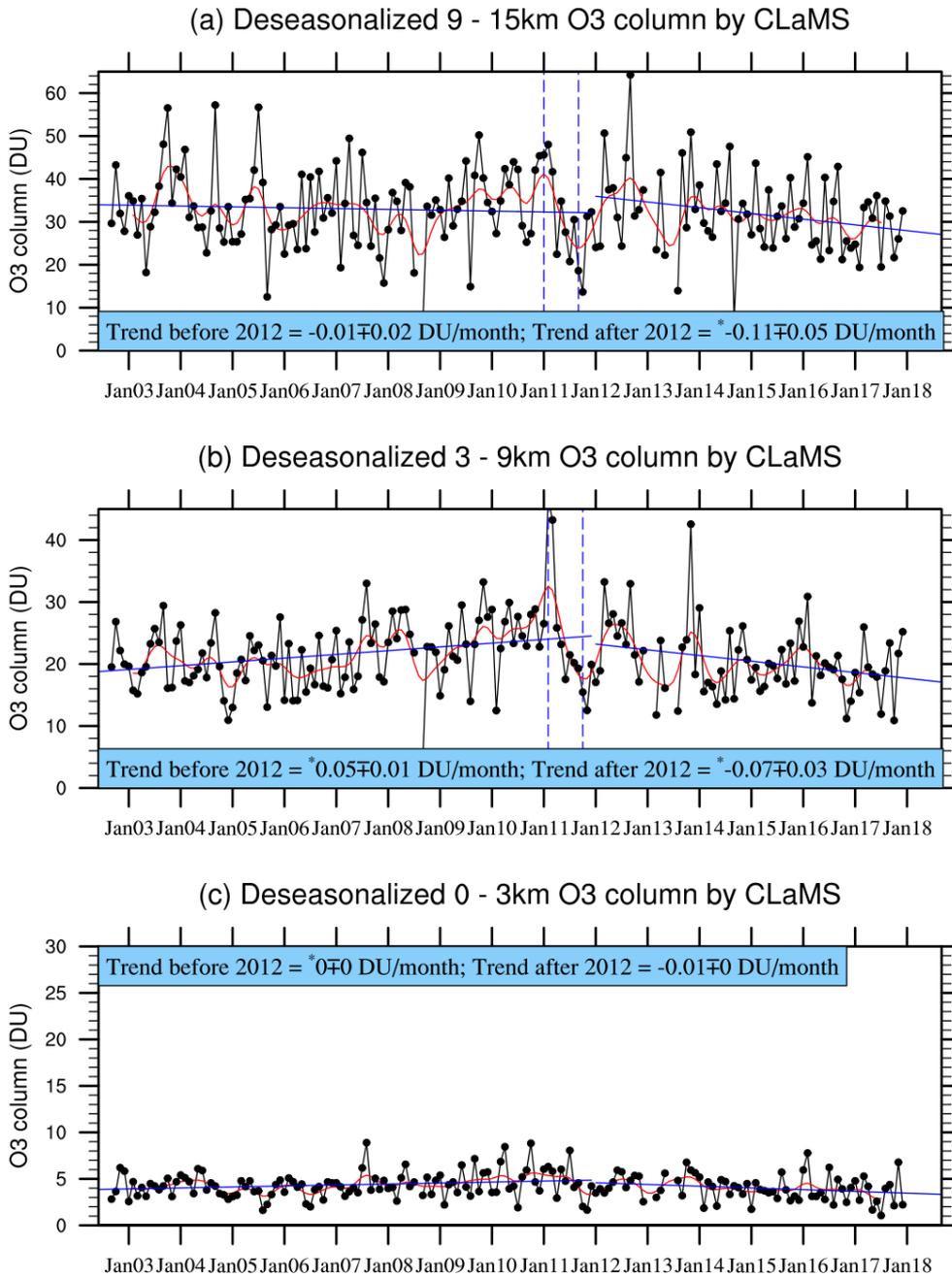
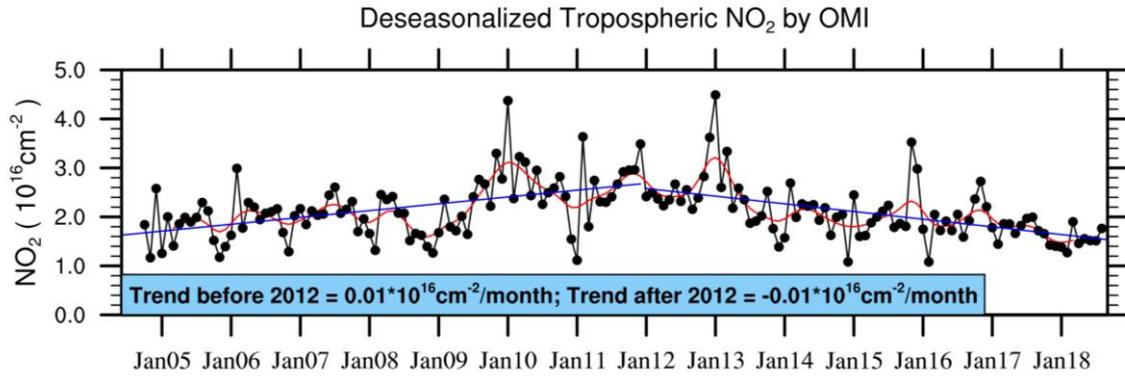


