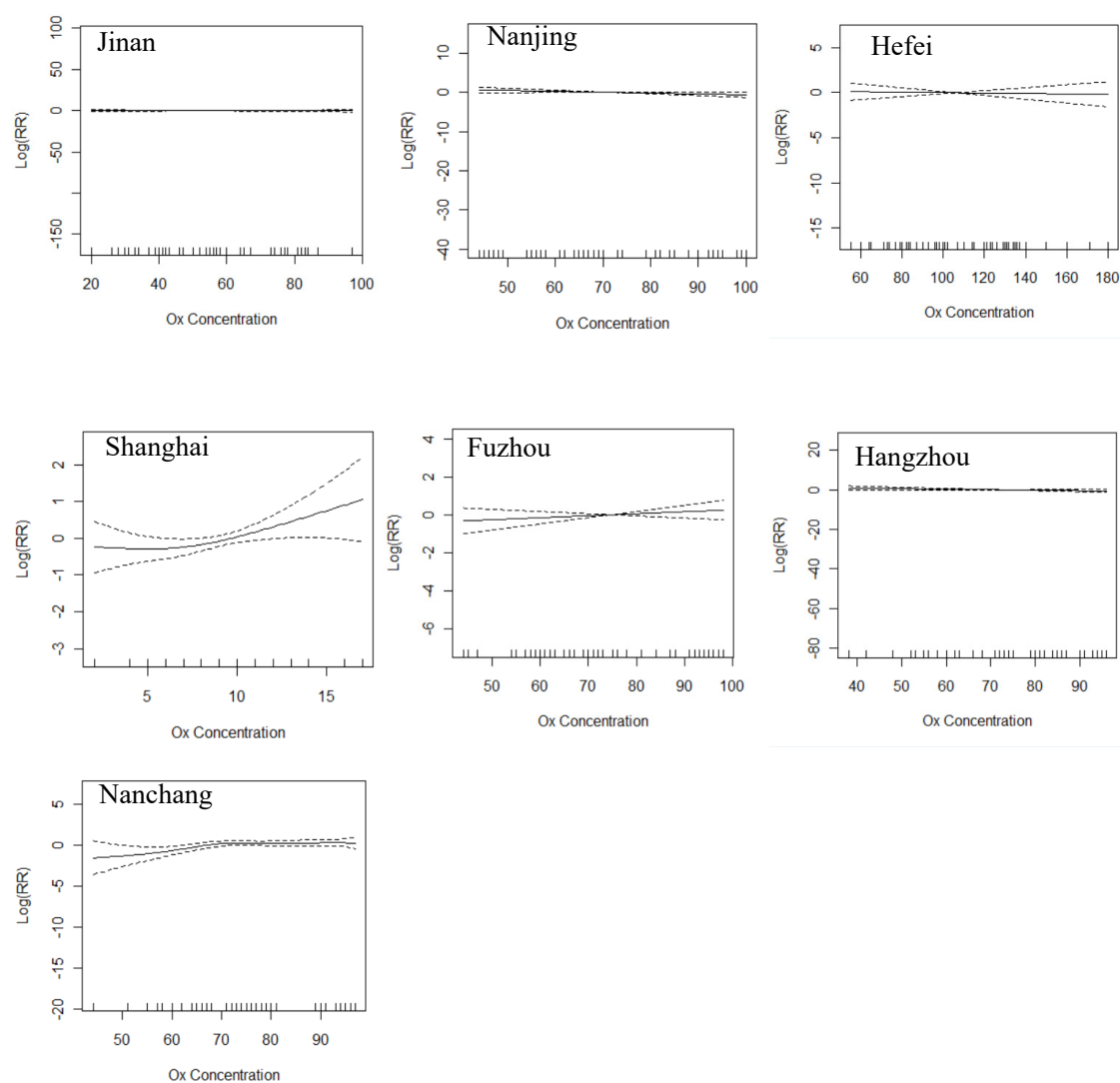
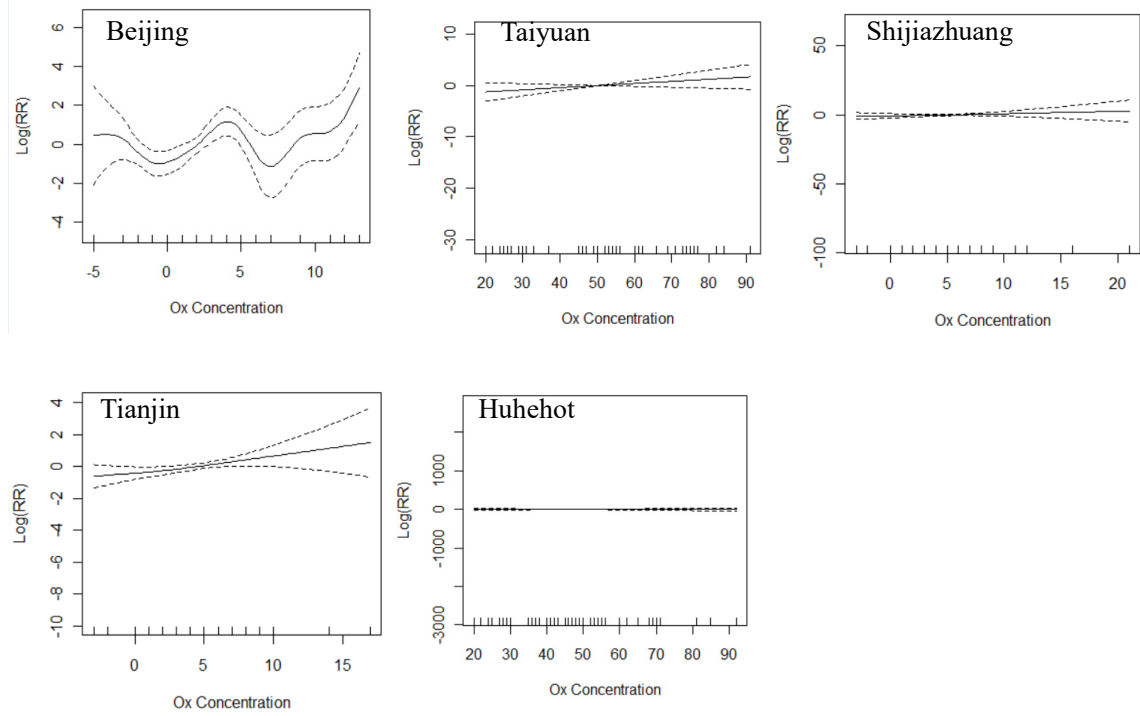


