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Supplement of

Local and regional contributions to fine particulate matter in the 18 cities of Sichuan Basin, southwestern China

Xue Qiao et al.

Correspondence to: Qi Ying (qying@civil.tamu.edu) and Hongliang Zhang (hlzhang@lsu.edu)

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26 Table S1. The area, population, and economic development, and the concentrations of PM_{2.5} and
 27 O₃ of the 18 prefectural cities in the SCB in 2015.

Region ID	City ID	City	Population (×1000)	Area (km ²)	GDP (×100 million RMB)	Annual PM _{2.5} (μg m ⁻³) [#]	Annual PM _{2.5} (μg m ⁻³) [*]
R1 & R5	1	Chongqing	33720	82400	15717.3	57	53
	2	Bazhong	3795	12293	501.34		35
	3	Dazhou	6828	16582	1350.76		59
R2	4	Guangyuan	3053	16311	605.43		21
	5	Guang'an	4674	6341	1005.61		43
	6	Nanchong	7423	12477	1516.2	61	58
R3	7	Deyang	3900	5910	1605.06	53	53
	8	Leshan	3538	12723	1301.23		55
	9	Luzhou	5057	12236	1353.41	62	59
	10	Meishan	3491	7140	1029.86		60
	11	Mianyang	5455	20248	1700.33	47	45
	12	Neijiang	4204	5385	1198.58		60
	13	Suining	3788	5323	915.81		49
	14	Ya'an	1549	15046	502.58		34
	15	Yibin	5521	13266	1525.9	58	56
	16	Zigong	3275	4381	1143.11	74	72
	17	Ziyang	5037	7960	1270.38		40
R4	18	Chengdu	12281	12119	10801.2	64	61

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 29 #data source: China Statistical Yearbook 2016, <http://www.stats.gov.cn/tjsj/ndsj/2018/indexeh.htm>;
 30 *calculated by using the data published on the air quality data releasing platform, Ministry of
 31 Ecology and Environment of the People's Republic of China. <http://106.37.208.233:20035/>.

32 Table S2. Predicted contributions from different regions to PM_{2.5} in the 18 city centers of the SCB in the summer.

Region ID	City	PM _{2.5} ($\mu\text{g m}^{-3}$)	Percentage contributions from each region, SOA, and others* (%)													
			R1	R2	R3	R4	R5	Within SCB	R6	R7	R8	R9	Outside SCB	SOA	Others	Non-local [#]
R1	Chongqing	64	71.2	1.3	0.9	0.1	0.6	74.1	1.8	8.5	0.0	0.5	10.8	8.8	6.3	13.7
R2	Bazhong	22	1.1	37.3	1.0	0.5	1.5	41.4	0.6	26.1	0.0	1.2	27.9	22.2	8.4	32.0
	Dazhou	29	0.6	45.9	0.4	0.1	3.6	50.6	0.6	23.1	0.0	1.0	24.7	16.7	8.1	29.4
	Guangan	31	5.8	45.6	0.7	0.2	2.9	55.2	1.5	18.1	0.0	1.0	20.6	16.2	8.1	30.2
	Guangyuan	20	2.0	46.2	2.0	0.9	0.7	51.8	0.6	18.5	0.0	1.4	20.5	18.3	9.4	26.1
	Nanchong	33	5.8	52.9	1.2	0.3	1.3	61.5	1.1	14.7	0.0	0.8	16.6	15.1	6.8	25.2
R3	Deyang	40	3.0	1.7	57.8	13.3	0.3	76.1	0.5	6.7	0.1	0.6	7.9	9.9	6.2	26.2
	Leshan	30	3.3	0.9	53.8	6.6	0.2	64.8	1.1	7.3	0.1	0.7	9.2	20.0	6.2	20.2
	Luzhou	41	13.0	1.0	51.9	0.5	0.4	66.8	2.8	8.6	0.0	0.6	12	15.2	6.0	26.9
	Meishan	38	3.4	0.9	38.9	27.5	0.2	70.9	0.8	6.8	0.1	0.6	8.3	15.0	5.8	40.3
	Mianyang	31	3.6	3.5	59.8	2.7	0.5	70.1	0.7	9.3	0.0	0.8	10.8	12.3	6.9	21.1
	Neijiang	39	14.2	1.7	49.9	0.9	0.4	67.1	1.9	9.3	0.1	0.6	11.9	14.9	6.1	29.1
	Suining	25	16.4	21.1	11.5	0.4	1.4	50.8	1.9	18.4	0.0	1.0	21.3	20.0	7.9	60.6
	Ya'an	14	4.2	1.1	36.1	10.2	0.3	51.9	1.0	9.6	0.1	1.2	11.9	28.2	8.0	27.7
	Yibin	37	4.2	0.8	58.8	1.4	0.3	65.5	2.0	7.1	0.1	0.6	9.8	18.4	6.2	16.5
	Zigong	45	7.9	1.1	60.0	0.9	0.3	70.2	1.7	7.5	0.0	0.5	9.7	14.0	6.0	19.9
	Ziyang	33	8.8	2.1	48.0	5.7	0.5	65.1	1.5	10.2	0.0	0.7	12.4	16.2	6.3	29.5
R4	Chengdu	44	2.5	1.1	13.6	60.0	0.3	77.5	0.6	5.8	0.1	0.6	7.1	9.6	6.0	24.6

33 *Others include IC, BC, windblown dust, and sea salt.

