Supplemental Information

Table S1. SO_2 emission (tons) from site location and surrounding major sources in 2011 (Source: epa.gov)

	County	SO_2 emission (Tons) in 2011					
		Industrial Process	Fuel Combustion	Fire	Mobile	Others	Total
1	Grant (Site location), OK	1	1	38	2	0	42
2	Garfield, OK (Oil and Gas industry)	**10,075**	73	26	11	1	**10,186**
3	Kay, OK	1,702	85	185	10	1	1,983
4	Noble, OK (Sooner lake power plant)	1	**19,140**	39	11	0	**19,191**
5	Osage, OK	5	10	1,773	6	2	1,796
6	Tulsa, OK	2,190	1,421	25	121	8	3,765
7	Rogers, OK	198	**18,087**	59	23	2	**18,369**
8	Mayes, OK	869	**19,198**	62	13	2	**20,144**
9	Muskogee, OK	224	**29,143**	271	14	2	**29,654**
10	Butter, KS	1,441	39	641	24	1	2,146
11	Shawnee, KS	1,034	3,895	71	37	0	5,037
12	Douglas, KS	6	2,798	51	18	0	2,873
13	Wyandotte, KS	32	9,805	2	48	1	9,888
14	Linn, KS	3	**17,873**	51	10	1	**17,938**

Table S2. NO_x emission (tons) from site location and surrounding major sources in 2011 (Source: epa.gov)

	County	NO_x emission (Tons) in 2011						
		Industrial Process	Fuel Combustion	Fire	Mobile	Biogenics	Others	Total
1	Grant (Site location), OK	667	499	98	708	821	2	2,795
2	Garfield, OK (Oil and Gas industry)	2,350	1,670	67	2,066	826	5	6,984
3	Kay, OK	2,056	1,110	422	2,215	718	5	6,526
4	Noble (Sooner lake power plant), OK	879	**11,476**	93	2,147	576	2	**15,173**
5	Kingfisher, OK	1,432	3,752	76	967	721	4	6,952
6	Logan, OK	854	1,408	121	1,901	502	8	4,794
7	Canadian, OK	2,038	3,718	81	4,804	685	10	**11,336**
8	Oklahoma, OK	840	5,405	166	**21,881**	339	33	**28,664**

9	Tulsa, OK	1,083	8,163	52	**18,298**	313	567	**28,476**
10	Roger, OK	3,445	**16,783**	132	4,142	405	39	**24,946**
11	Mayes, OK	807	**15,554**	107	2,942	379	17	**19,806**
12	Muskogee, OK	668	**18,409**	459	2,783	478	14	**22,811**
13	Reno, KS	727	2,790	253	2,853	840	7	7,470
14	McPherson, KS	1,722	657	268	2,289	616	13	5,565
15	Sedgwick, KS	295	4,117	177	**12,898**	656	7	**18,150**
16	Butler, KS	1,381	548	1,508	4,098	881	14	8,430
17	Neosho, KS	3,557	118	81	1,139	406	3	5,304
18	Wilson, KS	7,142	245	177	838	397	2	8,801
19	Montgomery, KS	3,547	823	218	1,723	426	6	6,743
20	Linn, KS	443	**8,379**	109	1,347	368	4	**10,650**
21	Chase, KS	307	8	1,937	2,051	516	1	4,820
22	Lyon, KS	33	1,241	1,326	2,812	533	4	5,949
23	Pottawatomie, KS	5	**13,818**	1,089	2,065	491	8	**17,476**
24	Shawnee, KS	25	2,665	164	6,178	333	1	9,366
25	Douglas, KS	214	5,414	108	3,135	271	0	9,142
26	Wyandotte, KS	317	8,068	5	7,567	77	16	**16,050**
27	Johnson, KS	1,888	1,559	14	**13,114**	211	17	**16,803**
28	Miami, KS	1,569	2,138	46	2,479	357	9	6,598