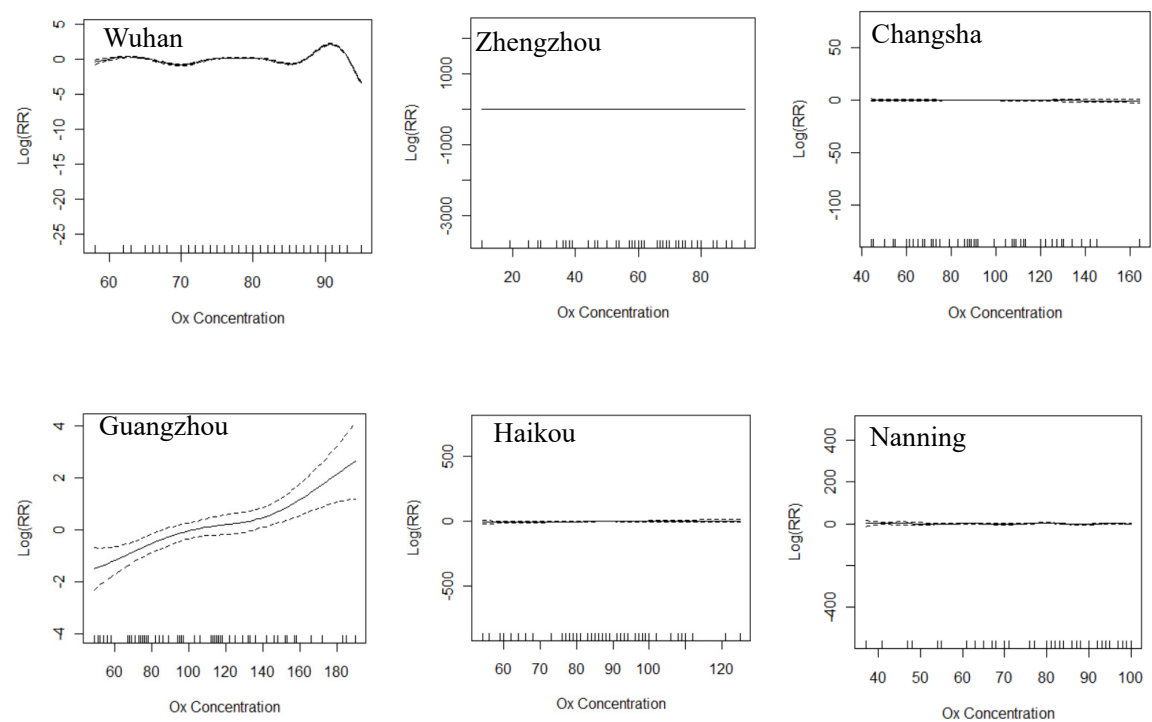
## Supplement Information



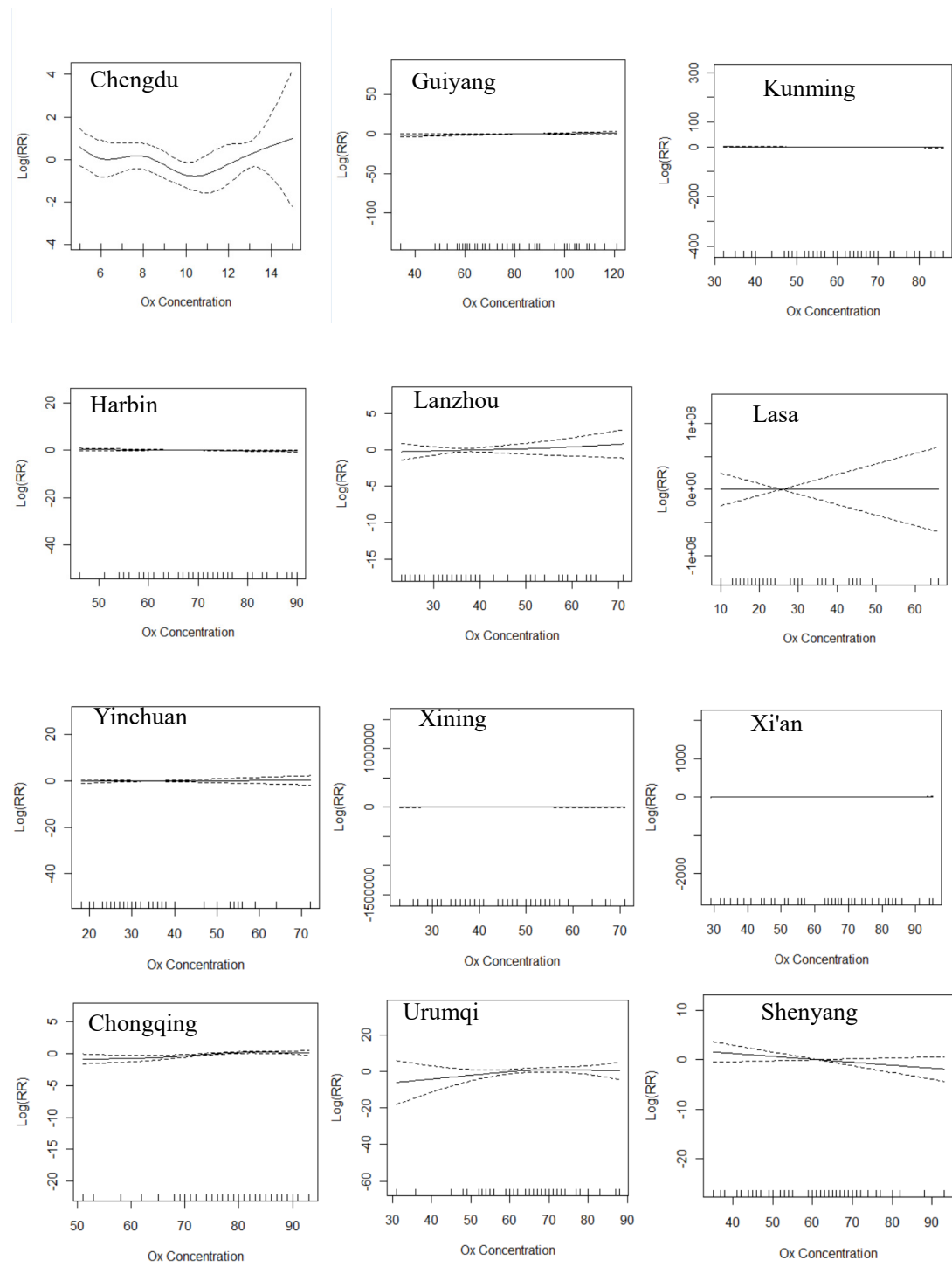
**Figure S1.