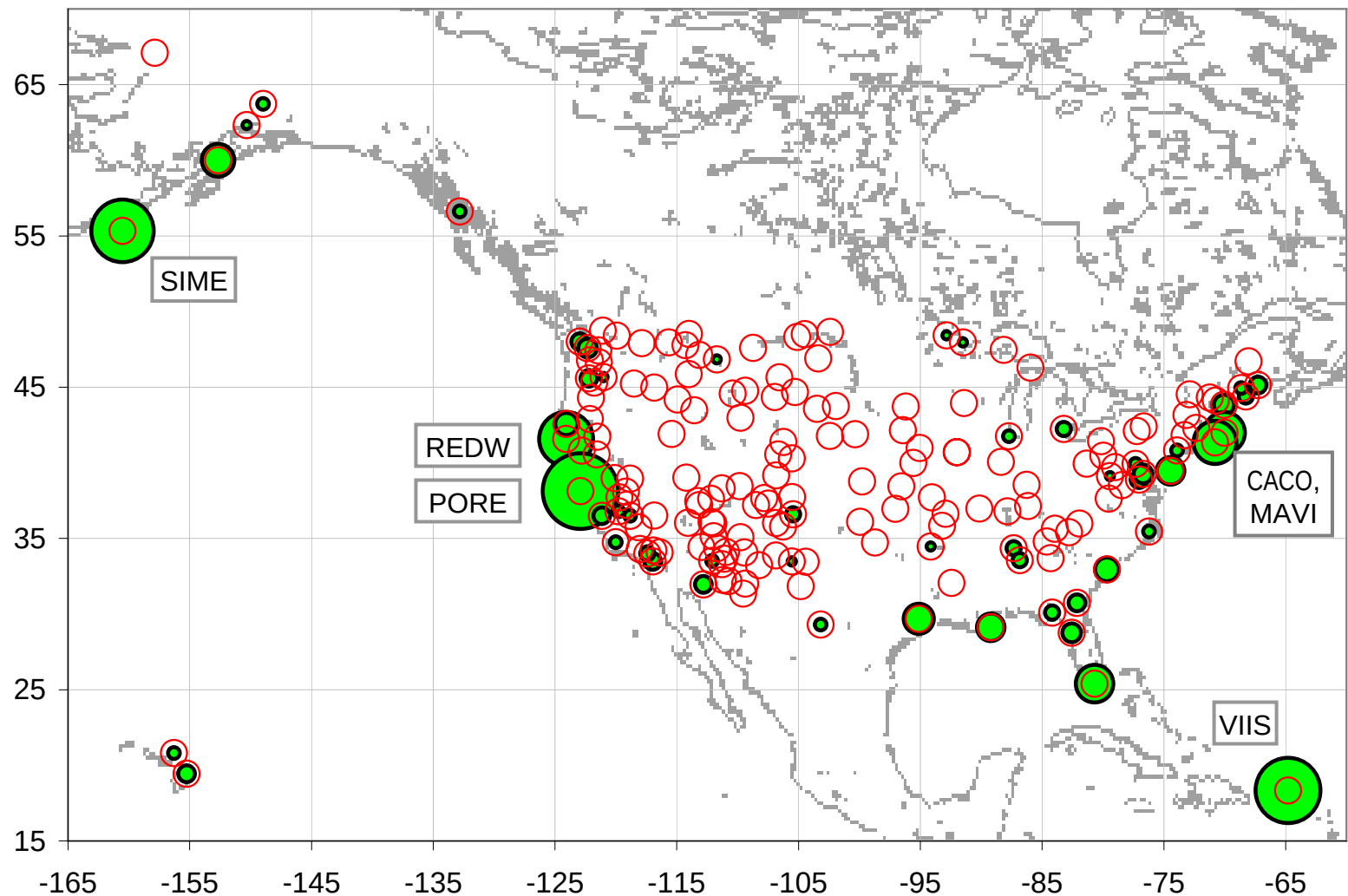


Chemical markers for sea salt in IMPROVE aerosol data



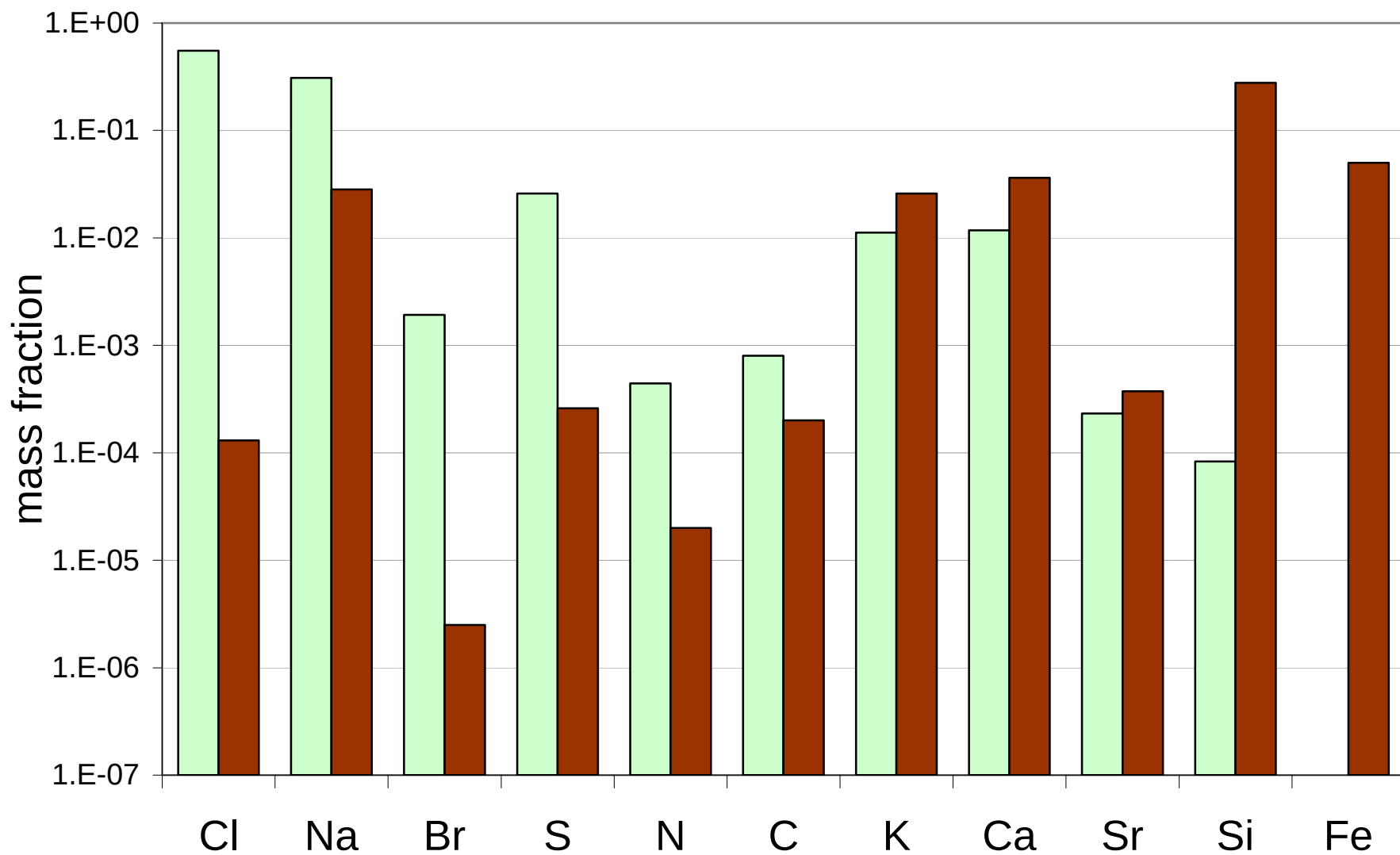
Why study sea salt?

