Supplementary Materials

Figures:

Fig. S1. Daily -72h back-trajectories of air-masses in spring, summer, autumn, and winter during 2011-2012 at Qianliyan Island.

Fig. S2. Raw nutrient concentrations ($\mu mol \cdot L^{-1}$) of leachates, that were collected at a 90s interval, in high time-resolution dissolution experiments. Noted that each of raw nutrient concentrations shown had subtracted the nutrient concentrations of the blank filter.

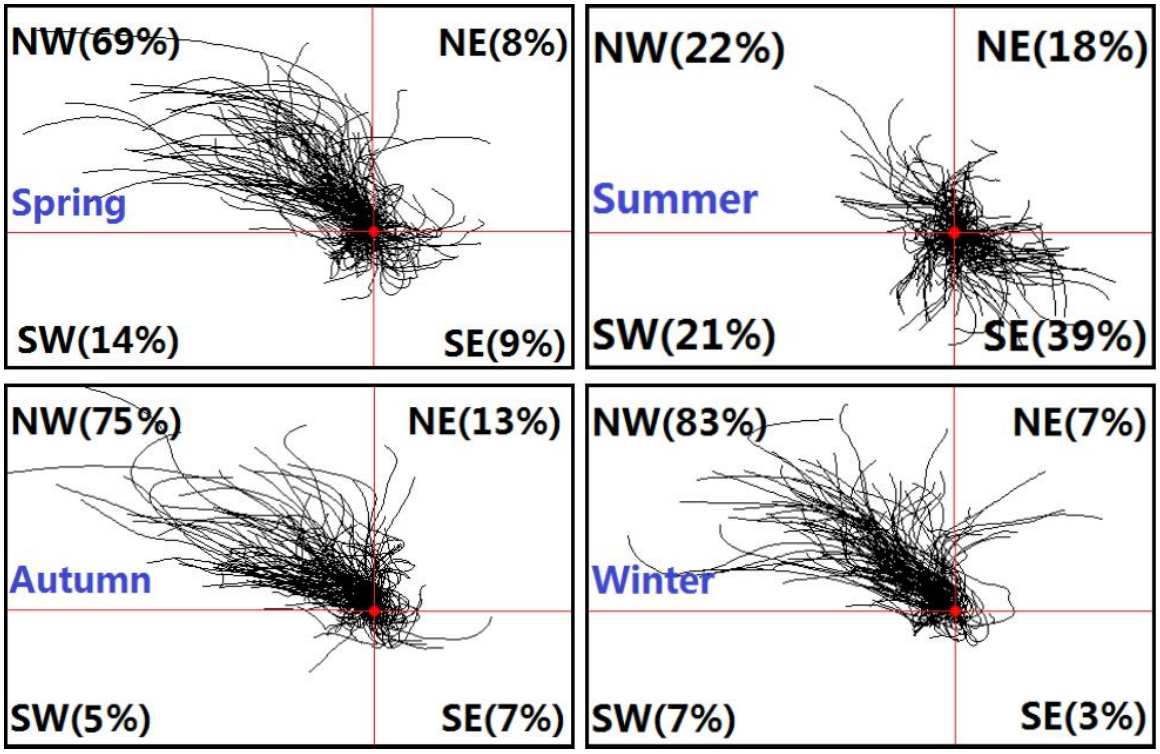
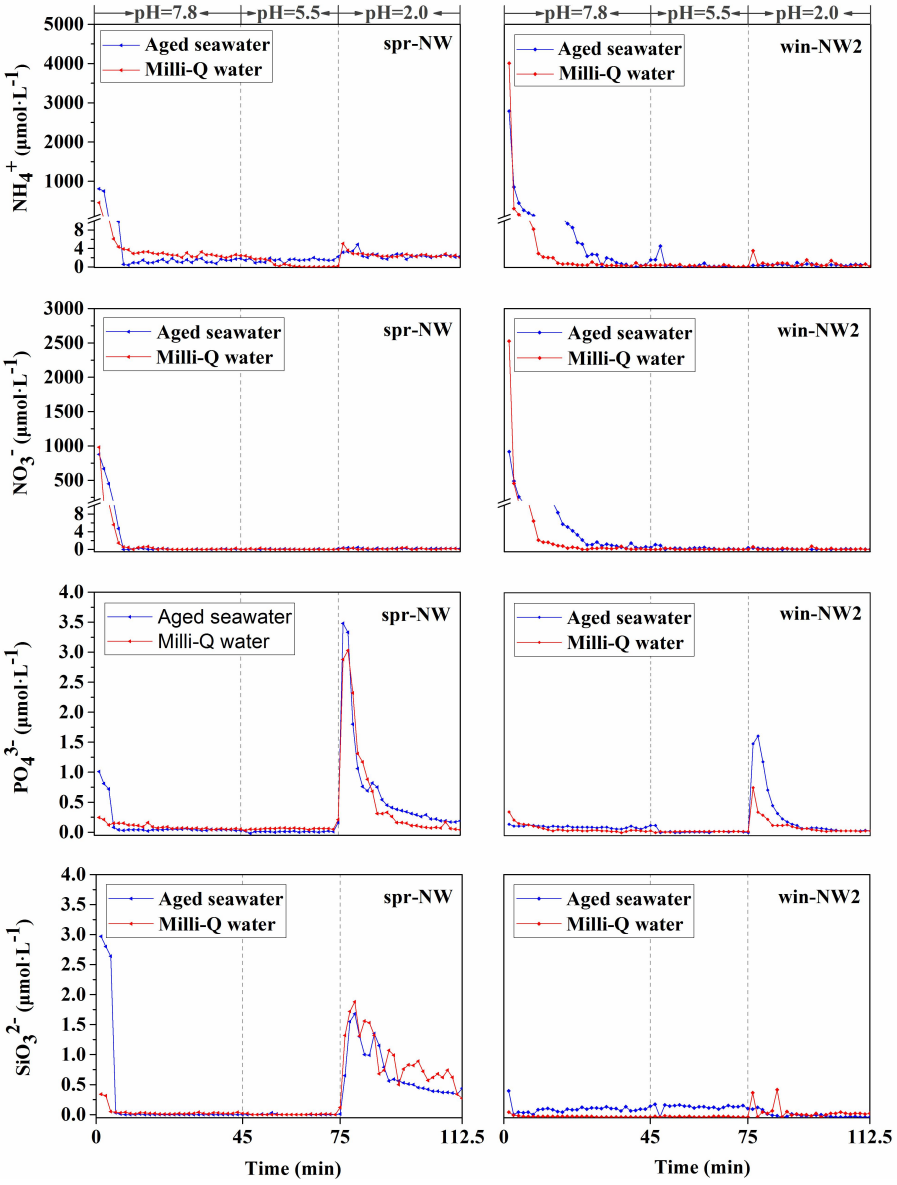