34 [#]Non-local=Within SCB + Outside SCB - Local

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36 Table S3. Source-region contributions to the NH₄⁺, NO₃⁻, and SO₄²⁻ of PM_{2.5} in each city center of the SCB in the summer.

Region ID	Cities	Source-region contributions (%)																	
		NH ₄ ⁺						NO ₃ ⁻						SO ₄ ²⁻					
		Conc*	Local	Non-local	Within SCB	Outside SCB	Others [§]	Conc*	Local	Other regions	Within SCB	Outside SCB	Others [§]	Conc*	Local	Non-local	Within SCB	Outside SCB	Others [§]
1	Chongqing	4.0	53.4	38.2	65.5	26.1	8.4	0.8	81.1	17.9	91.8	7.2	1.0	12.6	39.7	36.6	43.4	33.0	23.7
2	Bazhong	2.1	67.1	31.7	74.0	24.8	1.2	0.3	35.6	61.0	47.9	48.8	3.3	5.9	4.3	74.6	9.4	69.5	21.1
	Dazhou	2.6	68.3	30.4	80.1	18.6	1.3	0.7	54.6	42.8	63.6	33.9	2.6	7.0	6.2	70.5	9.3	67.3	23.4
	Guang'an	2.8	66.5	31.9	81.0	17.5	1.5	1.0	60.0	38.4	78.7	19.8	1.6	7.4	10.9	64.8	19.2	56.4	24.4
	Guangyuan	1.7	71.9	26.7	78.4	20.2	1.4	0.4	60.5	37.2	72.8	25.0	2.3	4.7	8.2	67.7	18.1	57.7	24.2
	Nanchong	2.9	74.1	24.3	84.3	14.1	1.6	1.4	72.3	26.4	84.9	13.8	1.3	7.2	14.8	62.7	25.7	51.8	22.5
3	Deyang	3.5	75.2	22.9	91.9	6.2	1.9	2.9	64.2	35.1	94.7	4.6	0.8	7.8	26.2	51.3	49.6	28.0	22.5
	Leshan	2.4	82.0	16.6	90.5	8.0	1.4	0.9	68.8	30.0	90.8	7.9	1.2	6.3	23.1	54.2	45.7	31.7	22.7
	Luzhou	3.7	67.3	30.5	82.9	14.9	2.2	2.2	66.1	33.2	92.9	6.4	0.7	8.8	20.8	57.0	42.8	35.1	22.2
	Meishan	3.8	68.6	29.9	92.6	5.9	1.6	2.4	39.2	60.1	94.1	5.2	0.7	8.7	17.5	63.8	55.2	26.1	18.8
	Mianyang	2.6	76.2	22.1	89.5	8.7	1.8	1.6	77.2	21.9	92.0	7.0	1.0	6.2	22.7	53.9	39.3	37.3	23.4
	Neijiang	3.3	64.9	33.0	85.0	12.9	2.1	1.8	58.1	41.0	90.6	8.5	0.9	8.2	17.9	59.5	40.2	37.3	22.6
	Suining	2.6	24.6	74.3	81.1	17.8	1.1	1.0	9.6	89.3	81.6	17.3	1.1	6.5	3.0	76.8	26.7	53.1	20.2
	Ya'an	1.4	77.5	21.7	90.0	9.1	0.8	0.3	39.8	58.6	82.4	16.0	1.6	3.8	18.1	60.9	45.8	33.2	21.0
	Yibin	3.1	81.6	16.6	87.6	10.6	1.8	1.6	81.9	17.3	92.4	6.7	0.9	7.8	30.6	45.8	45.0	31.4	23.6
	Zigong	3.6	74.5	23.0	86.0	11.5	2.5	2.0	75.7	23.6	93.2	6.1	0.8	8.8	26.4	50.4	44.0	32.9	23.2
Ziyang	3.0	76.7	22.1	89.4	9.4	1.2	1.7	53.8	45.2	89.0	10.0	1.0	7.1	16.4	62.4	39.8	39.0	21.2	
4	Chengdu	3.6	46.8	49.3	85.8	10.2	4.0	1.4	69.6	29.8	95.3	4.0	0.7	9.6	37.0	43.5	58.1	22.3	19.6

*concentration; §including IC, BC, windblown dust, and sea salt.