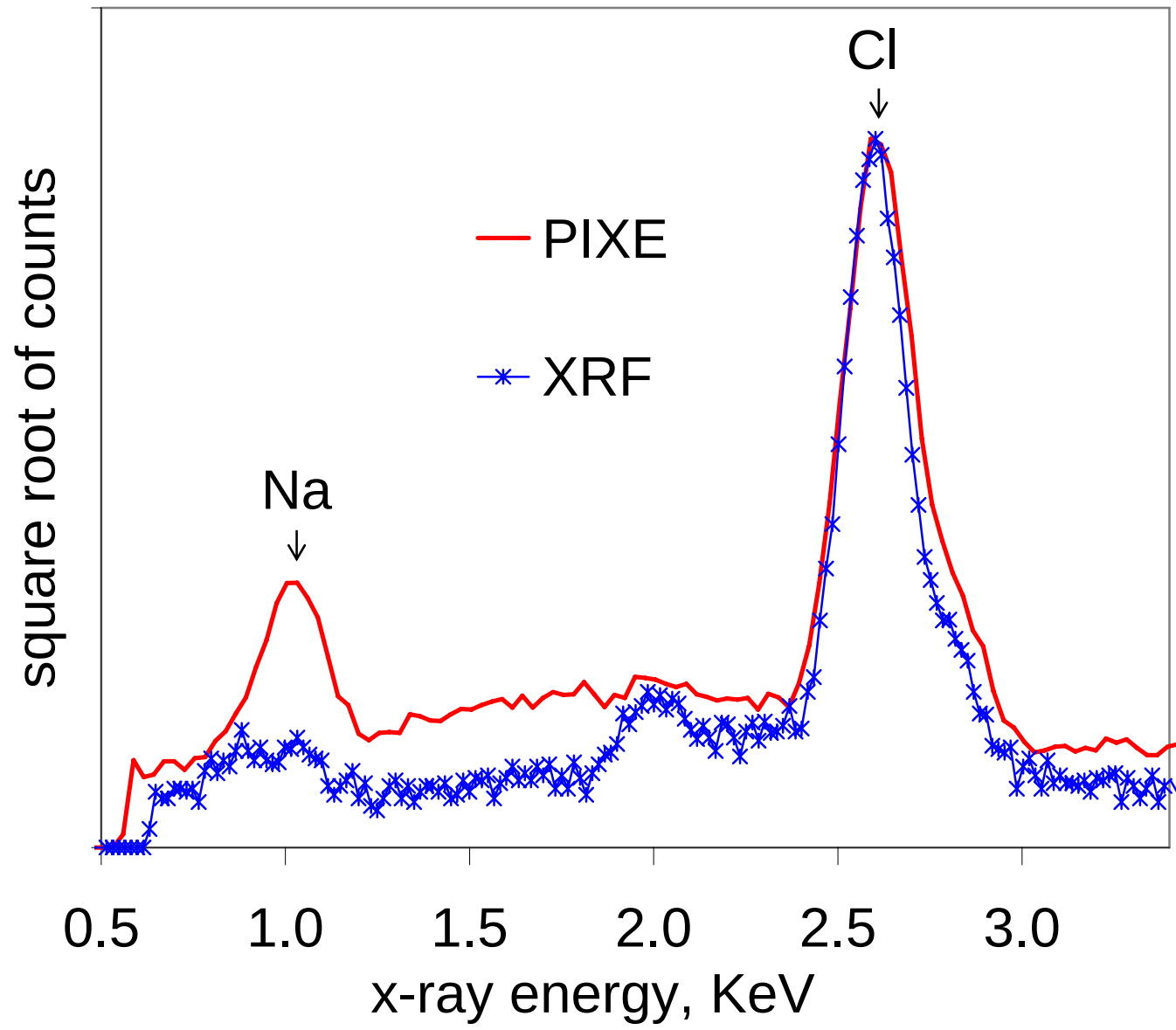
- ❖ It plays an important global role in tropospheric chemistry and the radiation balance.
- ❖ EPA is planning to add it to the Regional Haze Rule accounting scheme.
- ❖ It can be viewed as a “standard reference material” *in ambient air*, useful for system QA/QC.



Areas of filled circles are proportional to numbers of “marine days”
 ($\frac{[Cl^-]}{a_{Cl.salt}} \geq 1 \text{ ug/m}^3$) during 2004. Size of open circles corresponds
 to 10 days (out of 122 total sampling days).