**  $\text{O}_x$  values in eastern China.



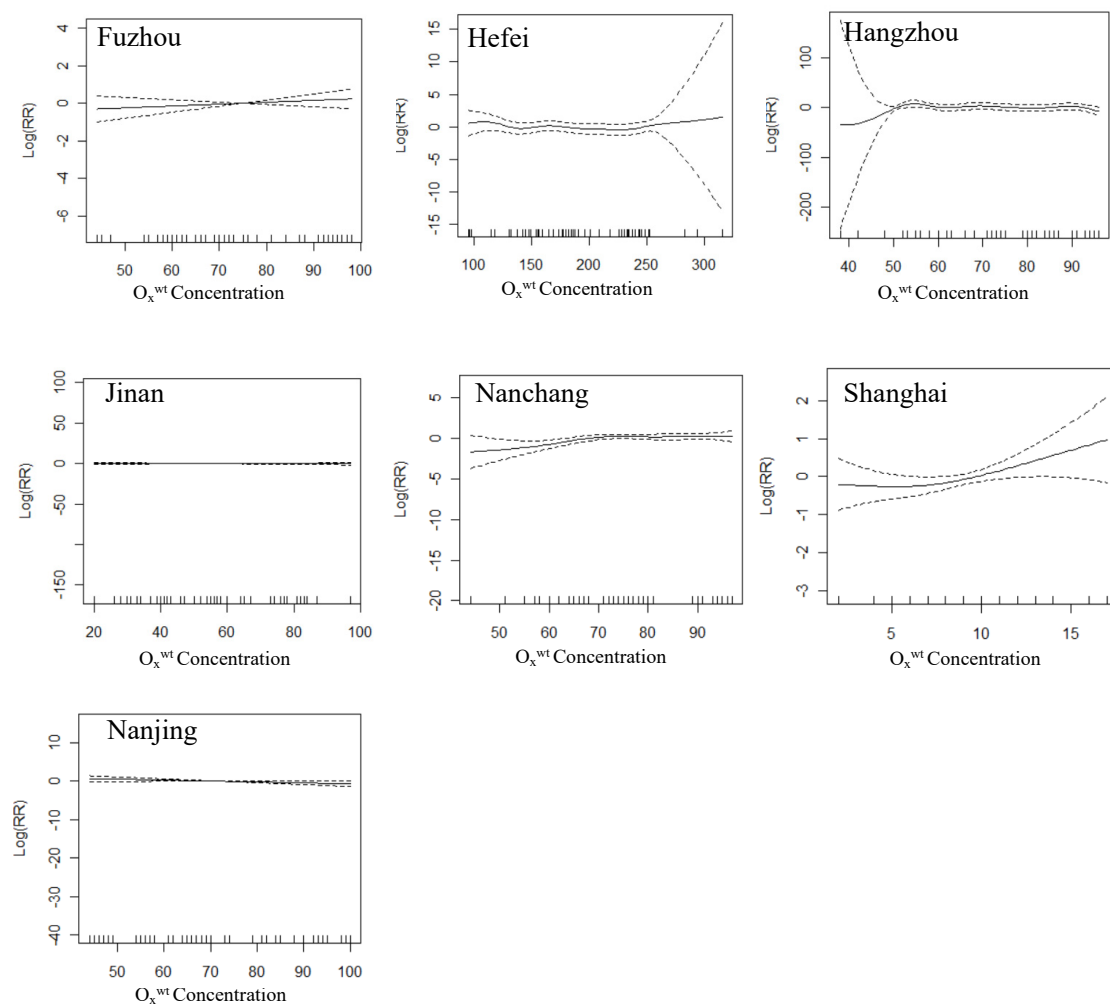
**Figure S2.**  $O_x$  values in Northern China.



