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Seasonal variation of aerosol iron solubility in coarse and fine particles at an inland city in northwestern China

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Table S1. Temperature and relative humidity (RH) in different seasons (spring: 01-30 April 2021; summer: 12 July-14 August 2021; autumn: 07 October-07 November 2021; winter: 26 November to 31 December 2020).

Season	Temperature (℃)			RH (%)		
	range	median	average	range	median	average
Spring	6.2-32.3	13.6	14.0±4.6	15-99	85	77±22
Summer	19.1-38.9	27.0	27.6±4.0	29-97	71	70±15
Autumn	0.2-20.4	12.7	12.6±3.2	24-98	83	80±13
Winter	-11.0-10.1	1.3	0.9±4.0	22-99	77	74±19

Table S2. Mass concentrations of $PM_{2.5}$ and PM_{10} in different seasons.

Season	$PM_{2.5}$ ($\mu g/m^3$)			PM_{10} ($\mu g/m^3$)		
	range	median	average	range	median	average
spring	11-62	33	35±14	15-243	85	93±61
Summer	11-48	23	23±8	24-76	55	51±16
Autumn	13-97	38	40±24	22-151	69	70±35
winter	13-156	81	80±32	41-212	101	107±39

Table S3. Correlation coefficients (R) for dissolved Fe with other species in different seasons. In this table, R values which are >0.5 are highlighted in bold.

	spring		summer		autumn		winter	
	coarse	fine	coarse	fine	coarse	fine	coarse	fine
SO_4^{2-}	**0.867**	**0.651**	0.490	0.190	**0.729**	**0.524**	0.460	**0.899**
NO_3^-	**0.898**	**0.616**	0.492	0.386	**0.791**	**0.725**	**0.687**	0.342
NH_4^+	**0.899**	**0.560**	0.352	0.190	**0.737**	**0.704**	**0.612**	0.250
K^+	**0.801**	**0.674**	**0.610**	**0.704**	**0.960**	**0.730**	**0.908**	**0.770**
Ca^{2+}	0.333	**0.621**	0.428	**0.721**	**0.748**	**0.654**	**0.721**	0.426
T-Fe	0.031	0.232	0.248	**0.613**	**0.675**	0.427	**0.538**	0.304
Al	0.004	0.229	0.302	**0.508**	**0.650**	**0.557**	0.468	0.360
As	**0.630**	**0.709**	0.467	0.459	**0.598**	**0.628**	**0.548**	0.315
Cr	**0.509**	0.292	0.355	0.051	**0.568**	0.384	**0.772**	0.348
Cu	0.421	0.298	-0.029	0.310	-0.197	-0.288	0.004	-0.127
Mn	0.365	0.240	0.276	**0.599**	**0.673**	**0.651**	**0.672**	0.336
Ni	0.355	0.169	0.114	0.327	0.086	-0.169	**0.782**	0.318
Pb	**0.651**	**0.712**	0.173	0.086	**0.880**	**0.636**	**0.740**	**0.660**
V	0.230	0.210	0.267	**0.568**	**0.724**	0.321	**0.654**	0.286
Zn	**0.693**	0.463	0.260	0.212	**0.571**	**0.769**	**0.626**	0.231

Table S4. The range, median and average of pH for fine and coarse particles in different seasons.

pH	fine			coarse		
	range	median	average	range	median	average
Spring	2.74-7.33	3.64	4.67±2.00	2.33-7.33	3.38	4.59±2.08
Summer	2.00-7.09	2.74	3.59±1.90	2.17-7.09	2.99	3.93±1.92
Autumn	1.33-3.43	3.13	2.98±0.46	2.27-3.58	2.79	2.84±0.29
Winter	1.62-7.58	4.15	4.23±0.89	3.46-7.74	4.16	5.15±1.72

Figure S1. (a) A map which shows the location of Xi'an in China; (b) A map which shows Xi'an, the Guanzhong Plain, Qinling Mountains, and Loess Plateau.