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41 Table S4. Source-region contributions to the NH₄⁺, NO₃⁻, and SO₄²⁻ of PM_{2.5} in each city center of the SCB in the winter.

Region ID	Cities	Source-region contributions (%)																	
		NH ₄ ⁺						NO ₃ ⁻						SO ₄ ²⁻					
		Conc*	Local	Non-local	Within SCB	Outside SCB	Others [§]	Conc*	Local	Other regions	Within SCB	Outside SCB	Others [§]	Conc*	Local	Non-local	Within SCB	Outside SCB	Others [§]
1	Chongqing	14.7	48.7	44.3	69.6	23.5	7.0	11.0	61.8	36.8	79.7	18.9	1.4	40.9	46.0	44.2	58.4	31.8	9.8
2	Bazhong	6.4	52.5	45.1	62.0	35.7	2.3	6.1	24.0	72.7	39.0	57.7	3.3	13.9	8.0	81.0	21.0	68.1	11.0
	Dazhou	8.4	58.6	39.0	73.7	24.0	2.3	8.5	35.2	62.2	52.1	45.3	2.6	17.8	11.1	77.9	23.9	65.1	11.0
	Guang'an	10.8	60.5	36.9	78.1	19.2	2.6	12.2	47.8	50.5	69.9	28.3	1.8	21.5	16.7	73.3	36.6	53.5	10.0
	Guangyuan	5.9	54.6	43.0	65.0	32.6	2.5	6.8	35.7	61.5	52.3	44.8	2.9	11.8	11.1	76.2	28.9	58.4	12.8
	Nanchong	11.4	65.9	31.5	79.7	17.7	2.7	13.5	53.2	45.1	71.0	27.3	1.8	22.1	20.3	69.7	38.4	51.6	10.0
3	Deyang	14.9	66.0	30.8	85.8	10.9	3.3	18.5	53.0	45.7	84.5	14.3	1.3	28.2	34.0	56.2	62.9	27.3	9.8
	Leshan	13.1	72.2	25.3	87.9	9.6	2.5	14.8	54.5	44.1	86.4	12.2	1.4	26.5	30.8	60.9	66.5	25.1	8.4
	Luzhou	15.6	60.8	36.0	80.8	16.0	3.2	16.7	54.6	44.2	82.8	16.0	1.2	33.2	30.9	61.1	58.2	33.8	8.0
	Meishan	17.1	55.0	42.5	89.0	8.4	2.6	19.6	38.1	60.8	88.5	10.4	1.1	35.9	23.1	69.6	72.1	20.7	7.3
	Mianyang	11.3	65.0	32.0	82.3	14.7	3.0	13.3	54.9	43.3	77.3	21.0	1.8	22.4	34.8	55.1	55.0	34.9	10.1
	Neijiang	14.0	59.4	37.6	81.9	15.1	3.0	15.4	46.3	52.3	79.5	19.1	1.5	29.0	24.5	67.0	54.3	37.3	8.5
	Suining	11.1	19.4	78.5	77.2	20.7	2.1	12.2	10.9	87.4	68.8	29.5	1.7	22.2	7.9	83.9	39.6	52.2	8.2
	Ya'an	9.6	64.1	33.8	85.0	13.0	2.0	9.2	40.6	57.4	80.2	17.8	2.0	21.0	25.6	66.7	63.7	28.7	7.6
	Yibin	14.2	70.7	26.5	84.3	12.8	2.9	15.5	62.3	36.4	84.2	14.5	1.3	29.6	33.4	58.4	61.9	29.9	8.2
	Zigong	14.5	62.6	34.0	81.7	14.9	3.5	15.2	54.6	44.0	81.4	17.2	1.4	30.9	29.7	61.4	57.3	33.9	8.9
Ziyang	13.4	65.3	32.4	84.8	12.9	2.4	15.7	48.5	50.0	79.4	19.1	1.5	25.9	25.7	65.5	53.9	37.3	8.8	
4	Chengdu	13.8	42.9	52.5	82.7	12.7	4.6	14.4	49.3	49.5	86.0	12.8	1.2	30.6	37.9	52.5	67.4	23.0	9.6

*concentration; §including IC, BC, windblown dust, and sea salt.