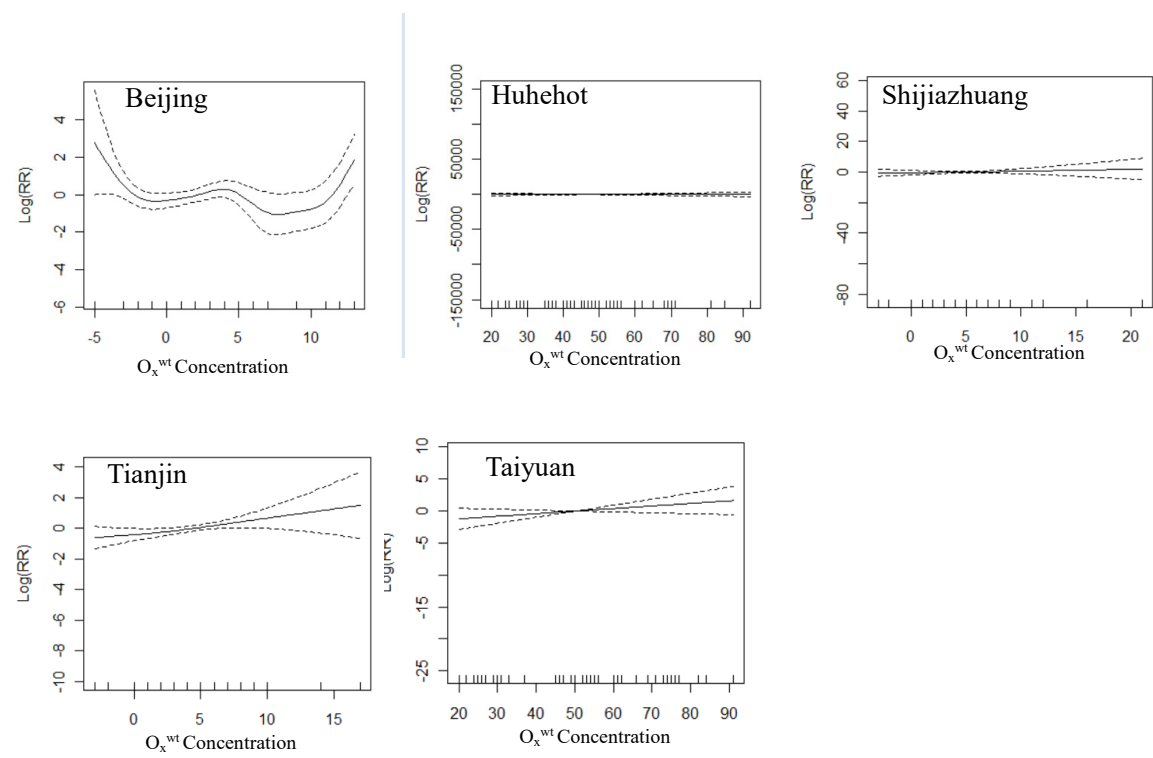
**Figure S3.**  $O_x$  value in southern China.



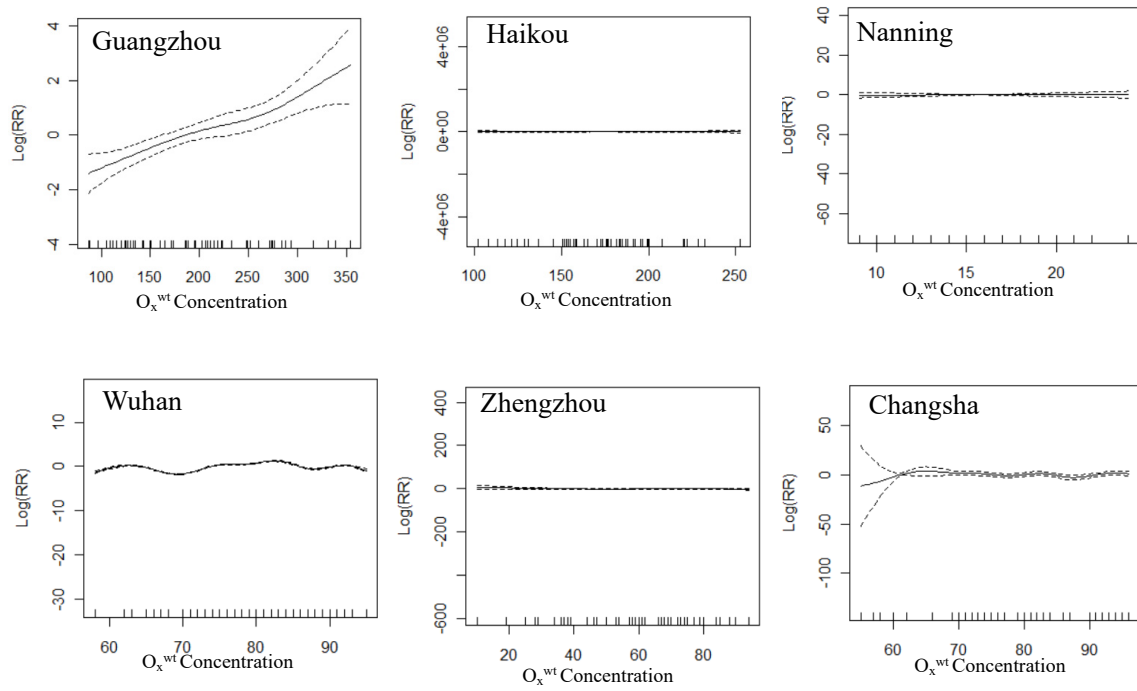
**Figure S4.**  $O_x$  values in other cities of China.