sea salt crustal material





Point Reyes

← PIXE

XRF →

$\frac{[Na]_P}{RM}$

1

0.1

$$RM = FM - 1.8[C] - \frac{1}{a_{Fe,crust}}[Fe] - [NO_3] - [SO_4]$$

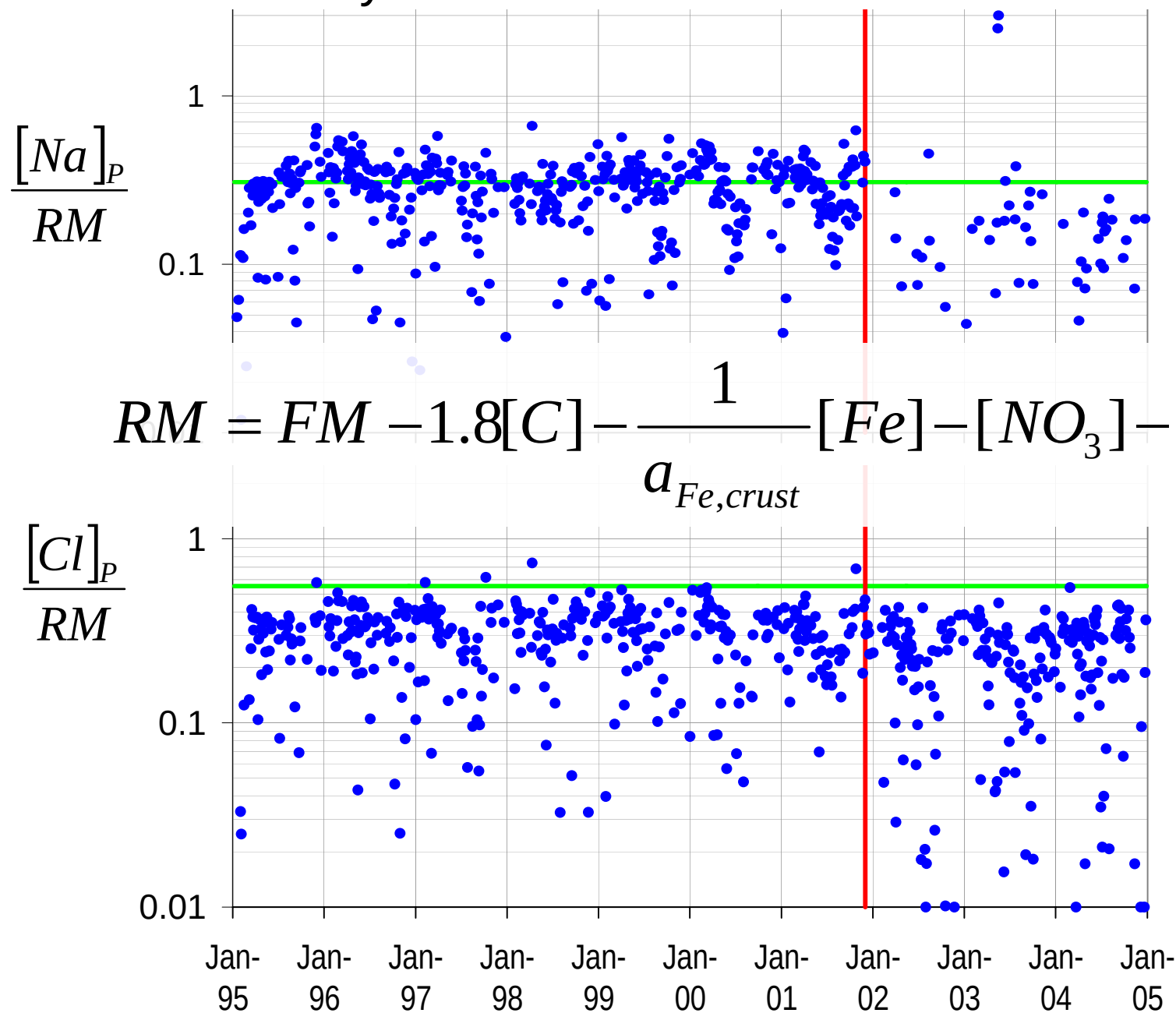