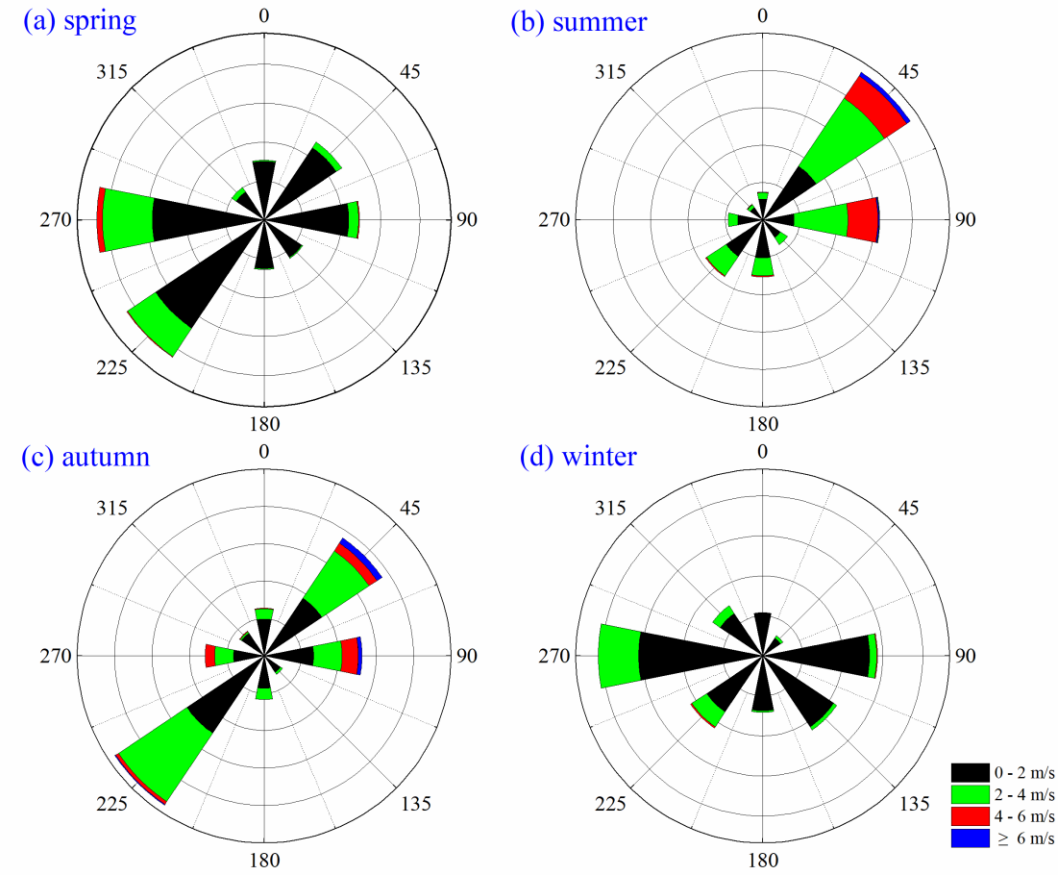


Figure S2. Wind rose which displays wind directions and speeds during the campaign: (a) spring; (b) summer; (c) autumn; (d) winter.

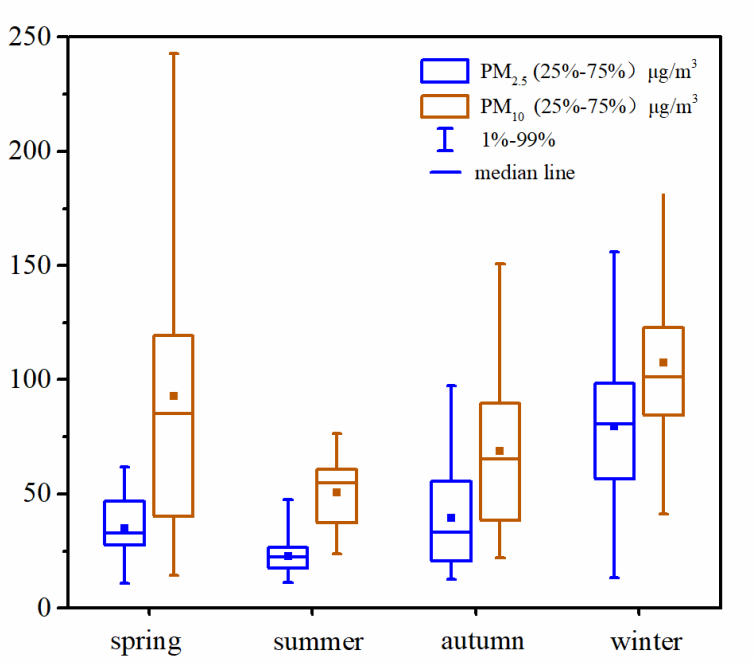


Figure S3. Mass concentrations of $PM_{2.5}$ and PM_{10} in different seasons.