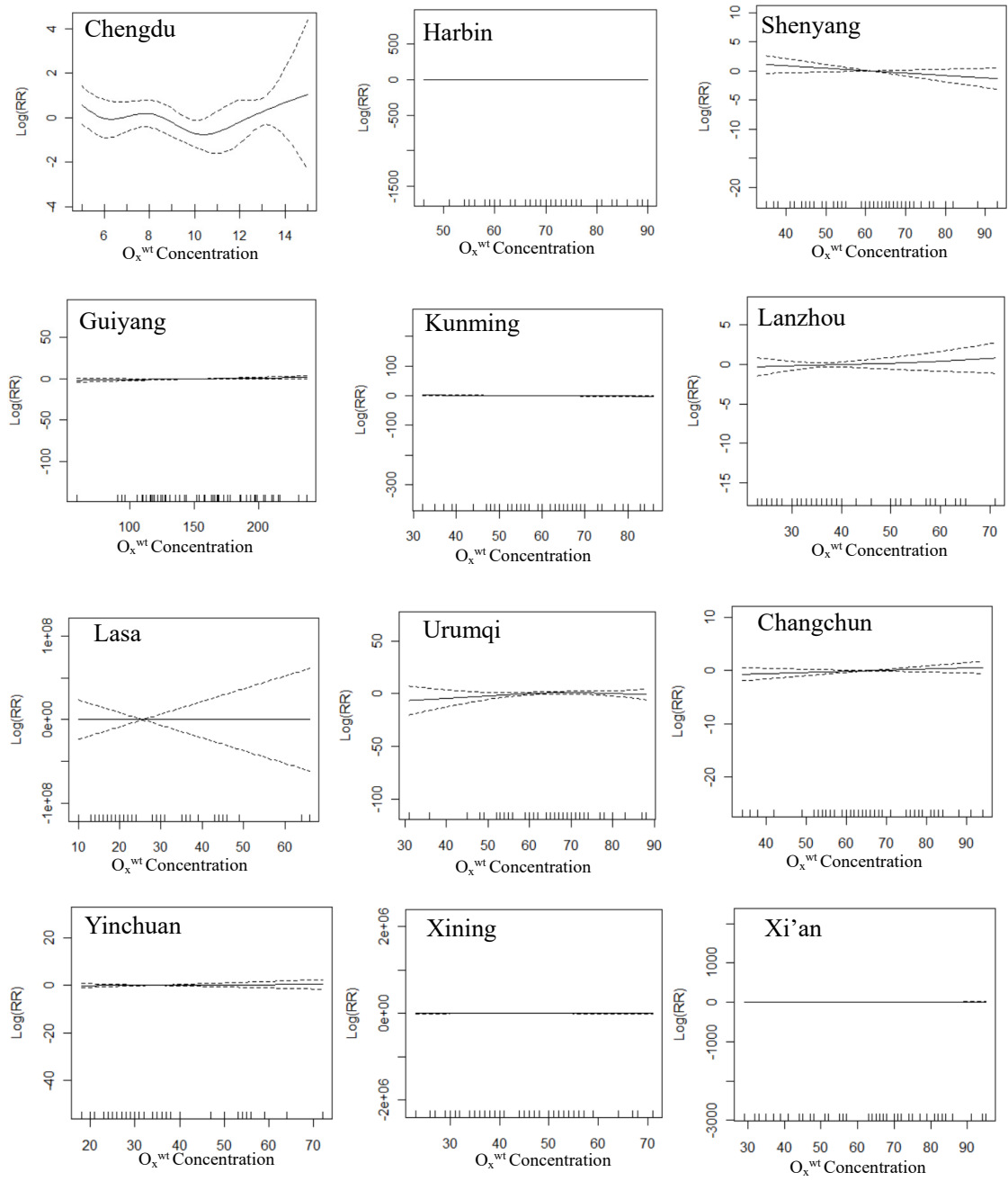
**Figure S5.**  $O_x^{wt}$  values in eastern China.



