Supplementary

(1) The equations of the four seasonal GWR models

The equations of the seasonal GWR model with auxiliary variables.

$$\textbf{Spring}: \mathrm{PM}_{2.5(i,j)} = \beta^1_{0(i,j)} + \beta^1_{1(i,j)}\mathrm{AOD}_{(i,j)} + \beta^1_{2(i,j)}\mathrm{WS}_{(i,j)} + \beta^1_{3(i,j)}\mathrm{Vpre}_{(i,j)} + \beta^1_{4(i,j)}\mathrm{VSB}_{(i,j)} \quad (1)$$

$$\textbf{Summer}: \mathrm{PM}_{2.5(i,j)} = \beta^2_{0(i,j)} + \beta^2_{1(i,j)}AOD_{(i,j)} + \beta^2_{2(i,j)}Elev_{(i,j)} + \beta^2_{3(i,j)}\mathrm{Vpre}_{(i,j)} + \beta^2_{4(i,j)}\mathrm{VSB}_{(i,j)} \quad (2)$$

$$\textbf{Autumn}: \mathrm{PM}_{2.5(i,j)} = \beta^3_{0(i,j)} + \beta^3_{1(i,j)}\mathrm{AOD}_{(i,j)} + \beta^3_{2(i,j)}\mathrm{WS}_{(i,j)} + \beta^3_{3(i,j)}\mathrm{Temp}_{(i,j)} + \beta^3_{4(i,j)}\mathrm{VSB}_{(i,j)} \quad (3)$$

$$\textbf{Winter}: \mathrm{PM}_{2.5(i,j)} = \beta^4_{0(i,j)} + \beta^4_{1(i,j)}\mathrm{AOD}_{(i,j)} + \beta^4_{2(i,j)}\mathrm{Apre}_{(i,j)} + \beta^4_{3(i,j)}\mathrm{RH}_{(i,j)} + \beta^4_{4(i,j)}\mathrm{VSB}_{(i,j)} \quad (4)$$

All the variable parameters are described in Table 1 of the manuscript and changes with location i on day j. the superscripts of β from 1 to 4 stand for the four different seasonal models: 1 is spring, 2 is summer, 3 is autumn and 4 is winter. $\beta^{1-4}_{0(i,j)}$ denote the constant term of four seasonal model at location i on day j respectively for four seasons; $\beta^1_{1-4(i,j)}$are variable coefficients of location i on day j in spring model, $\beta^2_{1-4(i,j)}$are variable coefficients at location i on day j in summer model, $\beta^3_{1-4(i,j)}$are variable coefficients at location i on day j of autumn model, $\beta^4_{1-4(i,j)}$are variable coefficients at location i on day j of winter model.

(2) The comparison of the autumn seasonal GWR model and yearly GWR model

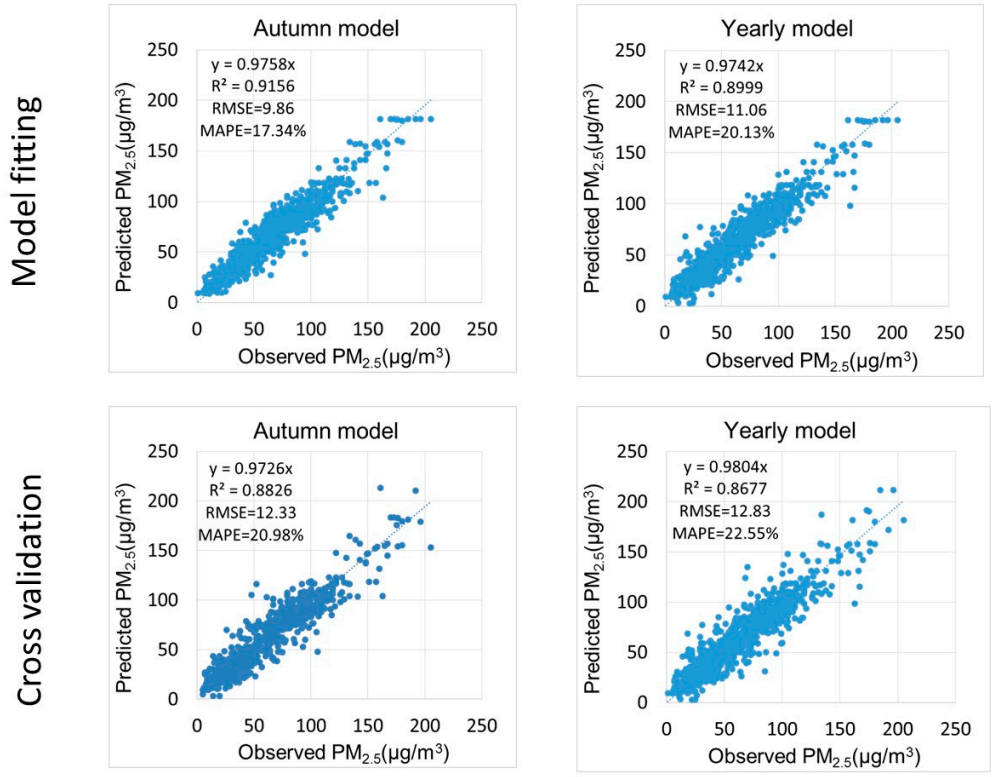

Figure S1. Comparison between observed $PM_{2.5}$ and predicted $PM_{2.5}$ from the autumn GWR model and the yearly model in 2013. The dashed lines are regression lines.