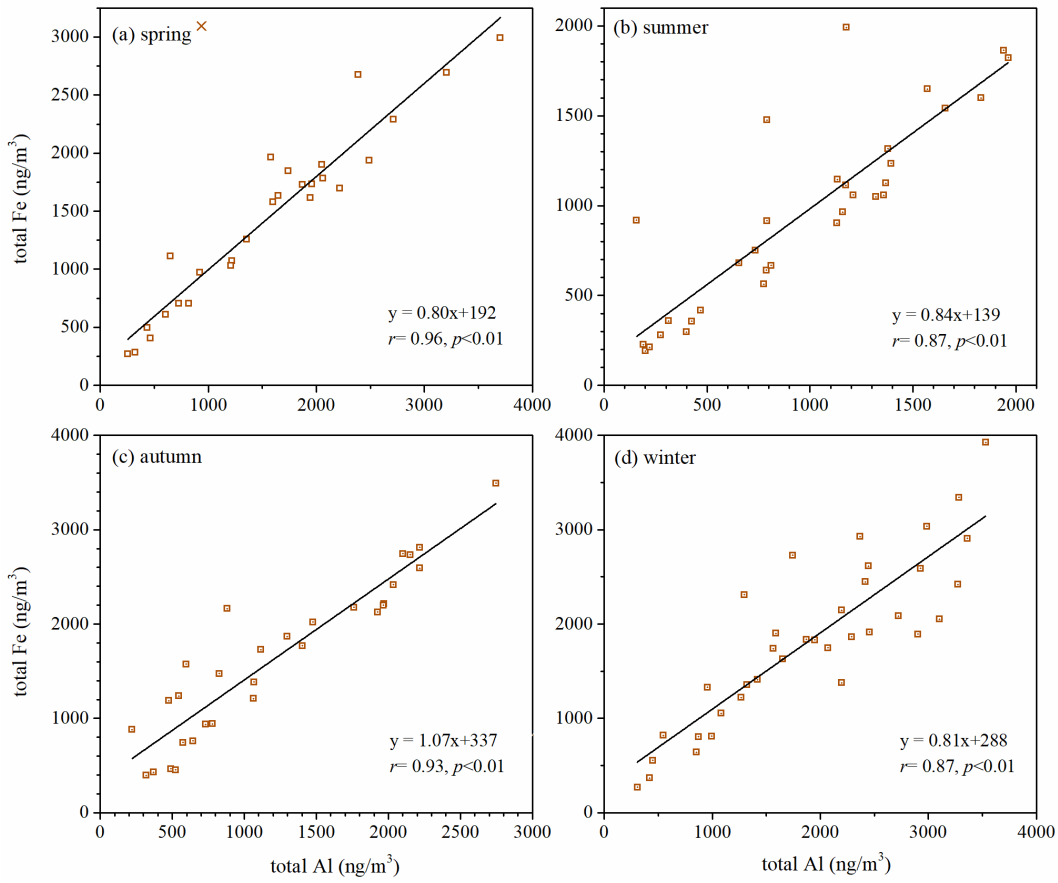


Figure S4. Correlations between total Fe and total Al for coarse particles in different seasons: (a) spring; (b) summer; (c) autumn; (d) winter.

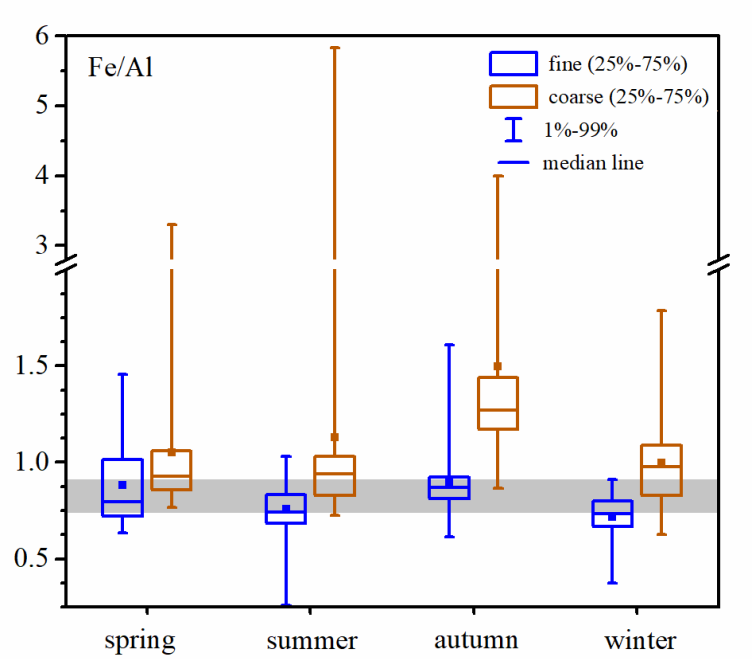


Figure S5. Mass ratios of total Fe to total Al, Fe/Al, for fine and coarse particles in different seasons.