$\frac{[Cl]_P}{RM}$

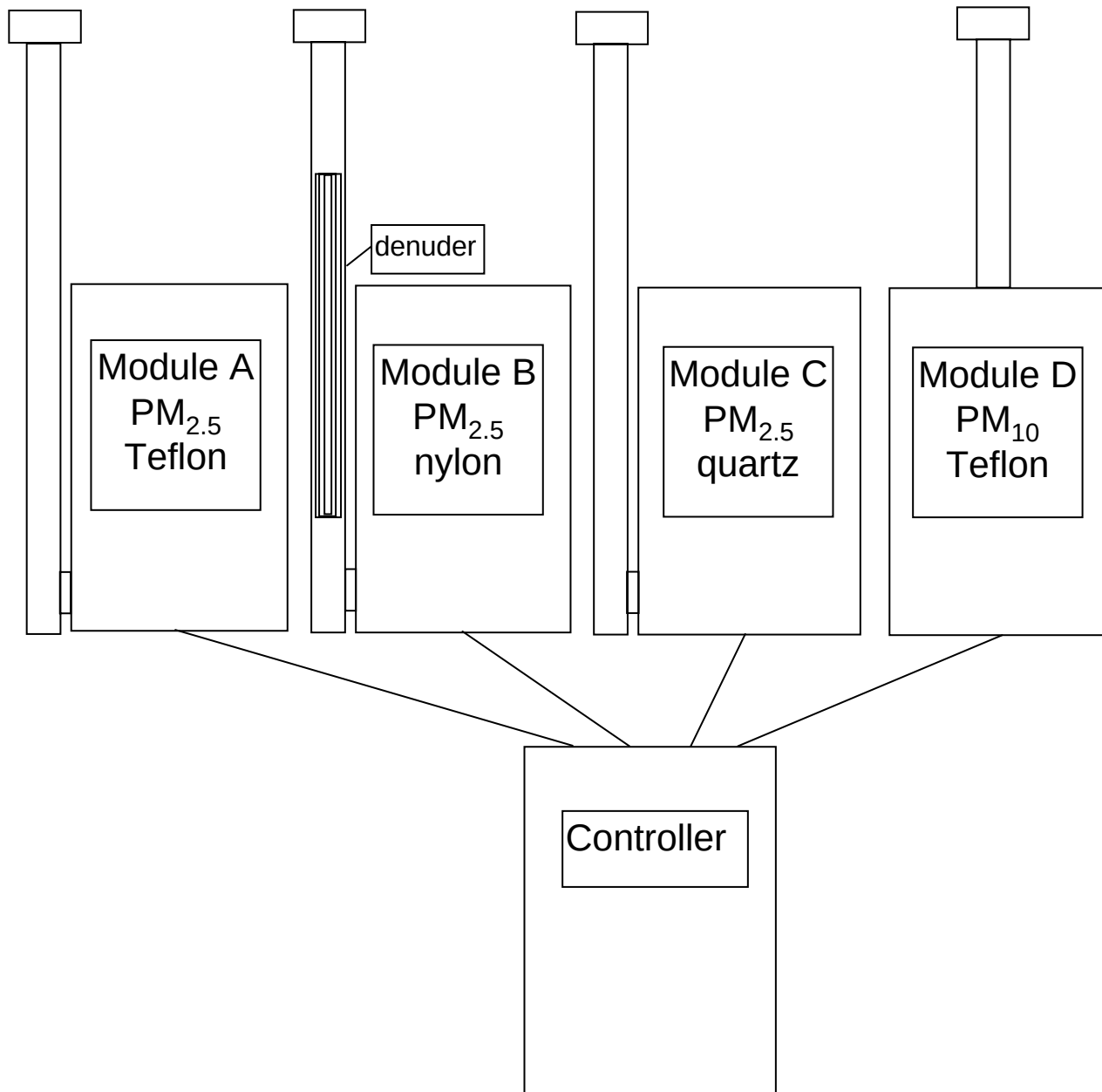
1

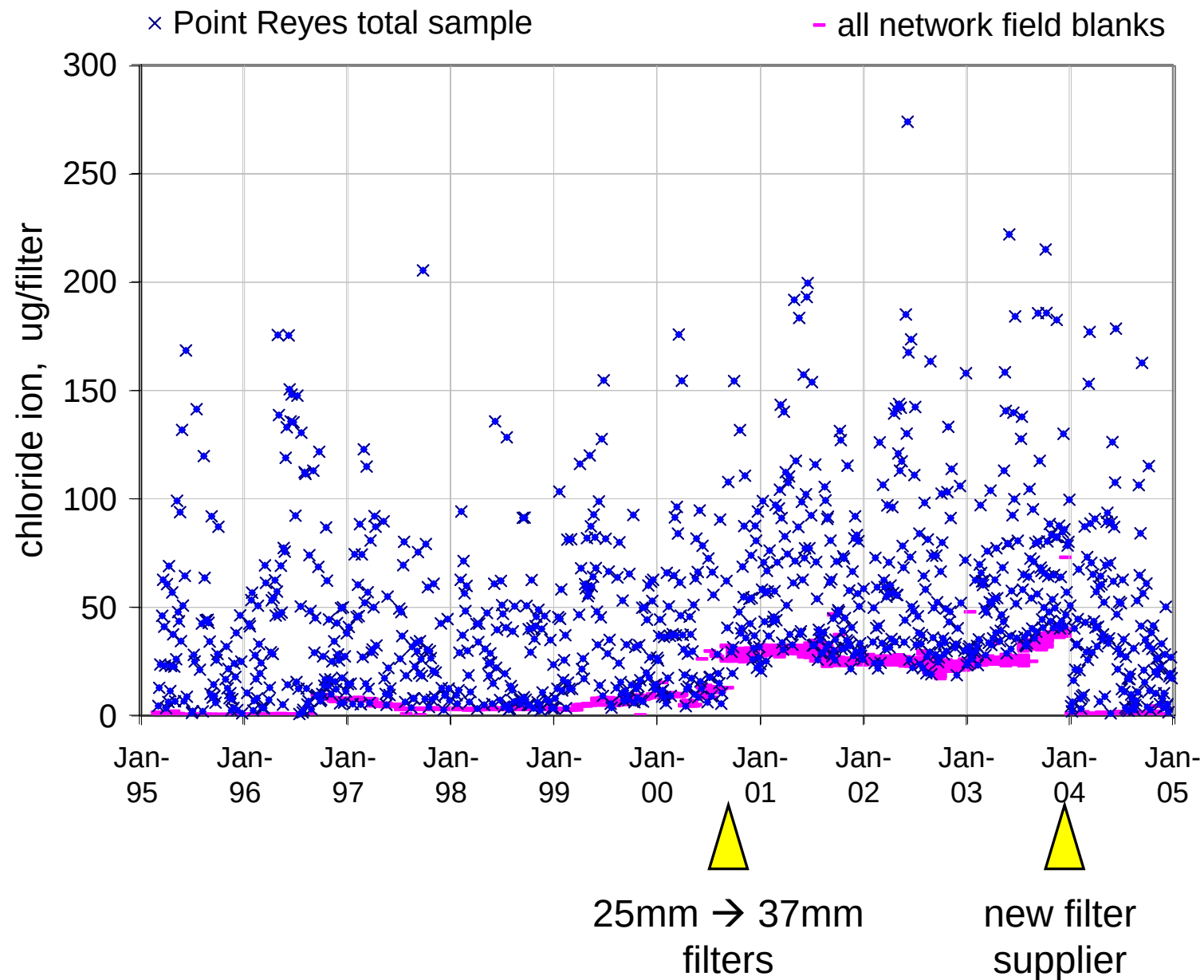
0.1

0.01

Jan-95 Jan-96 Jan-97 Jan-98 Jan-99 Jan-00 Jan-01 Jan-02 Jan-03 Jan-04 Jan-05



