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Sensitivity of biogenic volatile organic compound emissions to leaf area index and land cover in Beijing

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Table 1. The species composition of vegetation in Beijing and their standard emission rates of isoprene, area, specific leaf area (SLA) and leaf mass per area (LMA).

Species	Emission ($\mu g\ C\ g^{-1}h^{-1}$)	Area (km^2)	SLA (cm^2g^{-1})	LMA ($g\ m^{-2}$)	Dominant tree species
Needle Leaf Trees					
Pinus tabuliformis	0.4[a]	526	64.1[e, g, f]	156.0	*Pinus tabuliformis*
Larix	7.4[b]	44	98.9[e, f]	101.1	*Larix gmelinii* var. *principis-rupprechtii*
Picea	4.1[b]	4	57.9[e, f]	172.7	*Picea wilsonii, Picea koraiensis, Picea meyeri*
Platycladus orientalis	0.0[c]	649	66[e, g, i]	151.5	*Platycladus orientalis*
Broad Leaf Trees					
Quercus	223.5[a, b*]	720	126.9[e, g, j]	78.8	*Quercus mongolica*, *Quercus liaotungensis*
Betula	0.0[b]	157	141[e, k]	70.9	*Betula platyphylla*, *Betula dahurica*
Juglans mandshurica	0.0[b]	85	201.9[i, l]	40.3	*Juglans mandshurica*
Ulmus	0.0[b]	106	142.7[i, m]	70.1	*Ulmus laciniata*, *Ulmus pumila, Ulmus macrocarpa*
Robinia pseudoacacia	49.8[b]	207	317[i, n, o]	31.5	*Robinia pseudoacacia*
Populus	105.8[a]	570	158.6[g, i, l]	63.1	*Populus davidiana*
Salix	70.2[c]	60	150.6[i]	66.4	*Salix matsudana*
Pyrus	0.0[a]	8	173.4[i]	57.7	*Pyrus ussuriensis*
Armeniaca vulgaris	0.1[a]	12	129.2[i]	77.4	*Armeniaca vulgaris*
Diospyros kaki	0.1[a]	8	142[o]	70.4	*Diospyros kaki*
Juglans regia	0.0[a]	8	201.9[i, k, l]	49.5	*Juglans regia*
Castanea mollissima	0.0[a]	4	87.3[p]	114.5	*Castanea mollissima*
Ginkgo biloba	0.0[c]	28	154.3[i, m, q]	64.8	*Ginkgo biloba*
Fraxinus chinensis	0.02[d]	73	244.4[n, r, s]	40.9	*Fraxinus chinensis*
Quercus variabilis	65.5[a]	80	99.2[t]	100.8	*Quercus variabilis*
Tilia	0.0[a]	85	230.9	43.3[u]	*Tilia mongolica, Tilia mandshurica*
Paulownia	0	4	245.7	40.7[v]	
Other broadleaf forest	-	852	-	-	
Grass					
Grass	0.2[a]	-	-	60	
Shrub					
Shrub	8[a]	-	-	60	
Crop					
Other Crop	0.03[a]	-	-	60	
Corn	0.0[a]	-	-	60	

[a] Wang, Z., Bai, Y., and Zhang, S.: A biogenic volatile organic compounds emission inventory for Beijing, Atmospheric environment, 37, 3771-3782, 2003.

[b] Klinger, L. F., Li, Q. J., Guenther, A. B., Greenberg, J. P., Baker, B., and Bai, J. H.: Assessment of volatile organic compound emissions from ecosystems of China, Journal of Geophysical Research: Atmospheres, 107, ACH 16-11-ACH 16-21, 10.1029/2001jd001076, 2002.

[c] Wang, Z.H., Zhang, S.Y., Lu, S.H., Bai, Y.H: Screenings of 23 plant species in Beijing for volatile organic compound emissions. Environmental Science, 24, 7-12, 2013. (in Chinese)

[d] Ghirardo, A., Xie, J., Zheng, X., Wang, Y., Grote, R., Block, K., Wildt, J., Mentel, T., Kiendler-Scharr, A., Hallquist, M., Butterbach-Bahl, K., and Schnitzler, J.-P.: Urban stress-induced biogenic VOC emissions and SOA-forming potentials in Beijing, Atmospheric Chemistry and Physics, 16, 2901-2920, 10.5194/acp-16-2901-2016, 2016.