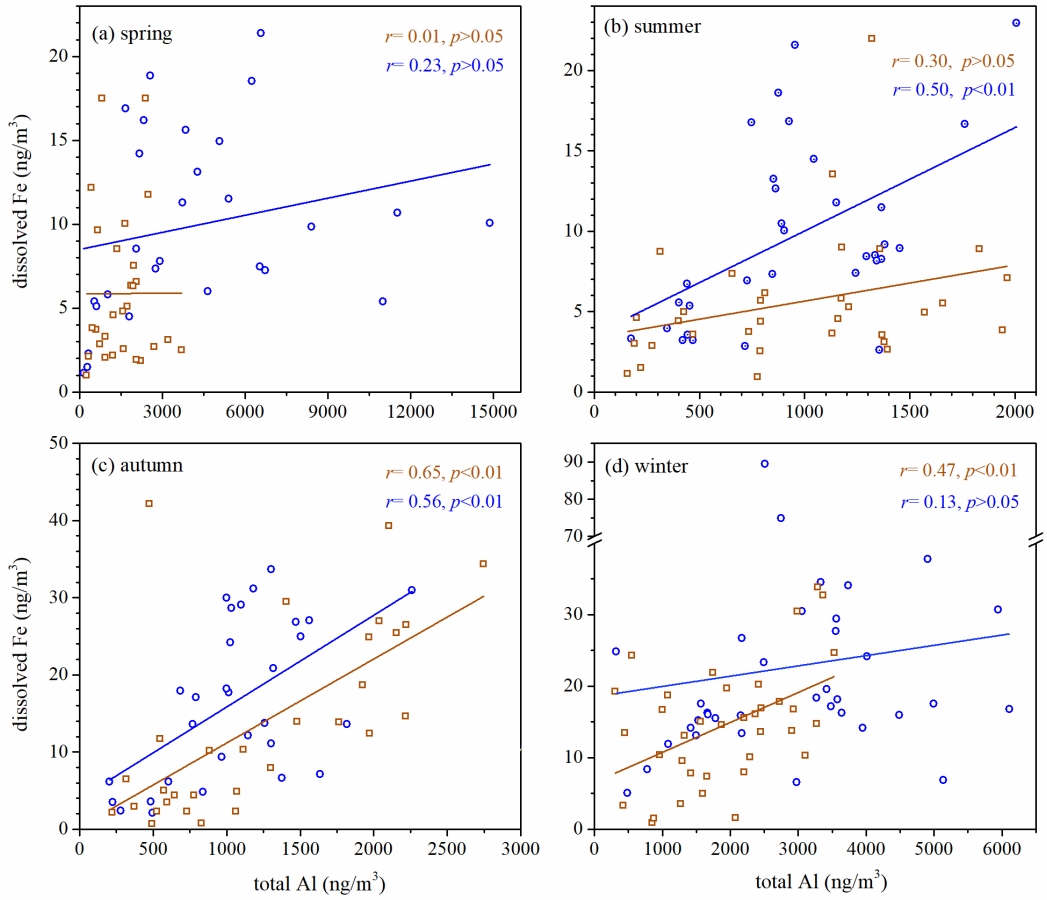


Figure S6. Dissolved Fe versus total Al for fine and coarse particles in different seasons: (a) spring; (b) summer; (c) autumn; (d) winter.

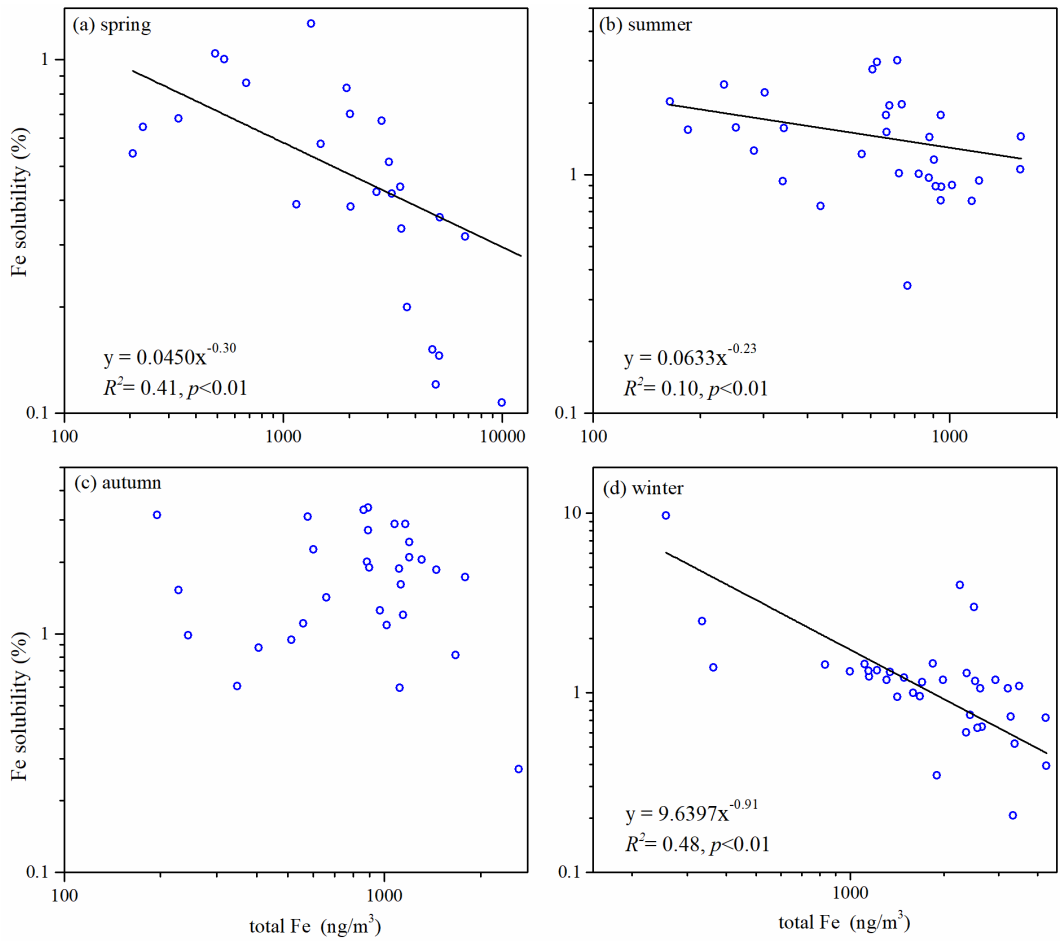


Figure S7. Fe solubility versus total Fe for fine particles in different seasons: (a) spring; (b) summer; (c) autumn; (d) winter.