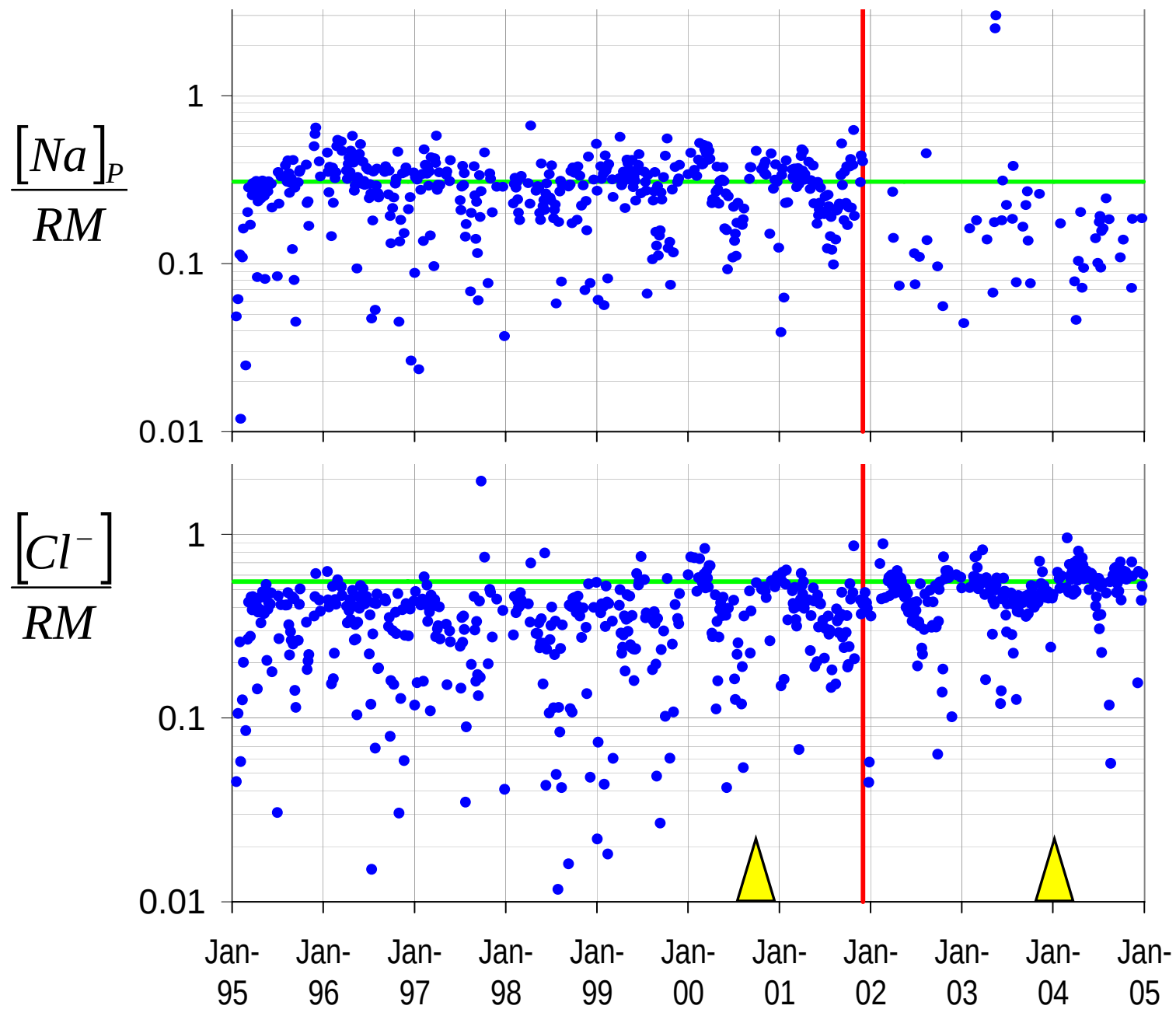


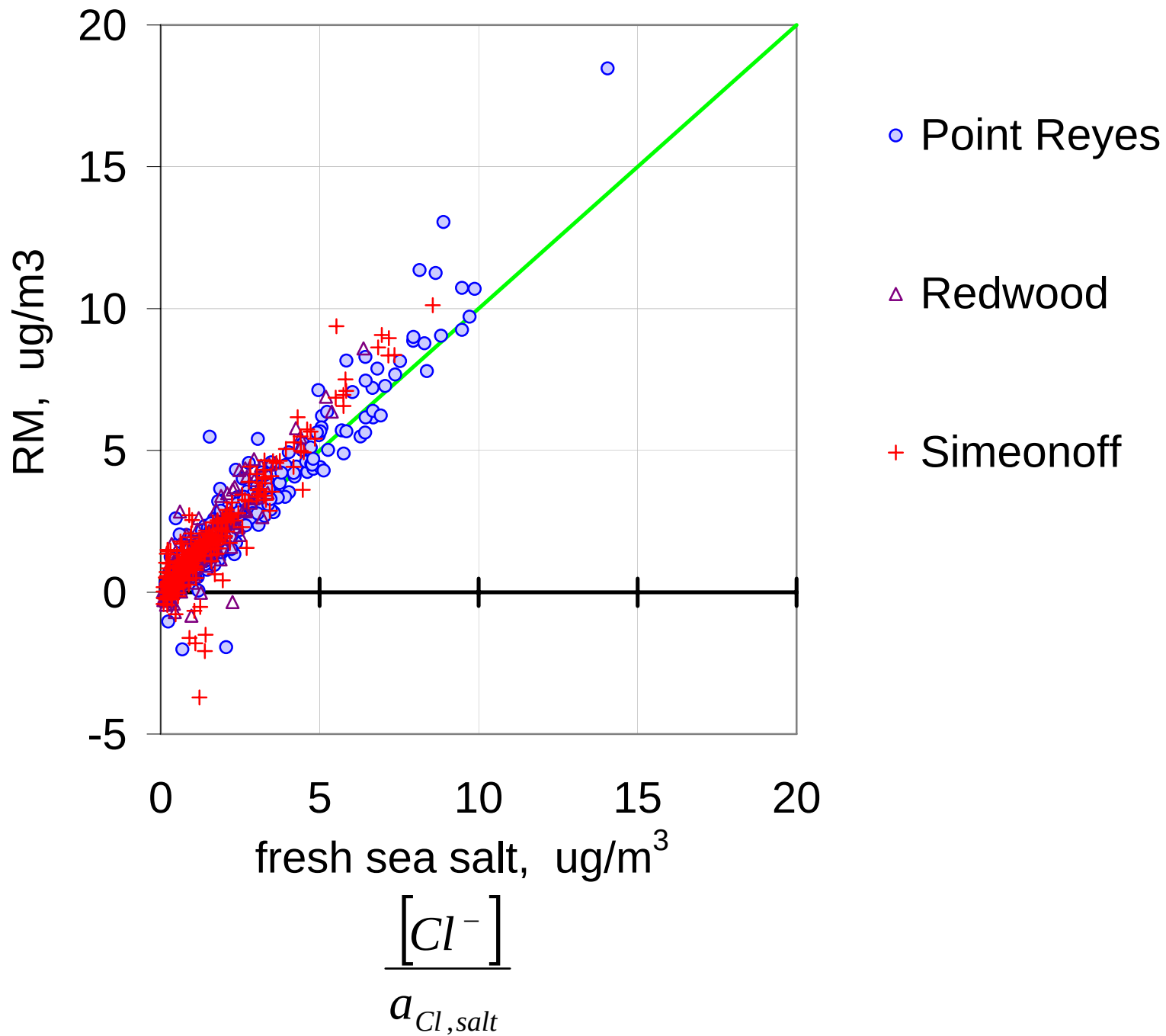


Point Reyes

← PIXE

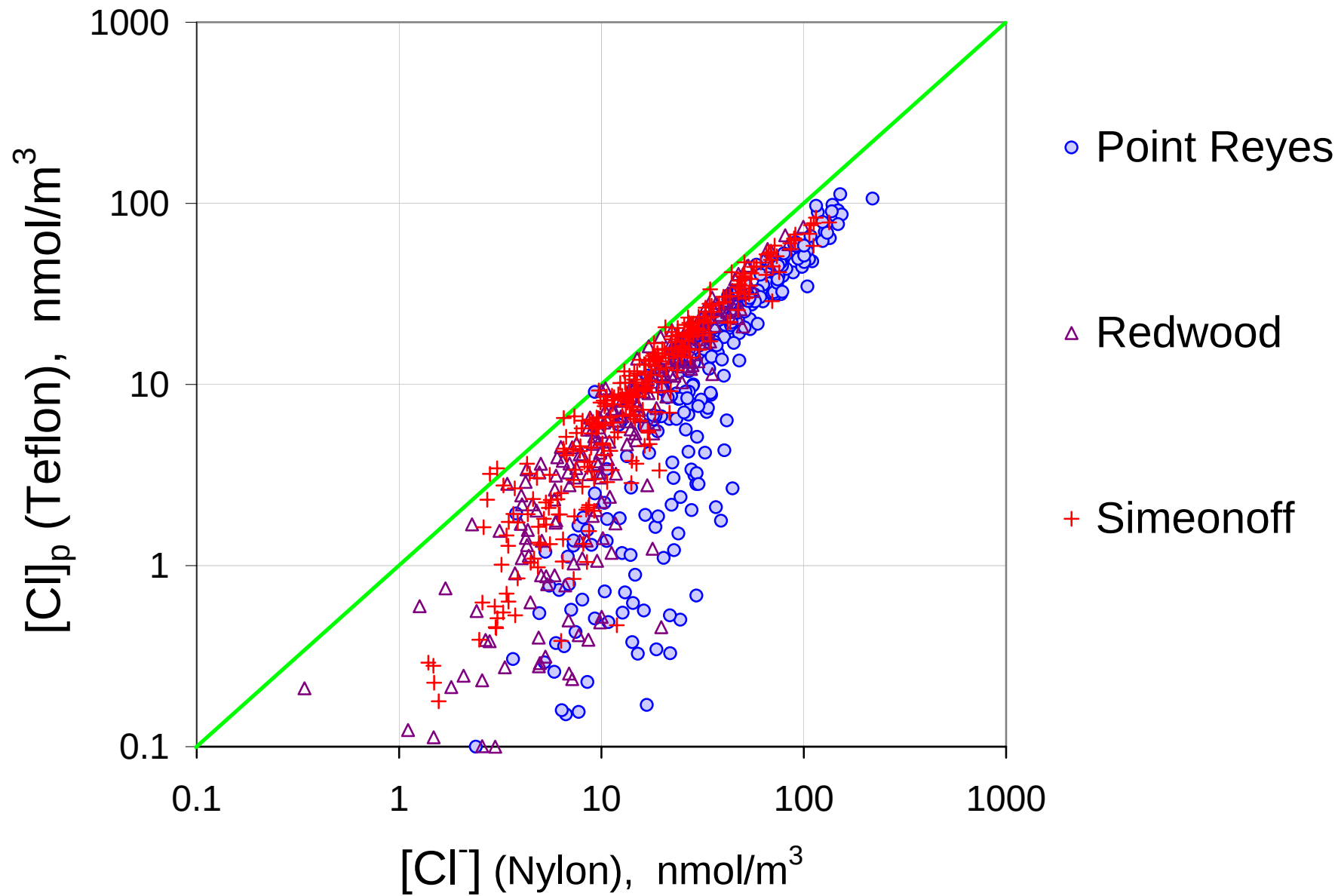
XRF →

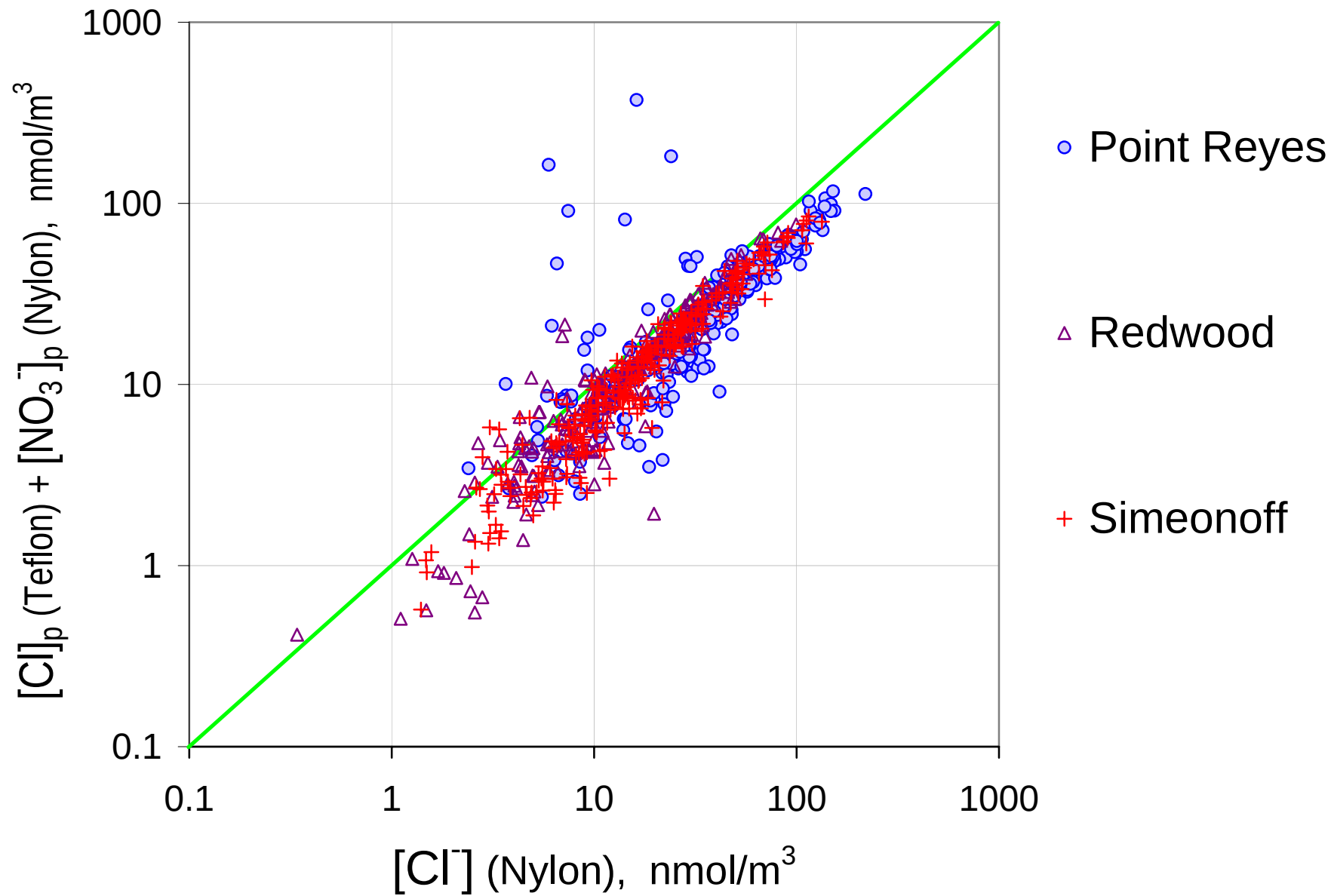