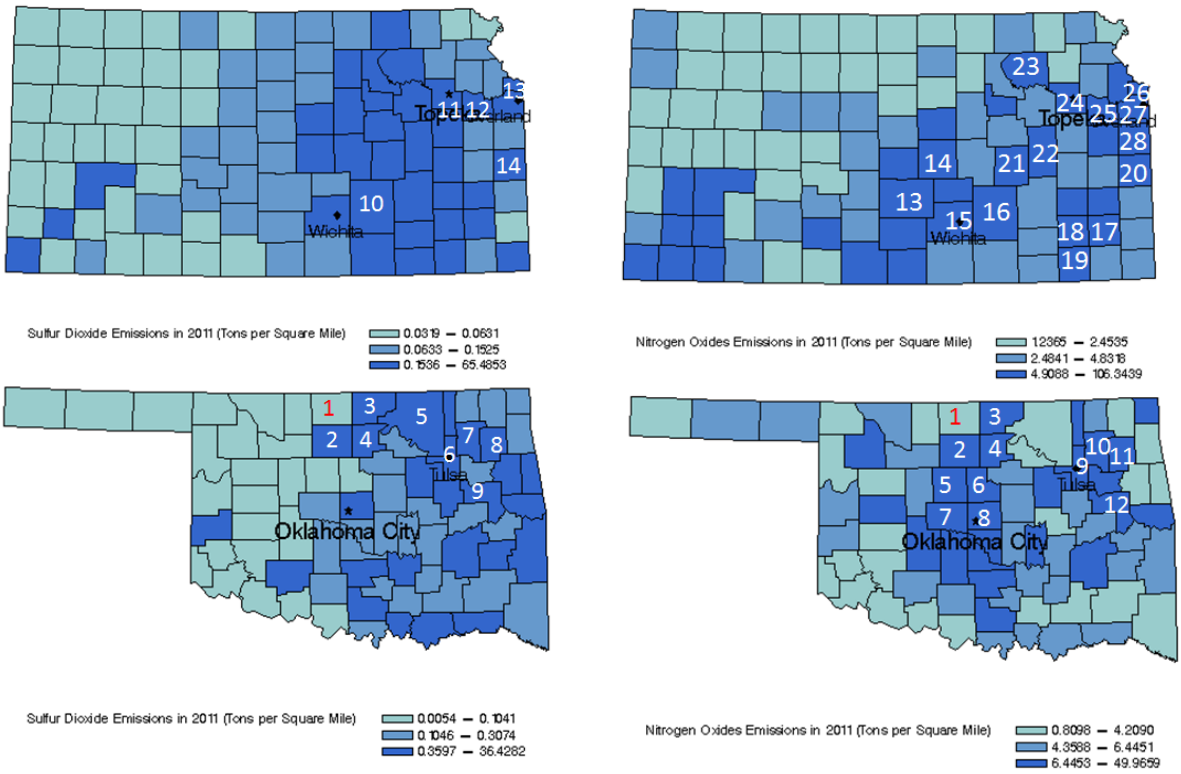

Fig S1. County-wise SO_2 (left) and NO_x (right) emission density in Oklahoma and Kansas in 2011. The county marked as '1' indicates the location of the SGP site. The number on each county corresponds to the county name in the respective table. It is assumed that the relative emissions density was similar in other years as well. (Source: epa.gov)

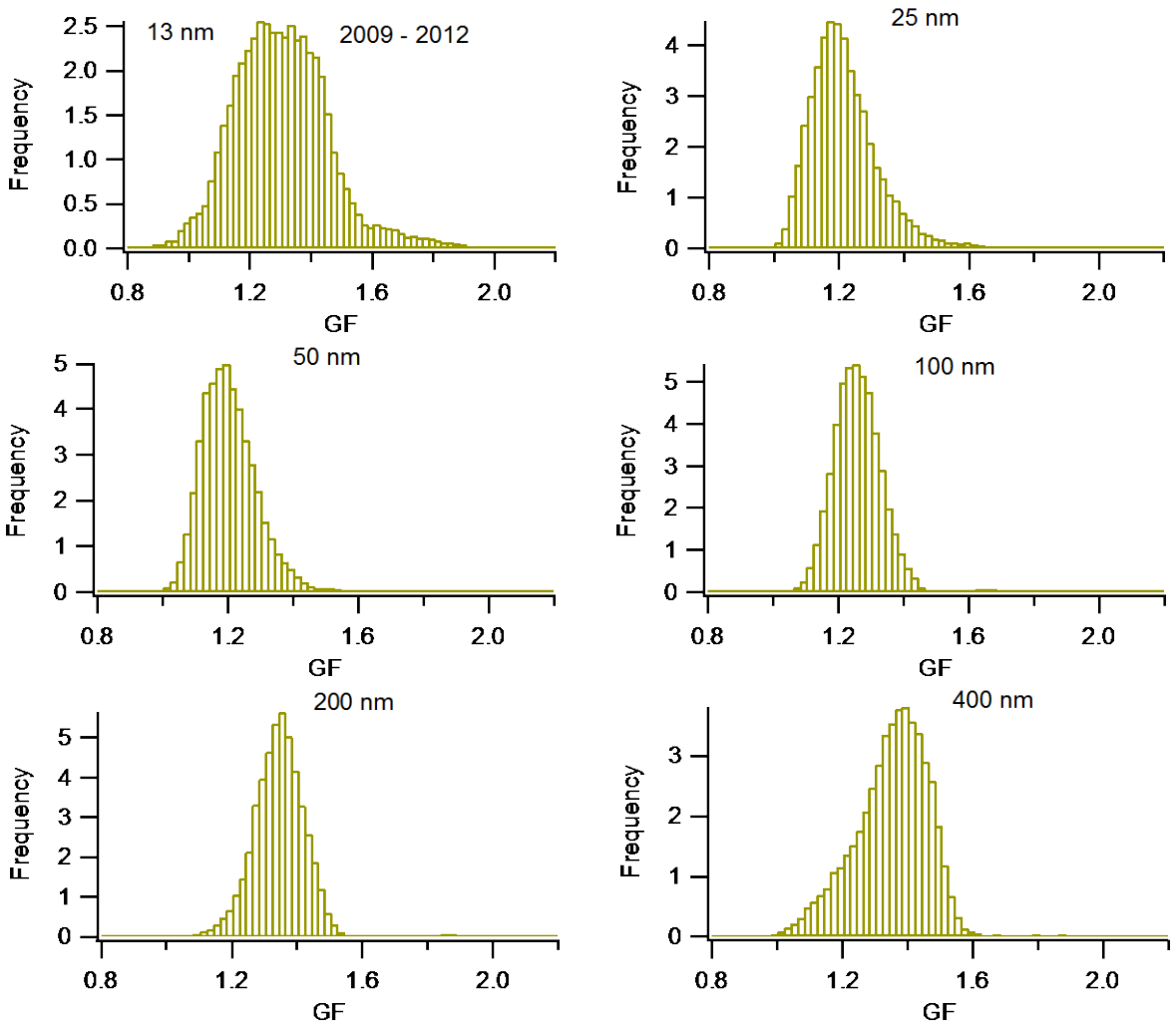

Fig. S2. Histograms of mean GF from measured distributions of 13, 25, 50, 100, 200 and 400 nm particles from 2009 to 2012.