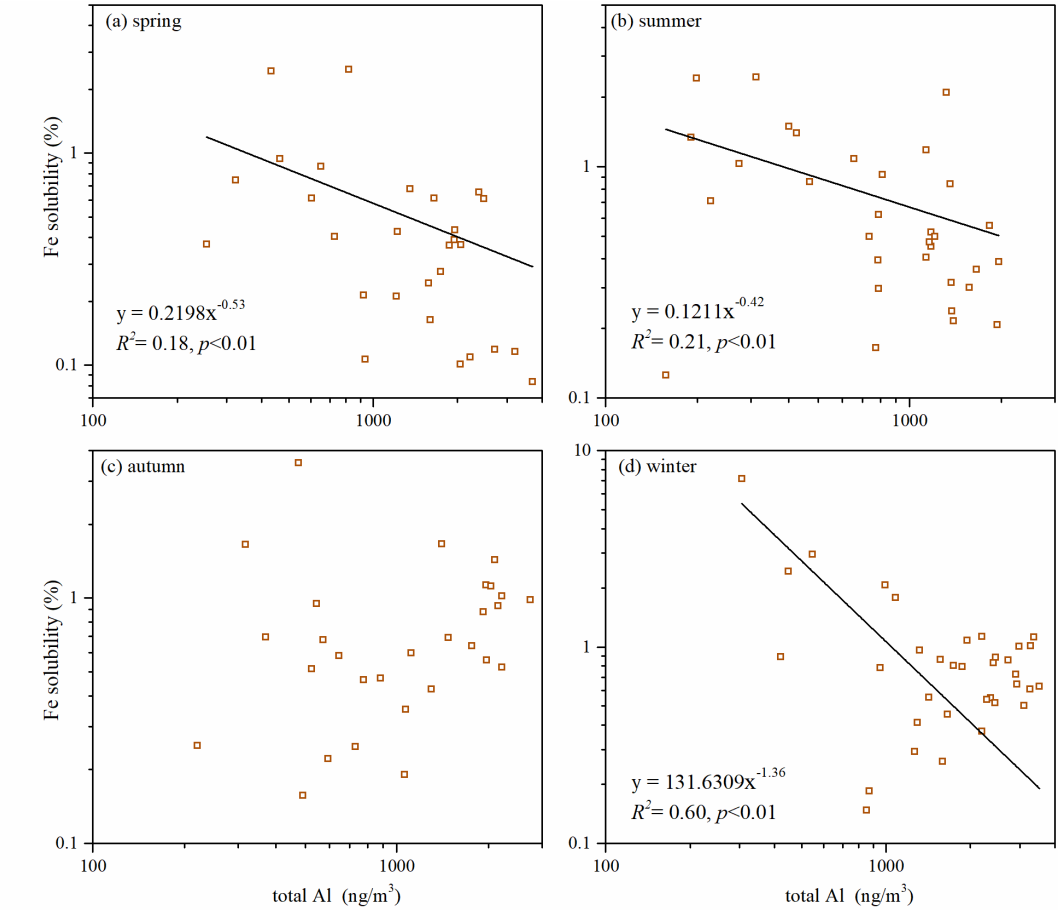
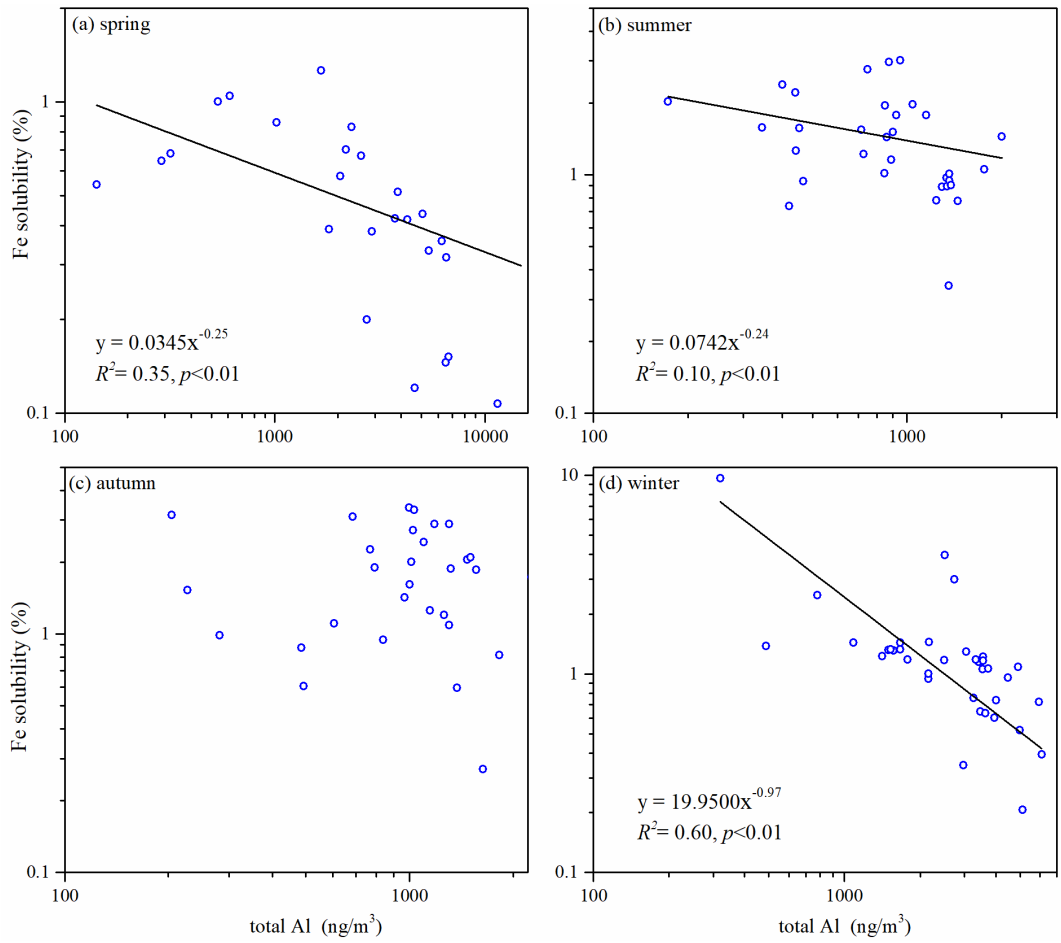


Figure S8. Fe solubility versus total Al for coarse particles in different seasons: (a) spring; (b) summer; (c) autumn; (d) winter.