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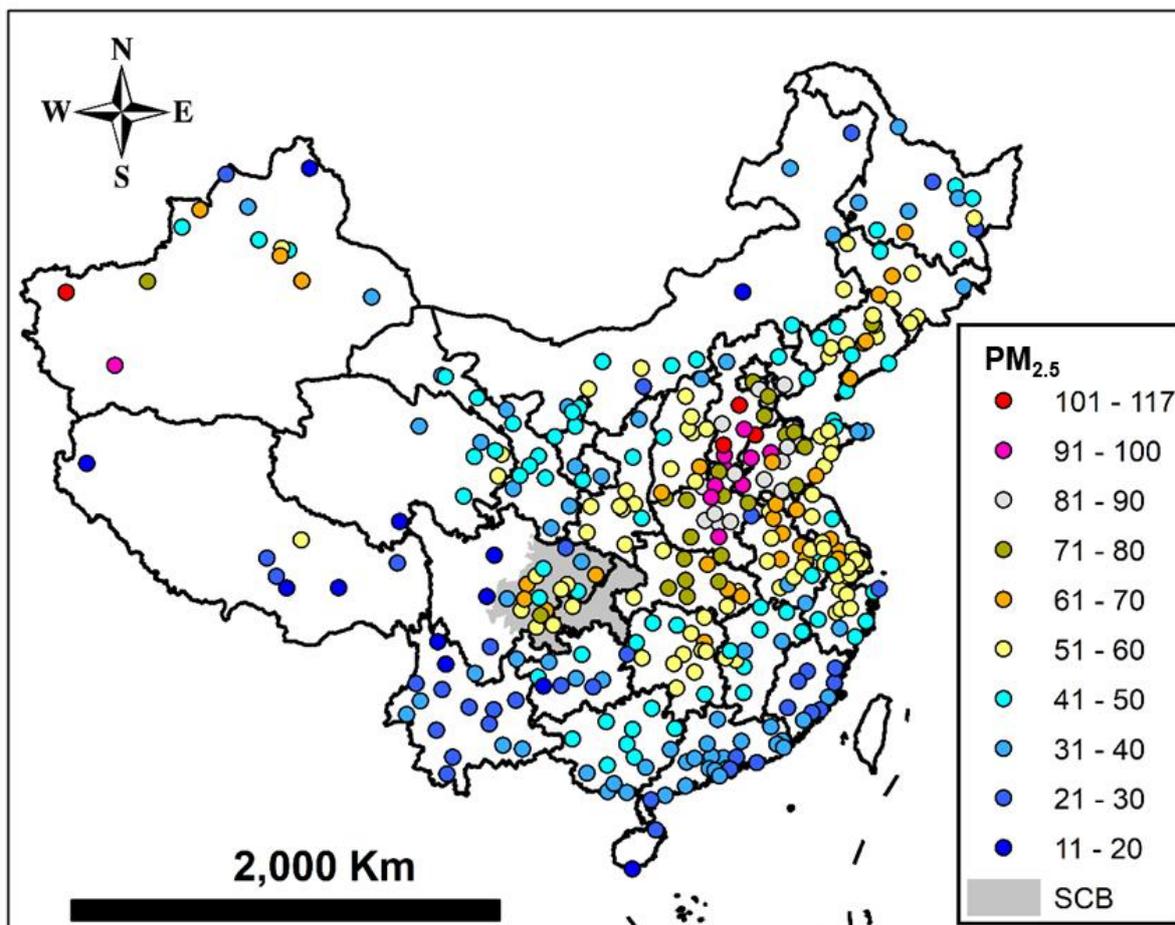
46 Table S5. Predicted maximum daily contribution from a given region (MDCs) in SCB city center and the corresponding PM_{2.5} concentrations in the
 47 city center on the same day. Only summer data are included in this table. The units are $\mu\text{g m}^{-3}$. The numbers in the bold present the contributions
 48 due to local emissions or that from R7.