**Figure S6.**  $O_x^{wt}$  values in northern China.



**Figure S7.**  $\text{O}_x^{\text{wt}}$  values in southern China.



**Figure S8.** O<sub>x</sub><sup>wt</sup> values in other cities of China.

**Table S1.** Lag effect for China cities.

		O <sub>3</sub>	NO <sub>2</sub>	O <sub>x</sub>	O <sub>x</sub> <sup>wt</sup>
Beijing	Lag1	7.9%[-2.2%,19%]	##	1.1%[-7.4%,10%]	2%[-2.6%,7%]
	Lag2	2.3%[-6.5%,12%]	##	0.2%[-6.8%,7.9%]	0.5%[-3.4%,4.7%]
	Lag3	1.9%[-6.5%,11%]	##	0.2%[-6%,6.8%]	0.4%[-3.2%,4.1%]
	Lag4	7.1%[-4%,19%]	##	3.1%[-5.5%,12%]	2.5%[-2.4%,7.7%]
	Lag5	4.4%[-6.2%,16%]	6.8%[-6.4%,22%]	4.4%[-2%,12%]	2.4%[-1.9%,6.9%]
	Lag6	##	4.4%[-8.1%,18%]	##	##
	Lag7	4.2%[-6.5%,16%]	16%[2.2%,32%]	7.3%[-0.1%, 15%]	3.4%[-0.9%,8%]
Tianjin	Lag1	##	5.1%[-13%,27%]	0.05%[-12%,13%]	0.2%[-11%,13%]
	Lag2	##	##	##	##
	Lag3	22%[-4.6%,56%]	##	0.3%[-9%,10%]	0.07%[-8.9%,10%]
	Lag4	##	##	##	##
	Lag5	4.8%[15%,29%]	##	##	##
	Lag6	14%[10%,47%]	2.8%[-15%,25%]	5.6%[-7.8%,21%]	5.2%[-7.6%,20%]
	Lag7	##	5.7%[-11%,26%]	1.9%[-10%,16%]	1.9%[-10%,16%]
Shanghai	Lag1	##	0.5%[-15%,19%]	##	##
	Lag2	4.1%[-5.1%,14%]	9.7%[-7%,30%]	5.9%[-2%,15%]	2.5%[-1%,7%]
	Lag3	2.8%[-7.1%,13%]	15%[-2%,36%]	7%[-2%,17%]	2.7%[-2%,7%]
	Lag4	##	11%[-6%,33%]	0.8%[-8%,10%]	##
	Lag5	4.1%[-5.8%,15%]	4%[-14%,27%]	3.5%[-5%,13%]	1.9%[-2%,6%]
	Lag6	6.9%[-3.1%,18%]	##	4.3%[-5%,14%]	2.7%[-2%,7%]
	Lag7	##	2.5%[-17%,26%]	##	##
Chonqing	Lag1	##	6%[-16%,34%]	0.6%[-7%,9%]	0.1%[-3%,4%]
	Lag2	##	##	##	##
	Lag3	##	39%[7%,81%]	##	##
	Lag4	9%[-1%,20%]	1.9[-20%,31%]	6%[-2%,17%]	3%[-1%,8%]
	Lag5	##	##	##	##
	Lag6	7%[-2%,18%]	23%[-19%,90%]	6%[-3%,17%]	3%[-1%,8%]
	Lag7	11%[1%,21%]	13%[-17%,57%]	8%[-0.5%,17%]	4%[0.2%,9%]
Shenyang	Lag1	12%[-18%,55%]	##	2.8%[-25%,41%]	##
	Lag2	6%[-24%,51%]	##	3.4%[-23%,39%]	2.9%[-13%,21%]
	Lag3	38%[-5%,104%]	##	15%[-13%,54%]	17%[-2.9%,41%]
	Lag4	##	12%[-22%,62%]	##	##
	Lag5	##	20%[-18%,78%]	1.1%[-27%,40%]	##
	Lag6	##	##	##	##
	Lag7	3%[-43%,89%]	##	##	##
Harbin	Lag1	13%[-7.4%,38%]	##	##	##
	Lag2	1.8%[-12%,18%]	29%[7%,57%]	5.3%[-5%,16%]	2.2%[-3%,8%]
	Lag3	##	16%[-0.4%,36%]	4.4%[-5%,14%]	1.2%[-4%,7%]
	Lag4	15%[-4.5%,38%]	##	2.3%[-9%,15%]	1.6%[-4%,8%]
	Lag5	5.6%[-11%,25%]	##	0.9%[-8%,11%]	1.1%[-4%,7%]