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64 **Figure S9.** Fe solubility versus total Al for fine particles in different seasons: (a) spring; (b)

65 summer; (c) autumn; (d) winter.

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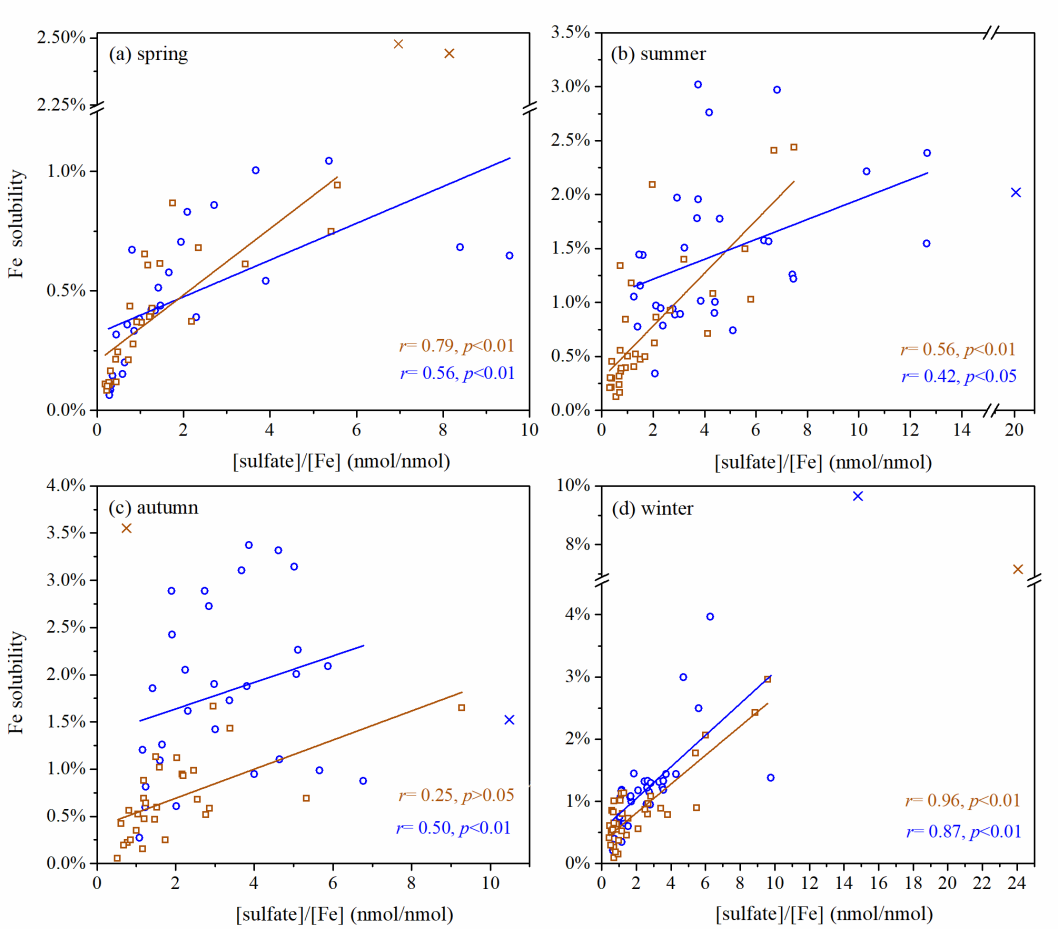

Figure S10. Fe solubility versus [sulfate]/[Fe] for fine and coarse particles in different seasons: (a) spring; (b) summer; (c) autumn; (d) winter. Blue symbols represent fine particles and brown symbols represent coarse particles. Cross symbols represent data points which are not included in fittings.