Region IDs	Cities	MDCs (total PM _{2.5} concentrations)											
		Within SCB					Outside SCB					SOA	Other*
		R1	R2	R3	R4	R5	R6	R7	R8	R9			
R1	Chongqing	147 (214)	5 (80)	6 (82)	0 (48)	3 (87)	4 (65)	30 (69)	0 (48)	2 (64)	21 (50)	10 (42)	
	Bazhong	4 (50)	17 (32)	4 (32)	2 (42)	2 (38)	1 (38)	36 (63)	0 (7)	1 (39)	23 (92)	6 (16)	
	Dazhou	2 (49)	43 (56)	3 (43)	1 (42)	3 (50)	1 (13)	31 (65)	0 (12)	1 (35)	42 (214)	6 (23)	
R2	Guangan	18 (88)	40 (60)	3 (49)	1 (39)	3 (50)	2 (28)	33 (71)	0 (16)	2 (41)	16 (49)	7 (25)	
	Guangyuan	7 (46)	22 (38)	7 (38)	3 (38)	1 (47)	2 (43)	23 (48)	0 (23)	1 (47)	23 (81)	8 (13)	
	Nanchong	19 (84)	45 (73)	6 (45)	3 (42)	2 (55)	3 (49)	29 (80)	0 (25)	1 (51)	33 (88)	7 (42)	
	Deyang	13 (54)	3 (41)	48 (57)	44 (89)	1 (82)	2 (78)	18 (82)	0 (74)	1 (30)	19 (46)	9 (23)	
	Leshan	7 (63)	1 (50)	34 (45)	16 (56)	0 (66)	3 (80)	17 (66)	0 (80)	1 (80)	25 (80)	7 (24)	
	Luzhou	46 (88)	3 (87)	61 (87)	2 (30)	1 (71)	6 (47)	24 (55)	0 (65)	1 (47)	29 (88)	9 (65)	
	Meishan	9 (59)	2 (84)	40 (55)	55 (100)	1 (84)	2 (74)	21 (84)	0 (68)	1 (68)	25 (54)	8 (26)	
	Mianyang	7 (57)	4 (42)	61 (87)	13 (85)	1 (49)	2 (47)	18 (64)	0 (87)	1 (24)	20 (81)	10 (24)	
R3	Neijiang	32 (70)	6 (44)	61 (76)	4 (38)	1 (104)	5 (66)	21 (104)	0 (41)	1 (66)	27 (84)	6 (29)	
	Suining	25 (53)	18 (36)	14 (33)	3 (33)	2 (78)	3 (41)	30 (53)	0 (31)	1 (53)	27 (81)	7 (15)	
	Ya'an	6 (43)	1 (23)	13 (39)	7 (22)	0 (41)	1 (30)	10 (37)	0 (41)	0 (19)	28 (70)	5 (14)	
	Yibin	12 (67)	1 (47)	60 (73)	4 (49)	1 (73)	5 (87)	19 (73)	0 (83)	1 (34)	18 (29)	7 (83)	
	Zigong	21 (74)	5 (53)	61 (76)	3 (28)	1 (102)	5 (80)	21 (102)	0 (49)	1 (80)	27 (87)	6 (31)	
	Ziyang	16 (56)	3 (39)	39 (53)	21 (54)	1 (80)	3 (56)	21 (47)	0 (56)	1 (56)	23 (66)	8 (20)	
R4	Chengdu	8 (55)	2 (97)	19 (68)	73 (112)	1 (107)	2 (89)	21 (107)	0 (74)	1 (27)	26 (66)	8 (31)	

49 * Others include IC, BC, windblown dust, and sea salt.

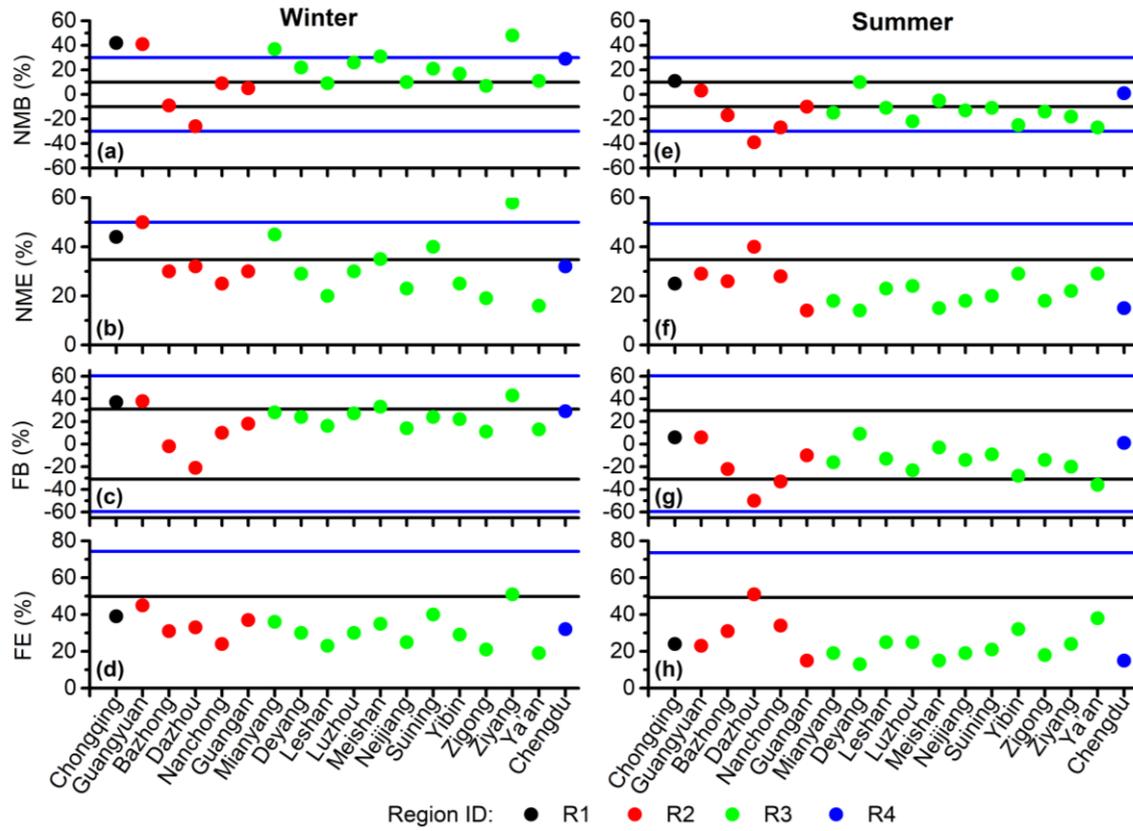
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 53 Figure S1. Annual average PM_{2.5} concentrations ($\mu\text{g m}^{-3}$) in major cities of China in 2015. Data
 54 source: China National Environmental Monitoring Center, <http://106.37.208.233:20035/>