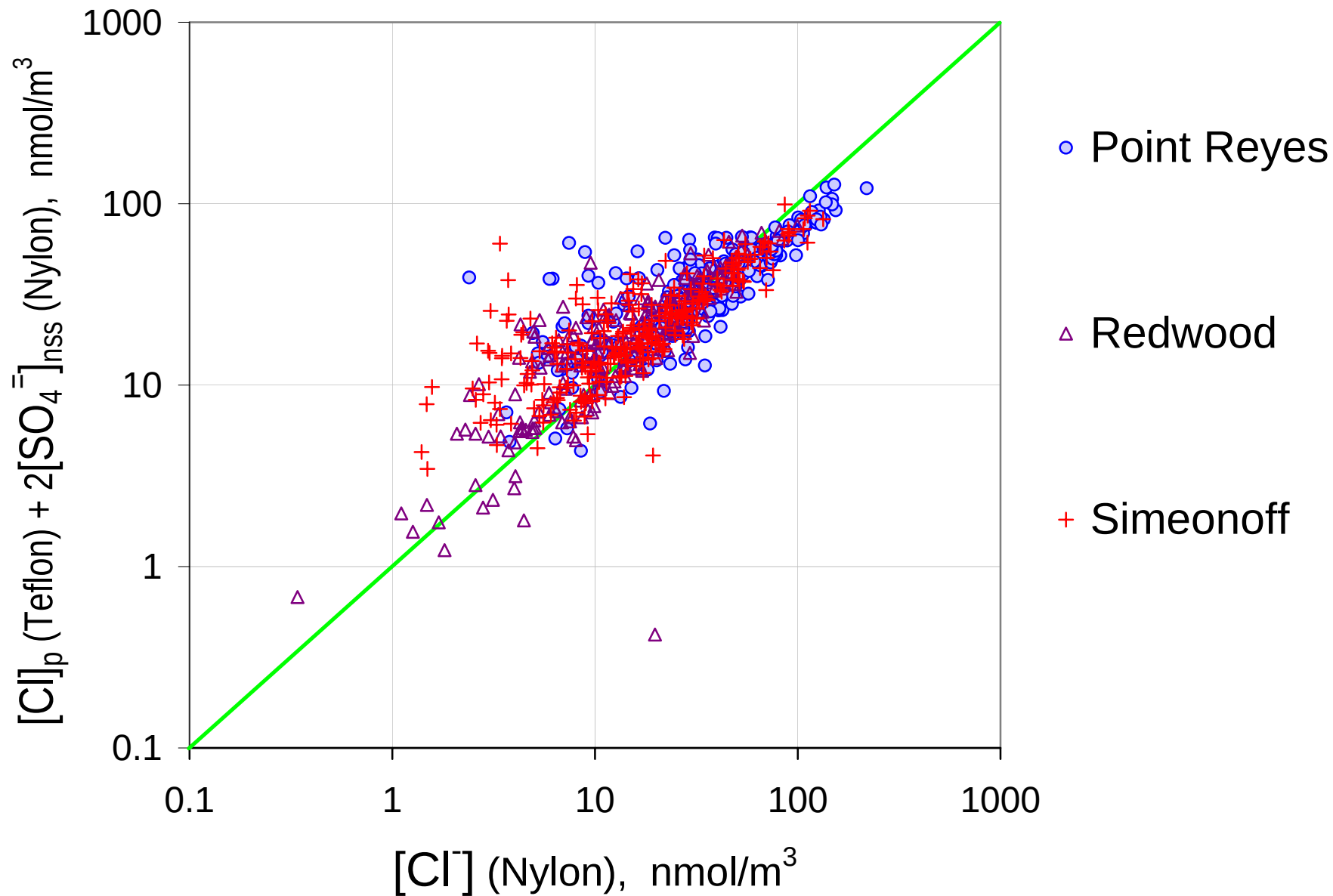


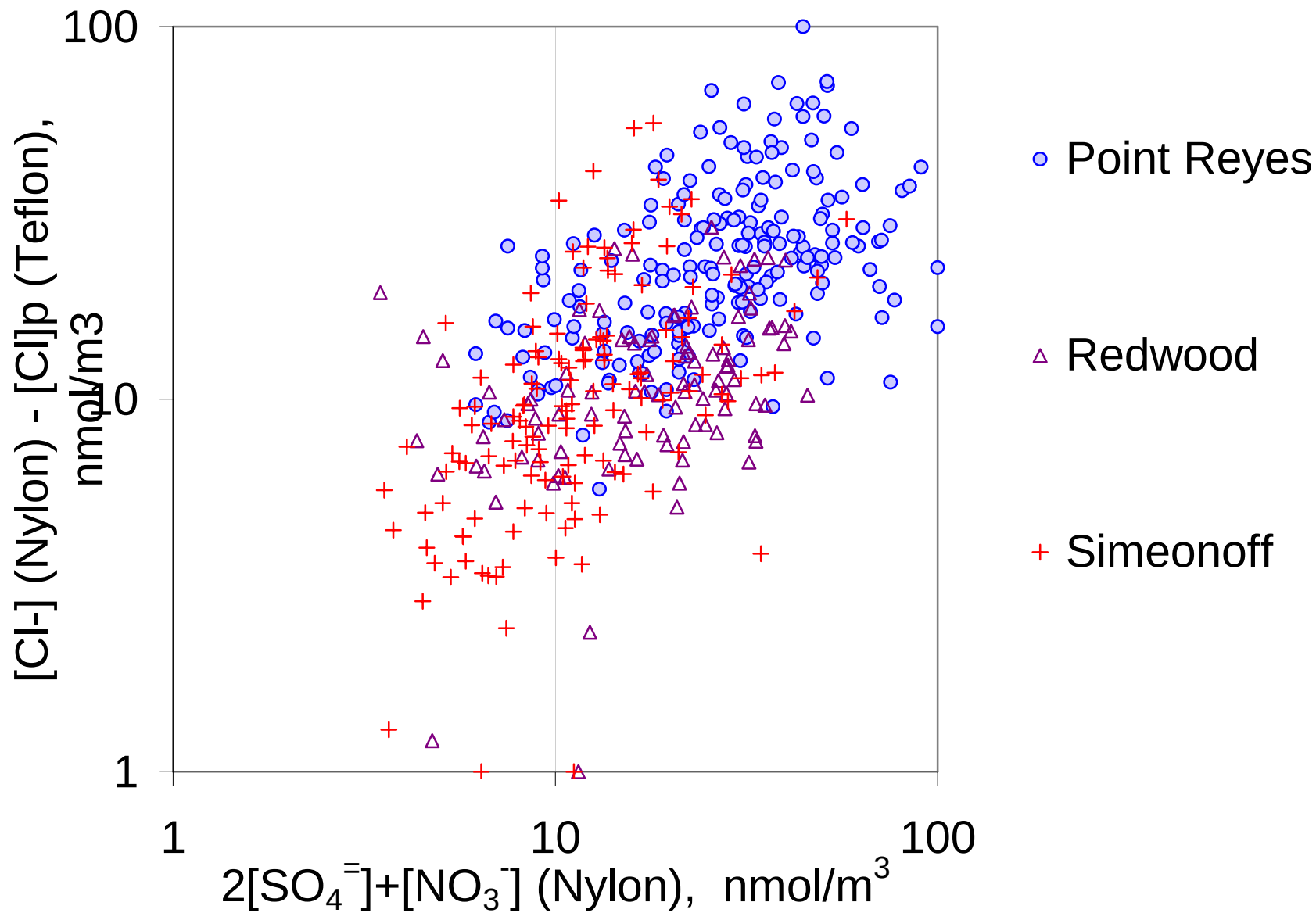
RM/Cl ⁻	PORE	REDW	SIME	CACO	MAVI	VIIS
m _g /seawater	1.08	1.16	1.17	1.10	1.20	1.45
ln s _g	0.23	0.23	0.16	0.31	0.22	0.34
"marine" samples	197	91	129	49	43	69
all valid samples	337	345	372	353	217	174

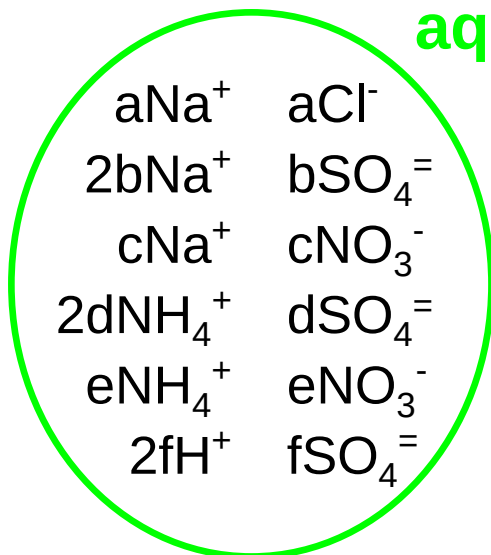
$$RM = FM - 1.8[C] - \frac{1}{a_{Fe,crust}}[Fe] - [NO_3] - [SO_4]$$