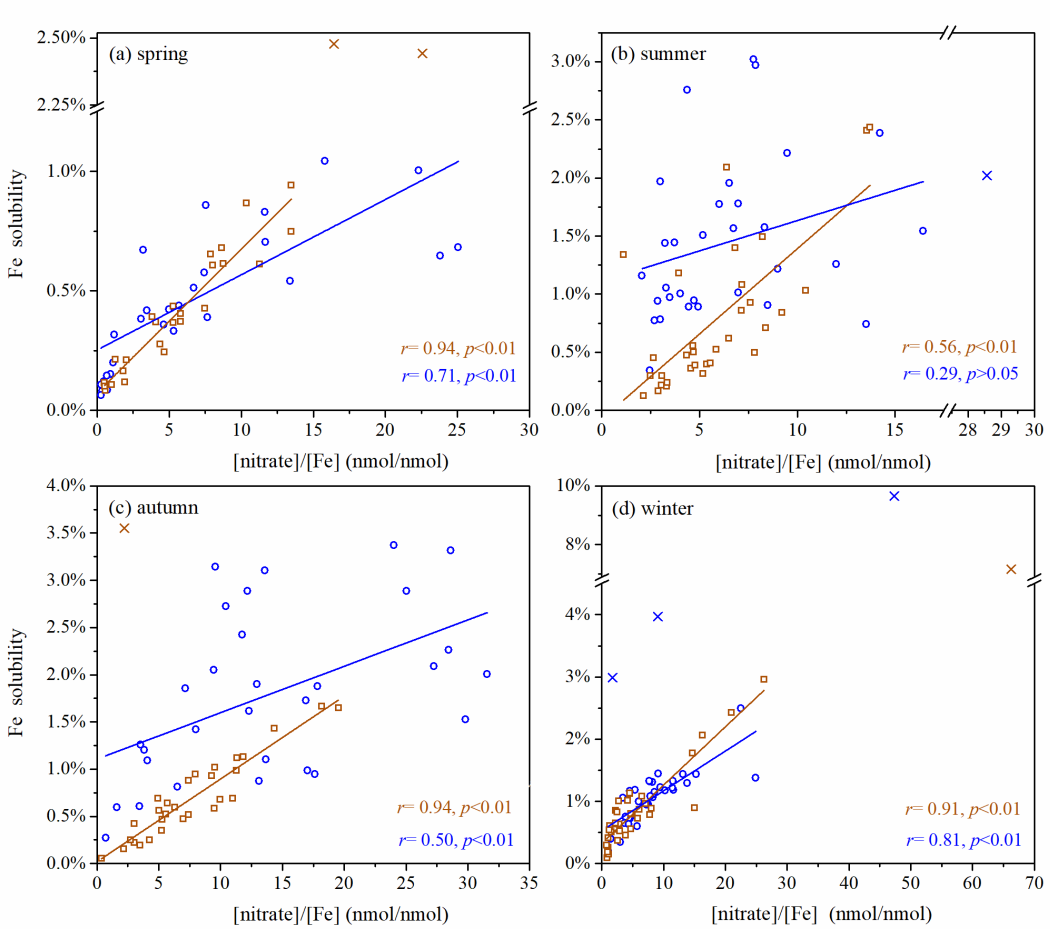

Figure S11. Fe solubility versus [nitrate]/[Fe] for fine and coarse particles in different seasons: (a) spring; (b) summer; (c) autumn; (d) winter. Blue symbols represent fine particles and brown symbols represent coarse particles. Cross symbols represent data points which are not included in fittings.

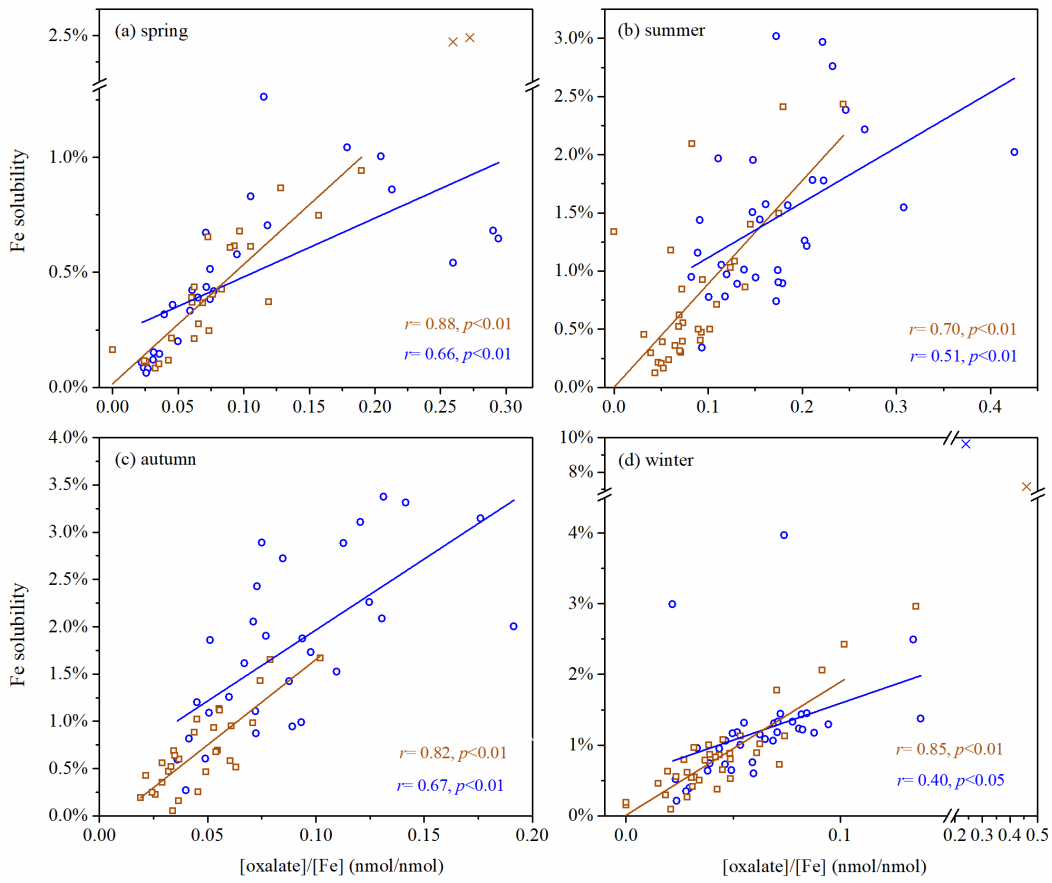

Figure S12. Fe solubility versus [oxalate]/[Fe] for fine and coarse particles in different seasons: (a) spring; (b) summer; (c) autumn; (d) winter. Blue symbols represent fine particles and brown symbols represent coarse particles. Cross symbols represent data points which are not included in fittings.