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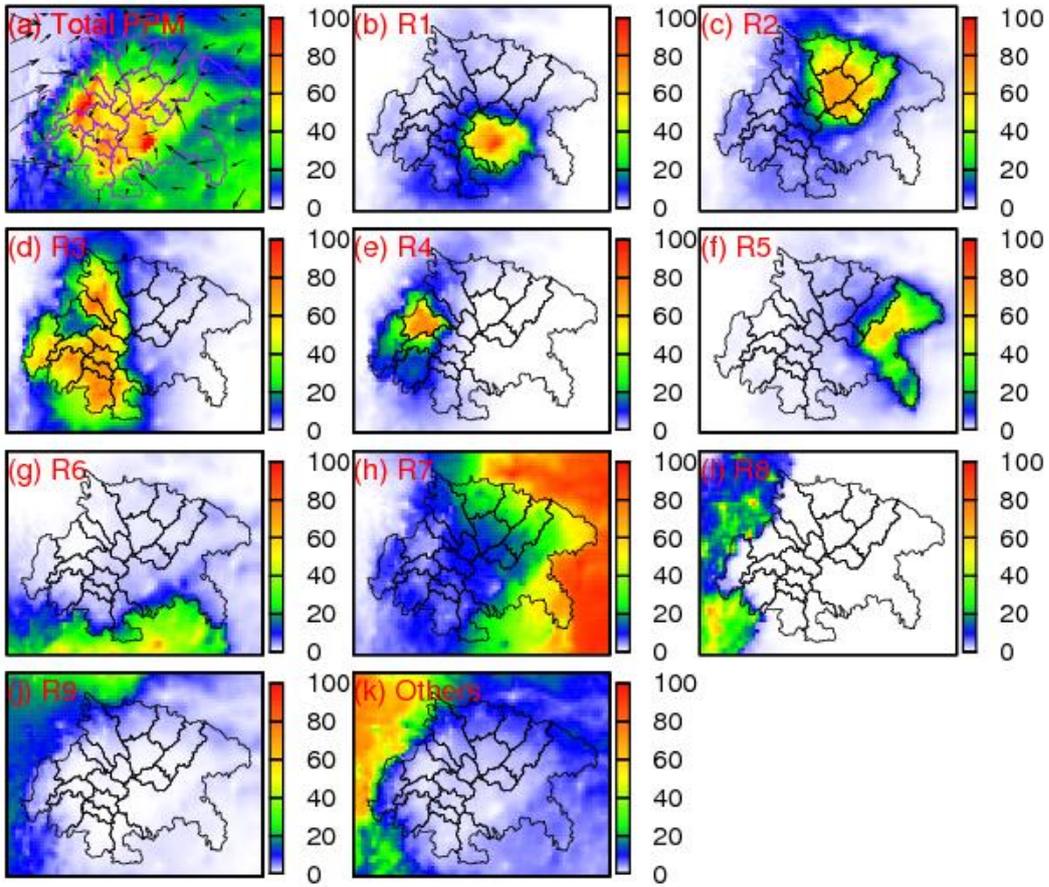


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58 Figure S2. Model performance for 24-hr PM_{2.5} in the 18 city centers of the SCB in the winter and
 59 summer. Note: NMB, NME, FB, and FE denote normalized mean bias, normalized mean error,
 60 fractional bias, and fractional error, respectively. The blue and black lines represent the modeling
 61 criteria and goals suggested by Emery et al. (2017), respectively. The predicted daily PM_{2.5}
 62 concentrations used to calculate NMB, NME, FB, and FE are those closest to the observations
 63 within 3×3 grid cell regions that surround the urban centers.