[e] Ren, Y. X., Zhang, Y., Hou, J. H., Li, Y., and Yao, Q.: A comparative study on the functional traits of the main forest communities in Xishan, Beijing. Journal of Green Science and Technology, (3), 8-9, 2012. (in Chinese)

[f] Li, M. C., Zhu, J. J., and Sun, Y. R.: Responses of specific leaf area of dominant tree species in Northeast China secondary forests to light intensity. Chinese Journal of Ecology, 28(8), 1437-1442, 2009. (in Chinese)

[g] Lü, J. Z., Miao, Y. M., Zhang, H. F., and Bi, R. C.: Comparisons of leaf traits among different functional types of plant from Huoshan Mountain in the Shanxi Province. Journal of Wuhan Botanical Research, 28(4), 460-465, 2010. (in Chinese)

[f] Diao, J., Guo, H., Lu, J., Lei, X. D., and Tang, S. Z.: Leaf area estimation model and specific leaf area of Chinese pine. Forest Research, 26(2), 174-180, 2013. (in Chinese)

[i] Wang, K., Wang, D. H., Wei, J., Zou, D. J., and Lu, H.: Growth of leaves of main landscaping tree species in northwest Liaoning Province. Arid Zone Research, 30(4), 640-645, 2013. (in Chinese)

[j] Qi, J., Ma, K. M., and Zhang, Y. X.: Comparisons on leaf traits of Quercus liaotungensis Koidz. on different slope positions in Dongling Moutain of Beijing. Acta Ecologica Sinica, 28(1), 122-128, 2008. (in Chinese)

[k] Gong, H., Guo, W., Wang, C. G., and Geng, Z. Z.: Function traits and correlation characteristics of common tree species in Maoer Mountain. Journal of Beihua University (Natural Science), 17(4), 455-462, 2016. (in Chinese)

[l] Bao, L. and Liu, Y. H.: Comparison of leaf functional traits in different forest communities in Mt. Dongling of Beijing. Acta Ecologica Sinica, 29(7), 3692-3703, 2009. (in Chinese)

[m] Ren, Y., Ge, Y., Gu, B. J., Min, Y., Tani, A., and Chang, J.: Role of management strategies and environmental factors in determining the emissions of biogenic volatile organic compounds from urban greenspaces. Environ. Sci. Technol., 48 (11), 6237-6246, 2014.

[n] Dong, Z. Y., Bai, X. F., Hou, Y. P., and Bu, Q. M.: Leaf calorific value of 8 tree species in the coastal areas of Jiaodong and cost of construction of leaf biomass and its adaptability. Scientia Silvae Sinicae, 51(3), 8-15, 2015. (in Chinese)

[o] Wang, C., Zhou, J., Xiao, H., Liu, J., and Wang, L.: Variations in leaf functional traits among plant species grouped by growth and leaf types in Zhenjiang, China. Journal of Forestry Research, 28(2), 241-248, 2017.

[p] Peng, J. J., Guo, S. J., Wang, J., Xu, C., and Ren, S.: Effect of different pruning intensity on leaf traits and photosynthetic characteristics of Chinese chestnut with different plant densities. Journal of Northeast Forestry University, 42(11), 47-50, 2015. (in Chinese)

[q] He, C. X., Li, J. Y., Zhang, Y. X., Zheng, Q. S., Xie, B., and Ding, Y. T.: Differences in leaf mass per area, photosynthetic pigments and $\delta^{13}C$ by orientation and crown position in five greening tree species. Chinese Journal of Plant Ecology, 34(2), 134-143, 2010. (in Chinese)

[r] Song, L. H., and Gao, S. H.: Effects of traffic pollution on leaf morphological and physiological indexes of greening trees in Yinchuan. Hubei Agricultural Science, 54(10), 2423-2427, 2015. (in Chinese)

[s] Li, L.: Study on the effects of salt stress on 13 tree species. Master Dissertation, Shandong Agricultural University, Taian, Shandong, 2004. (in Chinese)

[t] Wu, L. L., Kang, H. Z., Zhuang, H. L., and Liu, C. J.: Variations of Quercus variabilis leaf traits in relation to climatic factors at regional scale. Chinese Journal of Ecology, (12), 2309-2316, 2010. (in Chinese)

[u] Li. G.Y. The relationship between chlorophyll and SPAD and the related factors for major broadleaved tree species in northeast China. Master Dissertation, Northeast Forestry University, Harbin, Heilongjiang, 2016. (in Chinese)

[v] Li, S. Y., Hu, H., Sun, X., Wang, B. P., and Qiao, J.: Paulownia Leaf Modal Traits and Their Correlation in a Whole Growth Season. Forest Research, 19(5), 660-664, 2006. (in Chinese)

* The standard emission rate of *Quercus* is the average value of standard emission rates of *Quercus mongolica* and *Quercus liaotungensis.*

Table S2. The physical options for the WRF model.

Physical mechanism	Scheme
Microphysics	WSM 3-class simple ice scheme
Long-wave radiation	RRTM scheme
Short-wave radiation	Duhbia scheme
Land Surface	Noah Land Surface Model
PBL Scheme	YSU scheme
Cumulus parameter	Kain-Fritsch (new Eta) scheme

Table S3. The meteorological validation with hourly temperature at 2 m height (T2) in-situ observation. The ME, MB and RMSE are abbreviations for mean error, mean bias, and root mean square error, respectively.

