



Spatial variation of aerosol optical properties in North China Plain

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The column-integrated optical properties of aerosol in Beijing and Xianghe situated at North China Plain were investigated based on Sun/sky radiometer measurements made at Aerosol Robotic Network (AERONET) sites. Only version 2 and level 2 quality-assured data were presented and analyzed in this paper. Time intervals differ for the two sites, with Beijing having 9 years of data (Mar.-May, 2001; Apr., 2002-Dec., 2011), while Xianghe having 6 years of data (Mar.-Apr., 2001; Sep., 2004-Dec., 2011). Monthly mean 500 nm AOT values reach a maximum in June (0.95) and exceed 0.55 from March through September, and the minimum values occur during the late fall and winter months of November through February at Beijing. The monthly mean AOT values at Xianghe are very close to those measured at Beijing. The absolute differences of AOT between the two sites are less than 0.1 except in June and July. The reason of large difference in June and July is the frequently cloud contamination in summer result in the monthly means over the two sites computed from a large number of measurements of different date. The monthly averaged AOT with the same date in June and July are re-computed and the absolute difference of AOT between Beijing and Xianghe reduced to 0.01 and 0.03 in June and July respectively. The monthly mean Angstrom Exponent (AE) in Beijing and Xianghe sites are very close, with the absolute difference less than 0.075. The monthly mean AE in the two sites varied between ~ 1.0 and ~ 1.3 except in spring (March-May), therefore clearly dominated by fine mode aerosol for most of the year. All monthly averaged SSA at Beijing showed much lower value as compared to Xianghe though the seasonal variations are similar for the two sites, which indicates that aerosol absorption is greater in Beijing. All monthly averaged imaginary part of refractive index at Beijing has much higher value than Xianghe. The absolute differences of SSA between the two sites range from 0.016 to 0.037 except that the difference in September is only 0.0005. All the significant differences but September exceed the 95% confidence level based on t-test technique. This very large difference in SSA over a relatively small distance (~ 70 km) suggests the significant variability in aerosol absorption between Beijing and Xianghe and the reasons for this difference should be investigated.