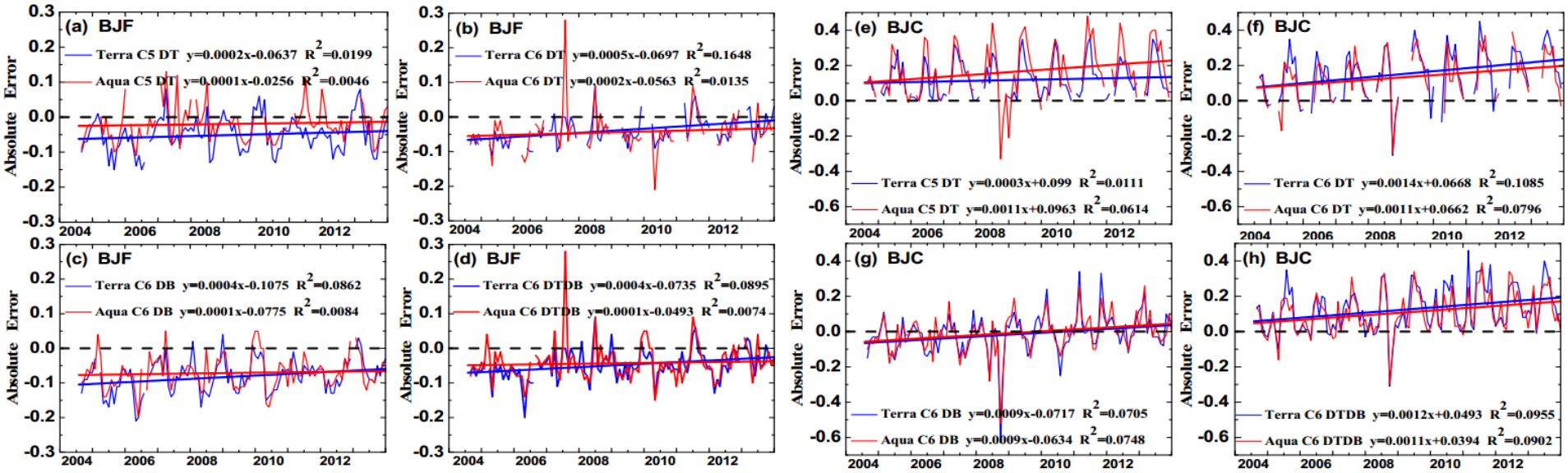

- DB showed a good agreement with the ground-based observations.
- The uncertainty of surface reflectivity estimation can not be ignored for DT and C6 DTDB.
- The accuracy of C6 DT did not improve, either.

# The comparison in the urban area on monthly scale




- DT products performed best in autumn, while there was obviously overvaluing in spring and summer
- The quality of C6 DB and DTDB retrievals in summer were markedly inferior to other seasons.

# The error trends of MODIS products




- The errors had strong seasonal cycle: they were in the larger range during spring and summer and smaller one during autumn and winter.

- The long-term tendency of error lines for all the products were on the rise to different extent, indicating that the sensor degradation issues can not be neglected.

# Summary and conclusions

- The ground-based AOD showed a slight decrease in the background and urban areas during nearly ten years, but few MODIS C5 and C6 products can catch the trend variation characteristics.
- Although C6 DB products have expanded coverage to all land surface, they still performed better in the urban than in the background.
- Excitingly, the new merged dataset, namely, C6 DTDB, generally had smaller biases in North China (especially in the background area), thus it may provide a more convenient MODIS AOD record data for other applications.
- Although the errors of sensor degradation were far less than the retrieval ones, it cannot be neglected and need further consideration in the retrieval algorithms.
- Since only the data from two ground sites were collected in this study, the results may have certain partialities.