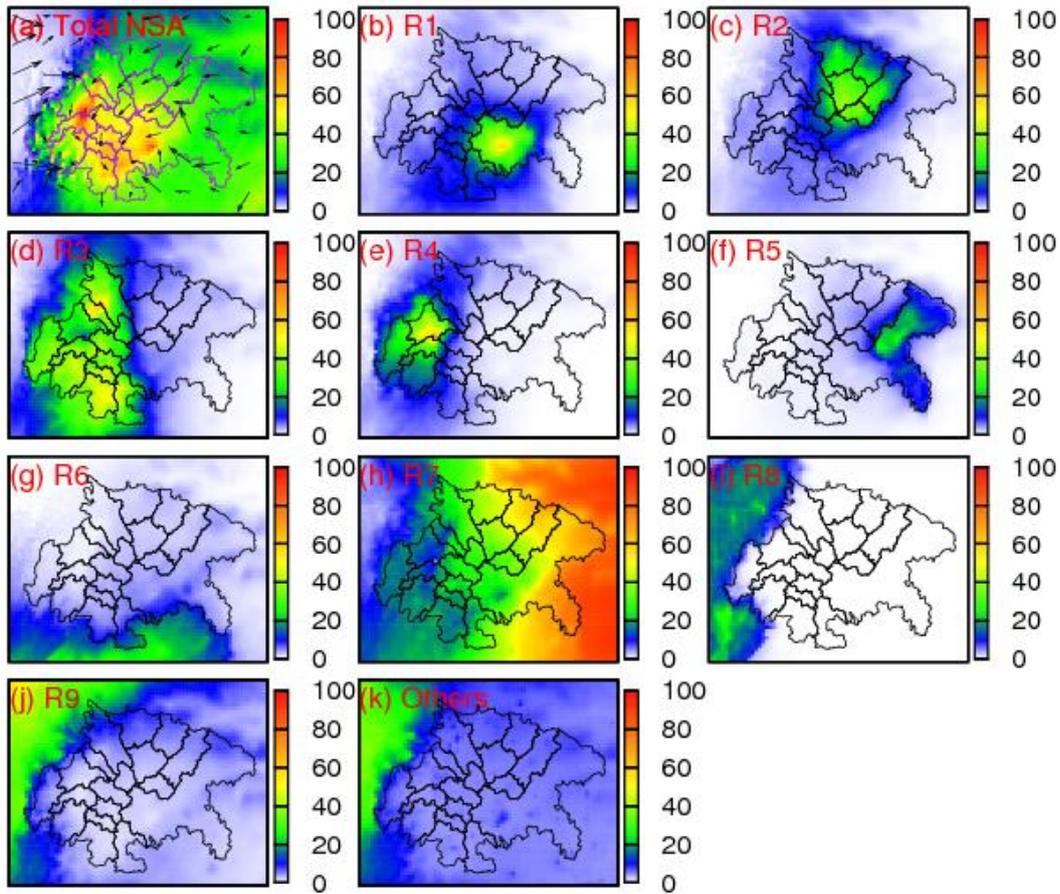
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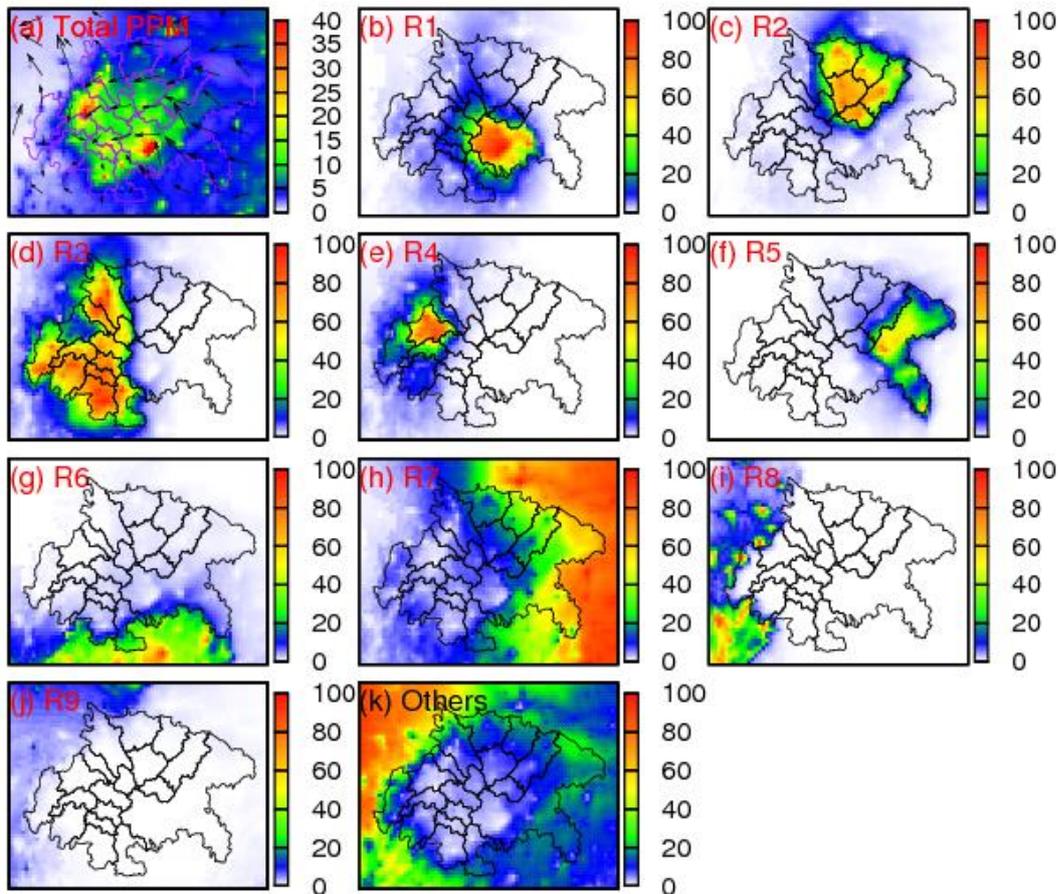
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 67 Figure S3. (a) Spatial distributions of predicted PPM concentrations ($\mu\text{g m}^{-3}$) and (b-l) the source-
 68 region contributions to PPM (%) in the SCB in the winter. Others include IC, BC, windblown
 69 dust, and sea salt.