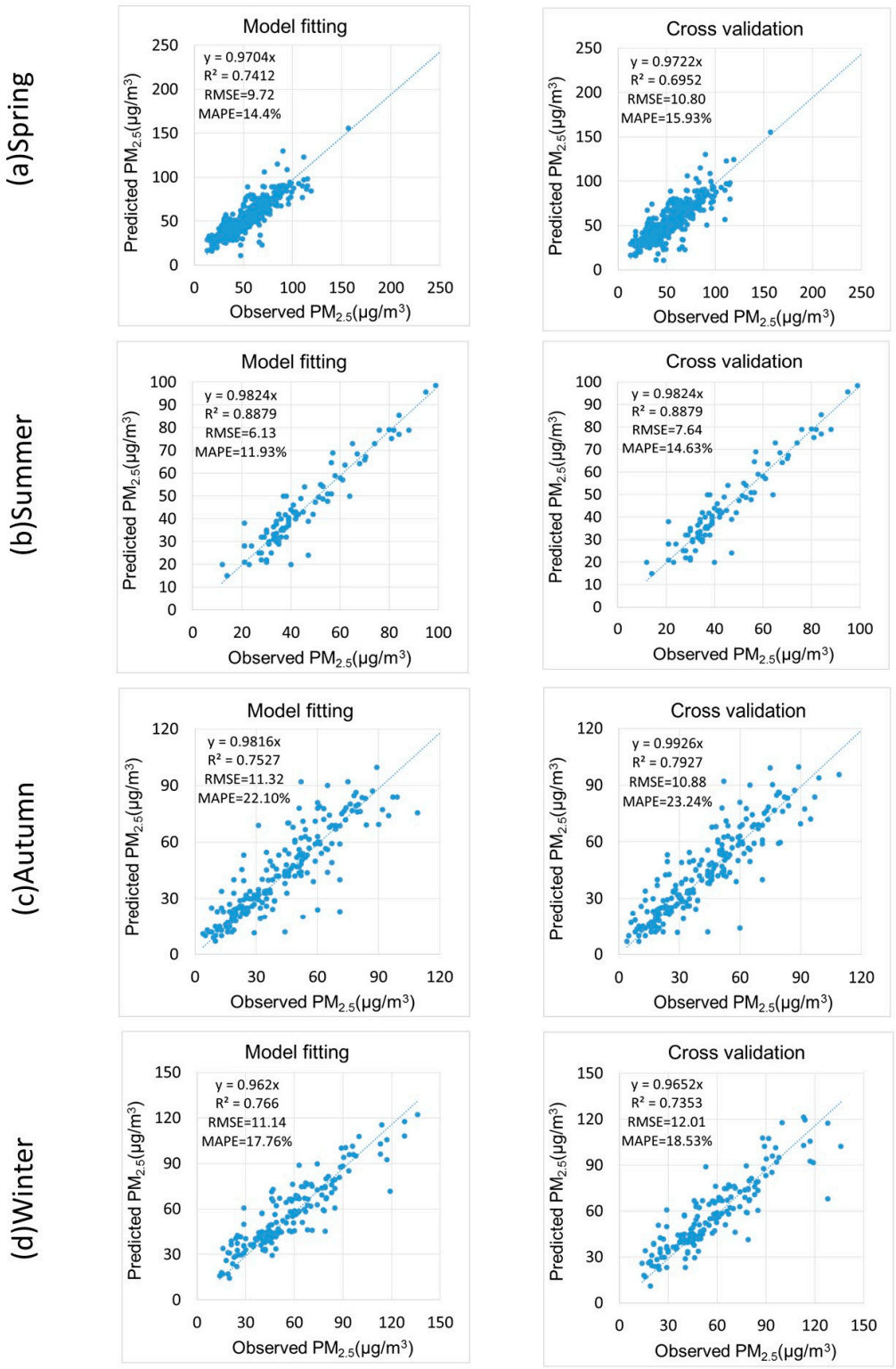

Figure S2. Comparison between observed $PM_{2.5}$ and predicted $PM_{2.5}$ concentrations in the four seasonal models of 2014. The dashed lines are regression lines.