Name	ME (°C)	MB (°C)	r	RMSE (°C)
Beijing	1.97	-0.72	0.98	2.54
Hai Dian	2.11	-0.65	0.98	2.7
Chao Yang	2.63	-1.7	0.97	3.18
Shun Yi	2.51	-1.71	0.98	3.06
Huai Rou	1.93	-0.07	0.98	2.48
Tong Zhou	5.39	-5.28	0.97	5.94
Chang Ping	2.18	-0.96	0.98	2.81
Yan Qin	2.5	1.64	0.98	3.24
Feng Tai	3.25	-2.51	0.97	3.83
Shijing Shan	2.05	-0.44	0.98	2.61
Da Xing	5.56	-5.36	0.96	6.27
Fang Shan	4.94	-4.68	0.96	5.73
Mi Yun	2.58	-0.69	0.97	3.13
Mengtou Gou	2.19	-0.91	0.98	2.71
Ping Gu	3.52	-2.87	0.97	4.2
Shangdian Zi	1.9	0.00	0.98	2.45
Xiayun Lin	2.51	-1.37	0.97	3.1
Zhai Tang	3.13	2.17	0.97	3.87
Tanghe Kou	3.36	0.11	0.95	4.19

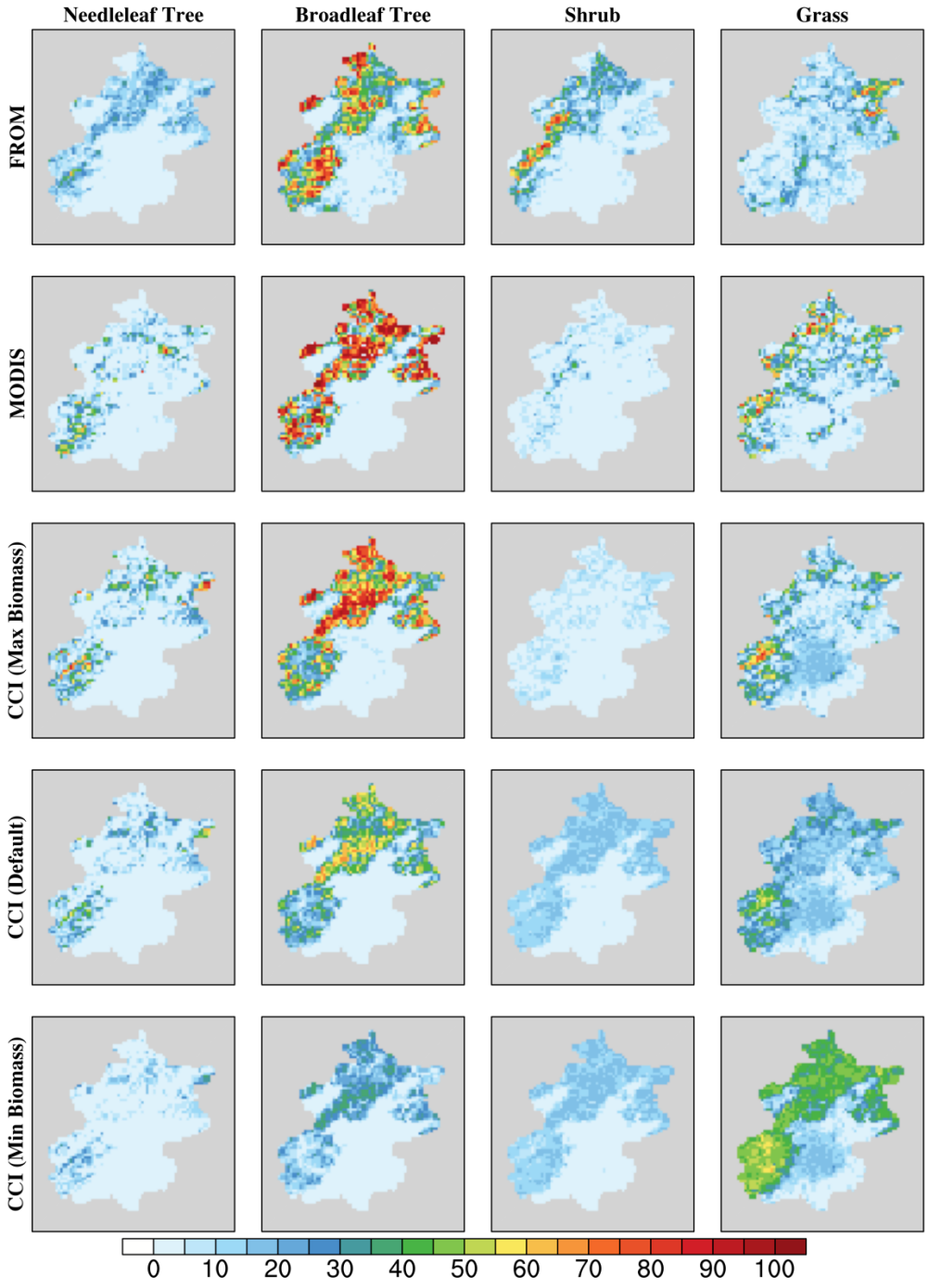

Figure S1. Spatial distribution of the proportions of plant functional types (PFTs) in model grids of all land cover inputs.