	Lag6	##	##	##	##
	Lag7	##	##	##	##
	Lag1	##	##	107%[28%,234%]	43%[1.6%,103%]
	Lag2	##	##	##	##
	Lag3	##	##	##	18%[-67%,339%]
Changchun	Lag4	32%[-28%,144%]	##	##	16%[-13%,58%]
	Lag5	##	##	##	##
	Lag6	##	##	##	##
	Lag7	##	##	##	##
	Lag1	##	21%[-34%,125%]	##	##
	Lag2	##	##	##	##
	Lag3	##	11%[-35%,94%]	##	##
Shijiazhuang	Lag4	75%[-2.6%,216%]	##	##	0.7%[-14%,18%]
	Lag5	81%[-7.6%,257%]	##	45%[-19%,164%]	29%[-7.4%,81%]
	Lag6	18%[-30%,101%]	##	##	2.2%[-17%,26%]
	Lag7	##	##	##	##
	Lag1	##	11%[-43%,120%]	##	##
	Lag2	21%[-9.2%,65%]	##	11%[-16%,49%]	7.9%[-6.4%,24%]
	Lag3	##	10%[-45%,122%]	0.6%[-23%,32%]	##
Jinan	Lag4	##	22%[-47%,186%]	##	##
	Lag5	##	32%[-38%,188%]	##	##
	Lag6	17%[-12%,57%]	##	17%[-13%,59%]	8.4%[-6.4%,25%]
	Lag7	##	##	##	##
	Lag1	##	##	##	##
	Lag2	##	##	##	##
	Lag3	10%[-10%,36%]	##	1.5%[-14%,20%]	2.7%[-6%,12%]
Nanjing	Lag4	##	##	##	##
	Lag5	##	##	##	##
	Lag6	7.3%[-13%,33%]	0.06%[-38%,62%]	5.7%[-12%,28%]	3.2%[-6.5%,14%]
	Lag7	##	34%[-13%,108%]	4.7%[-14%,28%]	0.7%[-9%,12%]
	Lag1	40%[8%,82%]	##	45%[-9%,93%]	18%[4%,35%]
	Lag2	##	##	##	##
	Lag3	2.9%[-24%,39%]	##	2.7%[-23%,37%]	1.3%[-12%,17%]
Hangzhou	Lag4	3.4%[-10%,20%]	##	##	1%[-6%,8%]
	Lag5	25%[3%,51%]	72%[-58%,628%]	29%[5%,59%]	12%[2%,23%]
	Lag6	3.4%[-11%,20%].	13%[-62%,244%]	4.5%[-11%,23%]	1.8%[-5%,10%]
	Lag7	4%[-20%,35%]	##	4.2%[-20%,37%]	1.9%[-10%,16%]
	Lag1	##	##	##	##
	Lag2	6.8%[-5%,21%]	2.3%[-46%,95%]	7.6%[-5%,22%]	3.4%[-2%,10%]
Fuzhou	Lag3	1.6%[-12%,18%]	##	1.2%[-15%,21%]	0.7%[-7%,9%]
	Lag4	##	1.6%[-36%,63%]	##	##
	Lag5	##	##	##	##
	Lag6	1.4%[-13%,19%]	1.8%[-41%,76%]	1.2%[-12%,17%]	0.6%[-6%,8%]

Zhengzhou	Lag7	3.5%[-11%,21%]	##	0.5%[-13%,16%]	0.9%[-6%,8%]
	Lag1	##	##	##	##
	Lag2	48%[9%,101%]	##	11%[-12%,40%]	12%[-1.5%,28%]
	Lag3	##	##	##	##
	Lag4	14%[0.5%,30%]	##	3%[-8%,17%]	3.8%[-2%,10%]
	Lag5	##	56%[26%,93%]	1.7%[-10%,15%]	##
	Lag6	##	6%[-19%,41%]	##	##
Wuhan	Lag7	##	##	##	##
	Lag1	8%[-6%,10%]	##	##	##
	Lag2	##	257%[244%,271%]	##	##
	Lag3	46%[45%,48%]	191%[180%,202%]	34%[33%,36%]	17%[17%,18%]
	Lag4	35%[34%,37%]	445%[423%,468%]	39%[37%,40%]	17%[16%,17%]
	Lag5	##	25%[19%,31%]	1%[0.1%,3%]	0.3%[-0.6%,1%]
	Lag6	##	##	##	##
Changsha	Lag7	##	##	##	##
	Lag1	##	##	##	##
	Lag2	23%[-1%,55%]	##	21%[-3%,52%]	10%[-1%,23%]
	Lag3	2%[-9%,15%]	##	0.06%[-10%,11%]	0.5%[-4%,6%]
	Lag4	##	##	##	0.4%[-9%,11%]
	Lag5	##	##	##	##
	Lag6	##	##	##	##
Hefei	Lag7	##	##	##	##
	Lag1	##	##	##	##
	Lag2	##	24%[-22%,101%]	##	##
	Lag3	6%[-9%,24%]	##	0.9%[-10%,13%]	1%[-5%,8%]
	Lag4	25%[7%,47%]	20%[-23%,91%]	25%[9%,45%]	12%[4%,20%]
	Lag5	##	##	##	##
	Lag6	##	##	##	##
Guangzhou	Lag7	4%[-9%,19%]	31%[-22%,123%]	5%[-6%,18%]	2%[-3%,9%]
	Lag1	##	10%[-25%,63%]	##	##
	Lag2	##	##	##	##
	Lag3	1%[-10%,14%]	16%[-11%,52%]	3%[-7%,16%]	1%[-4%,7%]
	Lag4	##	##	##	##
	Lag5	3%[-8%,17%]	##	##	0.3%[-5%,6%]
	Lag6	##	##	##	##
Nanning	Lag7	##	##	##	##
	Lag1	##	##	##	##
	Lag2	15%[-9%,46%]	##	##	4%[-5%,16%]
	Lag3	20%[-4%,52%]	##	13%[-6%,38%]	7%[-2%,19%]
	Lag4	##	48%[-41%,276%]	##	##
	Lag5	##	##	##	##
	Lag6	33%[0%,79%]	##	32%[-1%,78%]	14%[-0.2%,32%]
	Lag7	##	##	##	##