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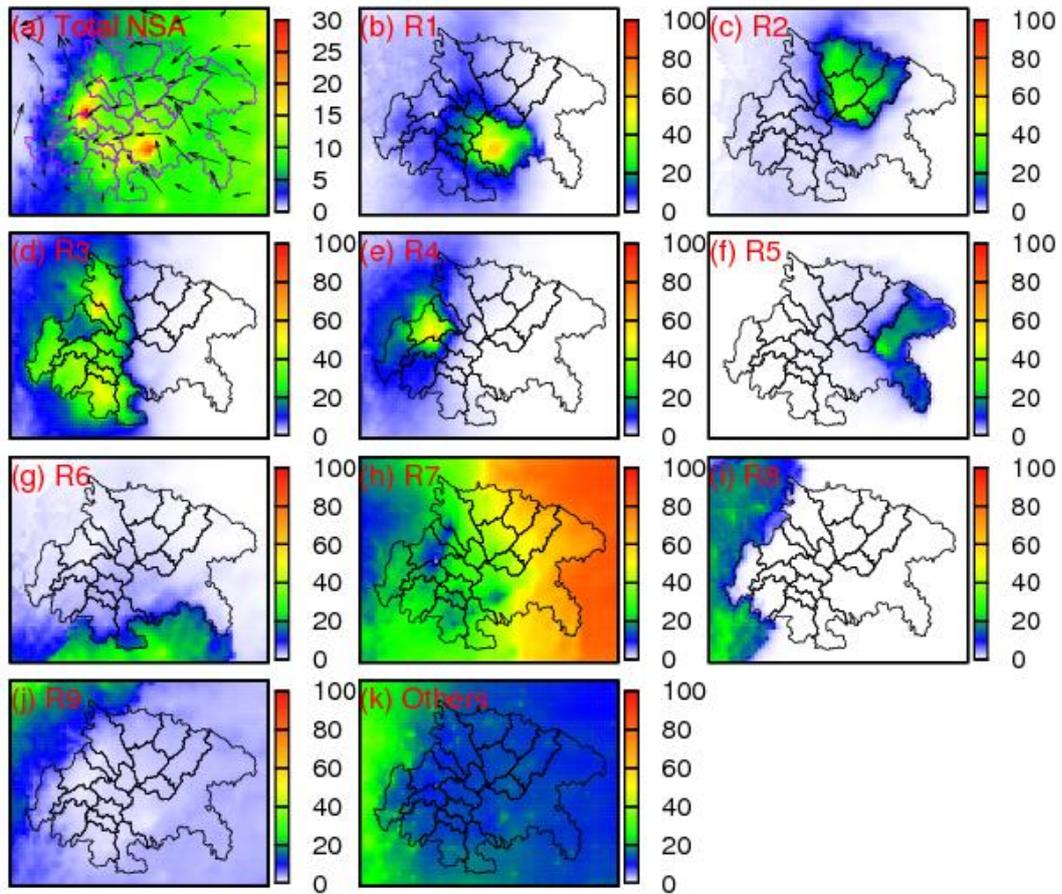
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 75 Figure S4. (a) Spatial distributions of predicted seasonal SIA concentrations ($\mu\text{g m}^{-3}$) and (b-l)
 76 source-region contributions to SIA (%) in the SCB in the winter. Others include IC, BC,
 77 windblown dust, and sea salt.

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 80 Figure S5. (a) Spatial distributions of predicted PPM concentrations ($\mu\text{g m}^{-3}$) and (b-l) source-
 81 region contributions (%) to PPM in the SCB in the summer. Others include IC, BC, windblown
 82 dust, and sea salt.

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85 Figure S6. (a) Spatial distributions of predicted SIA concentrations ($\mu\text{g m}^{-3}$) and (b-l) source-
 86 region contributions (%) to SIA in the SCB in the summer. Others include IC, BC, windblown
 87 dust, and sea salt.

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