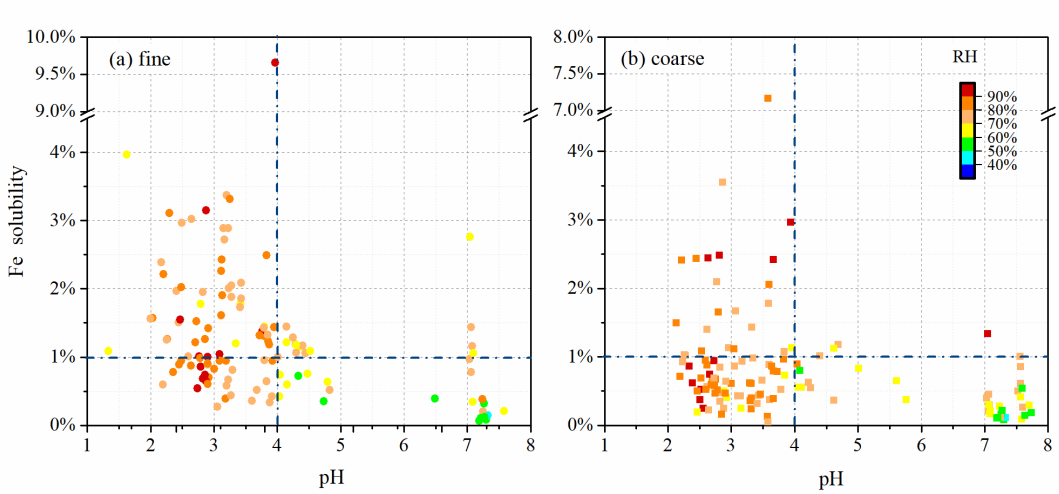

Figure S13. Fe solubility in different relative humidity (RH) ranges for (a) fine and (b) coarse particles.

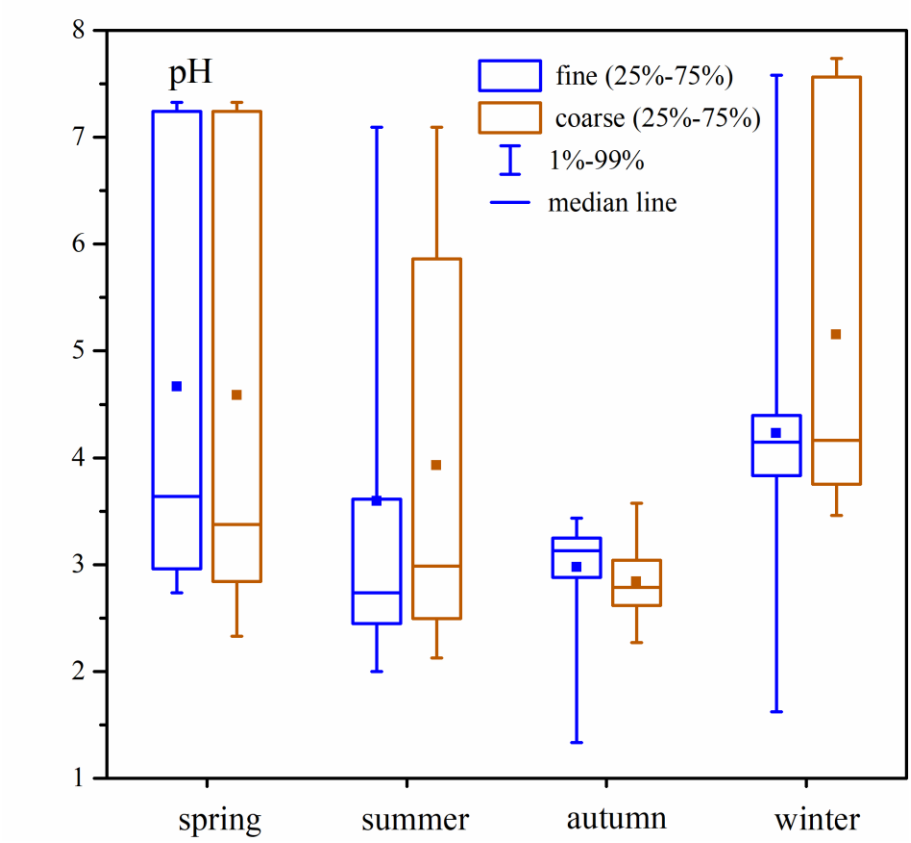

Figure S14. Seasonal variations of pH for fine and coarse particles in different seasons.