Lanzhou	Lag1	16%[-15%,59%]	##	4%[-14%,27%]	4%[-7%,17%]
	Lag2	26%[-7%,71%]	##	7%[-12%,32%]	6%[-5%,20%]
	Lag3	26%[-7%,72%]	##	9%[-11%,34%]	7%[-5%,21%]
	Lag4	0.2%[-28%,40%]	31%[-17%,110%]	6%[-14%,33%]	2%[-10%,17%]
	Lag5	##	16%[-28%,89%]	##	##
	Lag6	40%[-8%,116%]	49%[-19%,175%]	29%[-5%,76%]	15%[-2%,38%]
	Lag7	##	##	##	##
Yinchuan	Lag1	28%[-6%,78%]	58%[-16%,200%]	24%[-3%,58%]	12%[-2%,28%]
	Lag2	3%[-22%,39%]	##	1%[-17%,23%]	1%[-10%,14%]
	Lag3	9%[-20%,50%]	##	2%[-16%,26%]	2%[-9%,16%]
	Lag4	##	##	##	##
	Lag5	##	##	##	##
	Lag6	27%[-15%,91%]	1%[-29%,44%]	8%[-13%,35%]	6%[-7%,23%]
	Lag7	10%[-22%,57%]	##	3%[-18%,31%]	3%[-10%,19%]
Taiyuan	Lag1	14%[-27%,78%]	42%[-25%,172%]	23%[-24%,100%]	##
	Lag2	##	##	##	##
	Lag3	##	4%[-53%,135%]	##	##
	Lag4	##	##	##	##
	Lag5	##	##	32%[-49%,249%]	##
	Lag6	##	##	##	##
	Lag7	##	##	##	##
Huhehot	Lag1	##	##	##	##
	Lag2	##	##	##	##
	Lag3	##	##	##	##
	Lag4	##	##	##	-24%[-57%,33%]
	Lag5	##	##	##	##
	Lag6	##	##	##	##
	Lag7	##	##	##	##
Xi'an	Lag1	##	127%[-32%,666%]	5%[-18%,37%]	##
	Lag2	##	##	##	##
	Lag3	7%[-12%, -31%]	65%[-46%,407%]	7%[-9%,28%]	3%[-5%,13%]
	Lag4	21%[-11%,65%]	##	18%[-9%,53%]	9%[-4%,25%]
	Lag5	##	10%[-14%,44%]	##	##]
	Lag6	##	##	##	##
	Lag7	12%[-17%,53%]	##	10%[-6%,30%]	6%[-2%,16%]
Urumqi	Lag1	##	5%[-46%,108%]	##	##
	Lag2	20%[-15%,72%]	37%[-30%,174%]	42%[-3%,109%]	15%[-4%,40%]
	Lag3	5%[-34%,70%]	36%[-33%,181%]	31%[-27%,137%]	8%[-17%,42%]
	Lag4	5%[-38%,81%]	##	##	##
	Lag5	##	##	##	##
	Lag6	##	68%[-43%,404%]	##	##
	Lag7	##	57%[-30%,255%]	##	##

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	Lag1	##	##	##	##
	Lag2	116%[2%,359%]	##	63%[-7%,190%]	35%[-1%,85%]
	Lag3	##	##	182%[5%,655%]	70%[2%,185%]
Xining	Lag4	##	##	##	##
	Lag5	##	##	##	##
	Lag6	32%[-4%,84%]	##	28%[-5%,74%]	13%[-2%,32%]
	Lag7	##	##	##	##
	Lag1	##	##	##	##
	Lag2	##	##	##	##
	Lag3	##	##	##	##
Lasa	Lag4	##	##	##	##
	Lag5	##	##	##	##
	Lag6	##	##	##	##
	Lag7	##	##	##	##
	Lag1	4%[-7%,17%]	##	6%[-7%,22%]	2%[-3%,9%]
	Lag2	##	##	##	##
	Lag3	##	##	16%[-9%,50%]	##
Chengdu	Lag4	17%[1%,35%]	##	13%[-4%,34%]	8%[0.3%,16%]
	Lag5	##	##	##	##
	Lag6	##	1%[-35%,61%]	##	##
	Lag7	##	15%[-32%,98%]	##	##
	Lag1	##	##	##	##
	Lag2	12%[-17%,53%]	##	8%[-18%,44%]	4%[-9%,21%]
	Lag3	##	##	##	##
Guiyang	Lag4	##	73%[-71%,965%]	3%[-27%,49%]	0.6%[-16%,21%]
	Lag5	31%[-11%,93%]	##	24%[-12%,78%]	12%[-6%,34%]
	Lag6	##	##	##	##
	Lag7	##	##	31%[-16%,106%]	15%[-8%,46%]
	Lag1	##	##	##	##
	Lag2	##	##	##	##
	Lag3	##	##	##	##
Haikou	Lag4	##	##	##	##
	Lag5	##	##	##	##
	Lag6	##	##	##	##
	Lag7	45%[-6%,126%]	##	##	6%[-7%,21%]
	Lag1	33%[7%,66%]	13%[-82%,629%]	29%[5%,59%]	14%[3%,26%]
	Lag2	26%[-3%,64%]	##	31%[1%,71%]	13%[-0.4%,28%]
	Lag3	##	##	##	##
Kunming	Lag4	32%[-6%,86%]	##	29%[-4%,76%]	11%[-8%,36%]
	Lag5	13%[-8%,42%]	##	12%[-8%,38%]	6%[-4%,17%]
	Lag6	##	##	##	##
	Lag7	##	76%[-57%,630%]	##	##

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	Lag1	##	##	##	##
	Lag2	##	##	##	##
	Lag3	##	##	##	##
Nanchang	Lag4	3%[-12%,20%]	5%[-29%,56%]	2%[-9%,16%]	1%[-5%,8%]
	Lag5	11%[-3%,28%]	27%[-18%,99%]	12%[-3%,30%]	6%[-1%,14%]
	Lag6	##	8%[-27%,61%]	##	##
	Lag7	##	4%[-30%,55%]	##	##

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