NW(69%)
NE(8%)
Spring
SW(14%)
SE(9%)
NW(22%)
NE(18%)
Summer
SW(21%)
SE(39%)
NW(75%)
NE(13%)
Autumn
SW(5%)
SE(7%)
NW(83%)
NE(7%)
Winter
SW(7%)
SE(3%)

Fig. S1


pH=7.8
pH=5.5
pH=2.0
Aged seawater
Milli-Q water
spr-NW
win-NW2
NH4+ (μmol·L-1)
NO3- (μmol·L-1)
PO43- (μmol·L-1)
SiO32- (μmol·L-1)
Time (min)
0
45
75
112.5

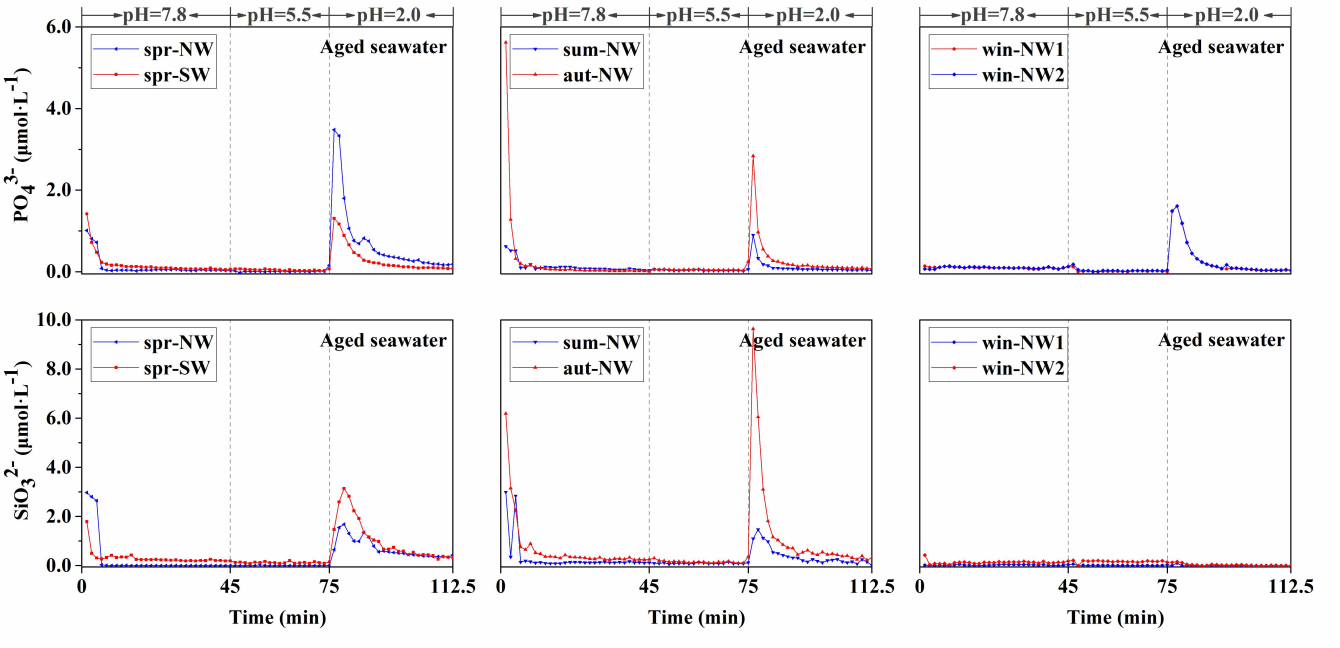

pH=7.8
pH=5.5
pH=2.0
spr-NW
spr-SW
sum-NW
aut-NW
win-NW1
win-NW2
Aged seawater
PO_4^{3-} (μmol·L^{-1})
SiO_3^{2-} (μmol·L^{-1})
Time (min)
0
45
75
112.5
0.0
2.0
4.0
6.0
8.0
10.0

Fig. S2

Table S1 Sampling date, source and TSP mass concentration ($\mu g \cdot m^{-3}$) of six aerosols.

Sample number	Date	Season-Source	TSP
1	2011-04-28	spr-SW	35.7
2	2011-03-20	spr-NW	236.4
3	2012-06-12	sum-NW	84.1
4	2012-10-13	atu-NW	80.4
5	2011-02-12	win-NW1	56.5
6	2011-01-28	win-NW2	129.3

Table S2 Aerosol nutrient concentrations ($nmol \cdot m^{-3}$) for ultrasound extractions.

Ultrasound extractions	NH_4^+	NO_3^-	PO_4^{3-}	SiO_3^{2-}
Milli-Q water-soluble				
spr-SW	92.2	67.8	0.27	0.20
spr-NW	142.4	233.2	0.37	0.45
sum-NW	184.8	77.4	0.60	0.50
atu-NW	270.0	280.0	0.86	1.53
win-NW1	165.1	108.6	0.55	0.34
win-NW2	340.0	284.5	0.63	0.30
Milli-Q acid-soluble				
spr-SW	95.2	72.7	0.66	
spr-NW	182.3	233.9	2.66	
sum-NW	194.4	72.2	0.86	
atu-NW	194.7	200.0	1.72	
win-NW1	206.4	97.4	0.81	
win-NW2	471.0	264.7	1.85	

Table S3 Aerosol nutrient concentrations (nmol·m^{-3}) for high time-revolution dissolution experiments.