Figure 3. Deseasonalized monthly mean partial columns of ozone over Beijing (black solid lines and dots) measured by the IAP ozonesonde and the corresponding Gaussian-weighted means using a half-width of 12 months (red curves). The blue solid lines estimate the linear trends (slope \pm standard error) before and after the decrease in ozone during late 2011 and early 2012. The periods of decrease are represented by the time between the two blue dashed lines. The trends with “*” passed the 95% significance criterion.

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10 **Figure 4.** Deseasonalized monthly mean partial columns of ozone over Beijing (black solid lines and dots) simulated by CLaMS and the corresponding Gaussian-weighted means using a half-width of 12 months (red curves). The blue solid lines estimate the linear trends (slope \pm standard error) before and after the decrease in ozone during late 2011 and early 2012. The periods of decrease are represented by the time between the two blue dashed lines. The trends with “*” passed the 95% significance criterion.



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Figure 5. Deseasonalized monthly mean columns of tropospheric NO₂ (black solid lines and dots) and the corresponding Gaussian-weighted means using a half width of 12 months (red curves). The blue lines estimate the linear trend before and after the sudden decrease of ozone during late 2011 and early 2012.

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Table 1. Trends in the monthly mean partial column ozone (units: DU/year) at three altitudes in four seasons. The trends with “*” passed the 95% significance criterion. The trends with “*” passed the 90% significance criterion.

		Ozonesonde						CLaMS					
		M_{O_3}	Before 2012		After 2012		Δ_{rel}	M_{O_3}	Before 2012		After 2012		Δ_{rel}
			T_{O_3}	T_{rel}	T_{O_3}	T_{rel}			T_{O_3}	T_{rel}	T_{O_3}	T_{rel}	
9–15 km	Winter	39.22	0.02	0.0	-3.73	-9.5	-9.6	42.15	-0.20	-0.5	-9.90	-23.5	-23.0
	Spring	39.26	*6.66	*17.0	-2.37	-6.0	-23.0	48.48	3.87	8.0	*-12.7 1	*-26.2	-34.2
	Summer	24.09	2.92	12.1	0.02	0.1	-12.0	24.50	-1.65	-6.8	-1.77	-7.2	-0.5
	Autumn	20.61	0.49	2.4	-1.57	-7.6	-10.0	16.05	-1.07	-6.7	-4.35	-27.1	-20.5
3–9 km	Winter	18.38	*2.43	*13.2	1.08	5.9	-7.3	19.46	2.64	13.6	0.67	3.4	-10.1
	Spring	22.77	*7.43	*32.6	*2.97	*13.0	-19.6	27.30	*7.68	*28.1	-5.34	-19.6	-47.7
	Summer	25.57	*4.16	*16.3	0.55	2.1	-14.2	26.69	-0.27	-1.0	*-6.80	*-25.5	-24.5
	Autumn	20.04	*3.35	*16.7	*-2.15	*-10.7	-27.4	12.34	-0.01	-0.1	*-4.47	*-36.2	-36.2
0–3 km	Winter	9.55	*0.9 3	*9.7	*1.83	*19.2	9.4	3.87					
	Spring	15.94	*4.10	*25.7	*2.90	*18.2	-7.5	5.46					
	Summer	20.38	*3.91	*19.2	0.39	1.9	-17.3	4.57					
	Autumn	13.18	*3.34	*25.3	-0.33	-2.5	-27.9	3.14					