High Time-resolution Dissolution Experiment	NH_4^+	NO_3^-	PO_4^{3-}	SiO_3^{2-}
Milli-Q water-soluble				
spr-NW	56.3	109.9	0.37	0.13
win-NW2	322.1	222.1	0.16	0.02
Milli-Q acid-soluble				
spr-NW	62.3	110.1	1.72	2.23
win-NW2	323.2	222.3	0.36	0.17
Aged seawater-soluble				
spr-NW	157.4	189.4	0.36	0.77
win-NW2	348.3	152.0	0.23	0.51
Aged seawater acid-soluble				
spr-NW	163.1	189.9	1.96	2.37
win-NW2	349.1	152.2	0.73	0.56

High Time-resolution Dissolution Experiment	PO_4^{3-}	SiO_3^{2-}
Aged seawater-soluble		
spr-SW	0.62	1.17
spr-NW	0.36	0.77
sum-NW	0.20	0.49
atu-NW	0.82	2.07
win-NW1	0.50	0.12
win-NW2	0.23	0.51
Aged seawater acid-soluble		
spr-SW	1.36	3.70
spr-NW	1.96	2.37
sum-NW	0.32	0.91
atu-NW	1.46	4.73
win-NW1	1.49	0.13
win-NW2	0.73	0.56

Table S4 Aerosol (a) PO_4^{3-} and (b) SiO_3^{2-} dissolution rates (10^{-12} mol·m^{-2}·s^{-1}) at pH 7.8, 5.5 and 2.0 for high time-resolution dissolution experiments.

	$\mathbf{r}_{a1}$	$\mathbf{r}_{a2}$	$\mathbf{r}_{a3}$
Milli-Q water			
spr-NW	49	32	339
win-NW2	24	23	47
Aged seawater			
spr-SW	2553	1814	3916
spr-NW	1798	181	370
sum-NW	506	325	431
atu-NW	2333	1428	2253
win-NW1	160	116	0
win-NW2	194	218	170

(a)

	$\mathbf{r}_{a1}$	$\mathbf{r}_{a2}$	$\mathbf{r}_{a3}$
Milli-Q water			
spr-NW	109	60	280
win-NW2	108	70	107
Aged seawater			
spr-SW	1562	968	1454
spr-NW	148	85	314
sum-NW	206	132	152
atu-NW	992	568	694
win-NW1	654	488	1017
win-NW2	145	97	219

(b)