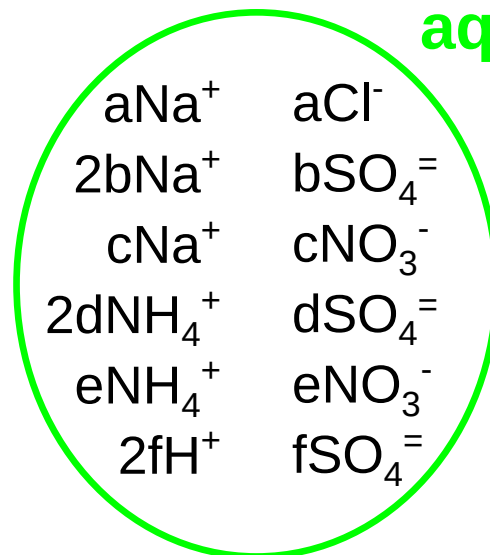








$g\text{HNO}_3$
 $h\text{HCl}$



denuder

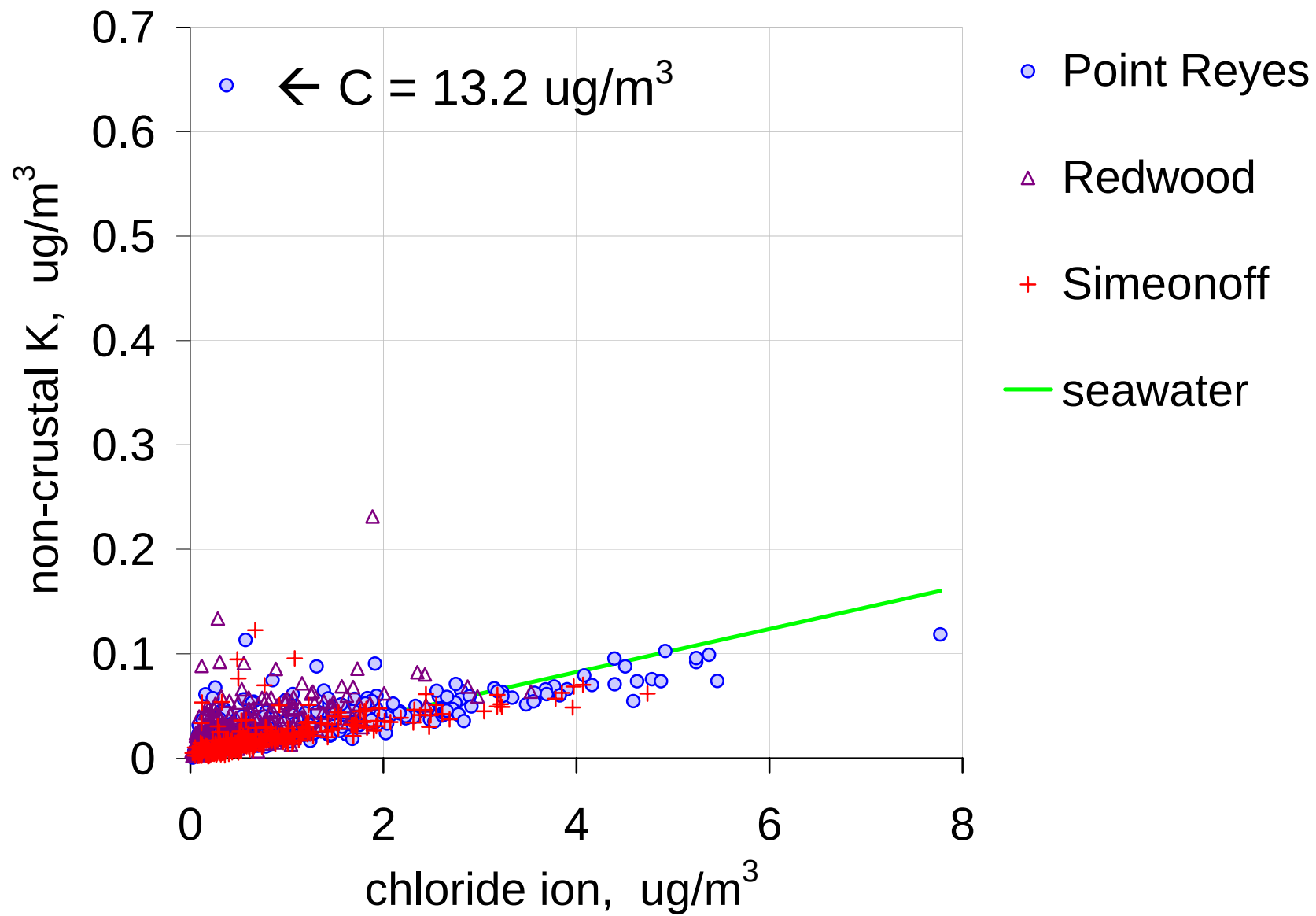
RM

$(a+2b+c)\text{Na}$
 $(2d+e)\text{NH}_4$
 $(a-2f-g)\text{Cl}$
 ~~$(c+e+g)\text{NO}_3$~~
 ~~$(b+d+f)\text{SO}_4$~~

Teflon

$a\text{Cl}$
 $(c+e)\text{NO}_3$
 $(b+d+f)\text{SO}_4$

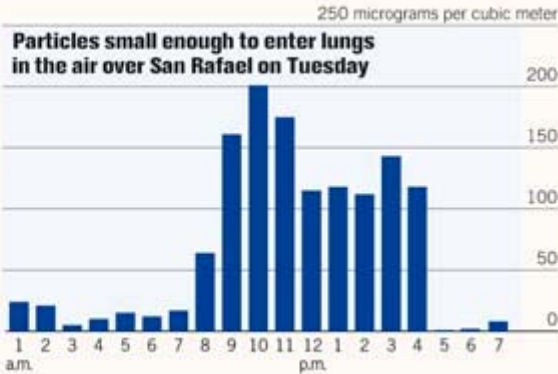
Nylon



Smoky hazard

Smoke from a fire in Yolo County contributed to a choking day for parts of the Bay Area on Tuesday. In San Rafael, particles of soot, dust and smoke small enough to enter air sacs in the lungs (10 microns, or less — about .0004 inches) increased dramatically as winds blew smoke over the area. At 10 a.m. there were 201 micrograms per cubic meter of the particles. Last year's average maximum 24-hour measurement was 41.

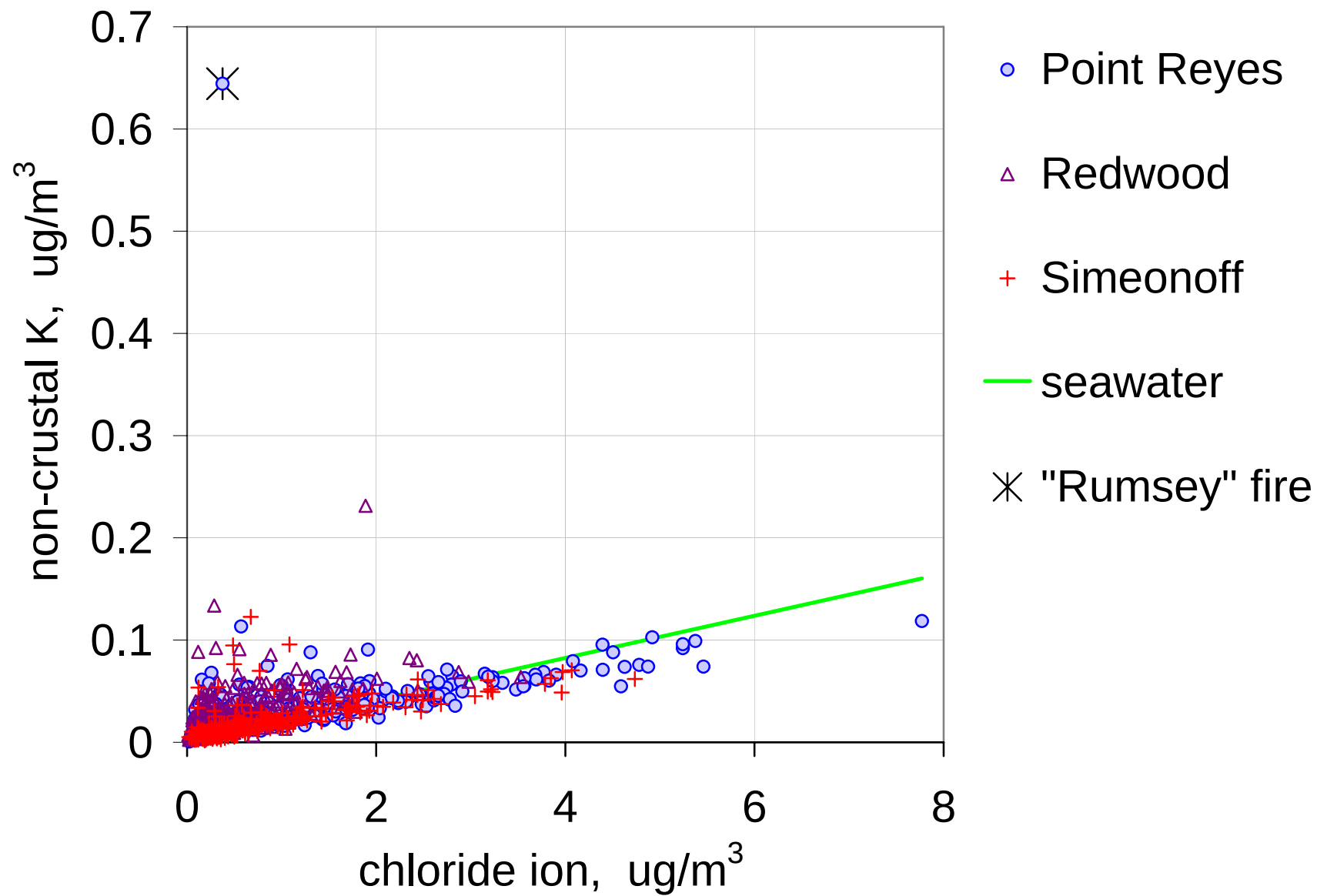
Note: Data may be revised.

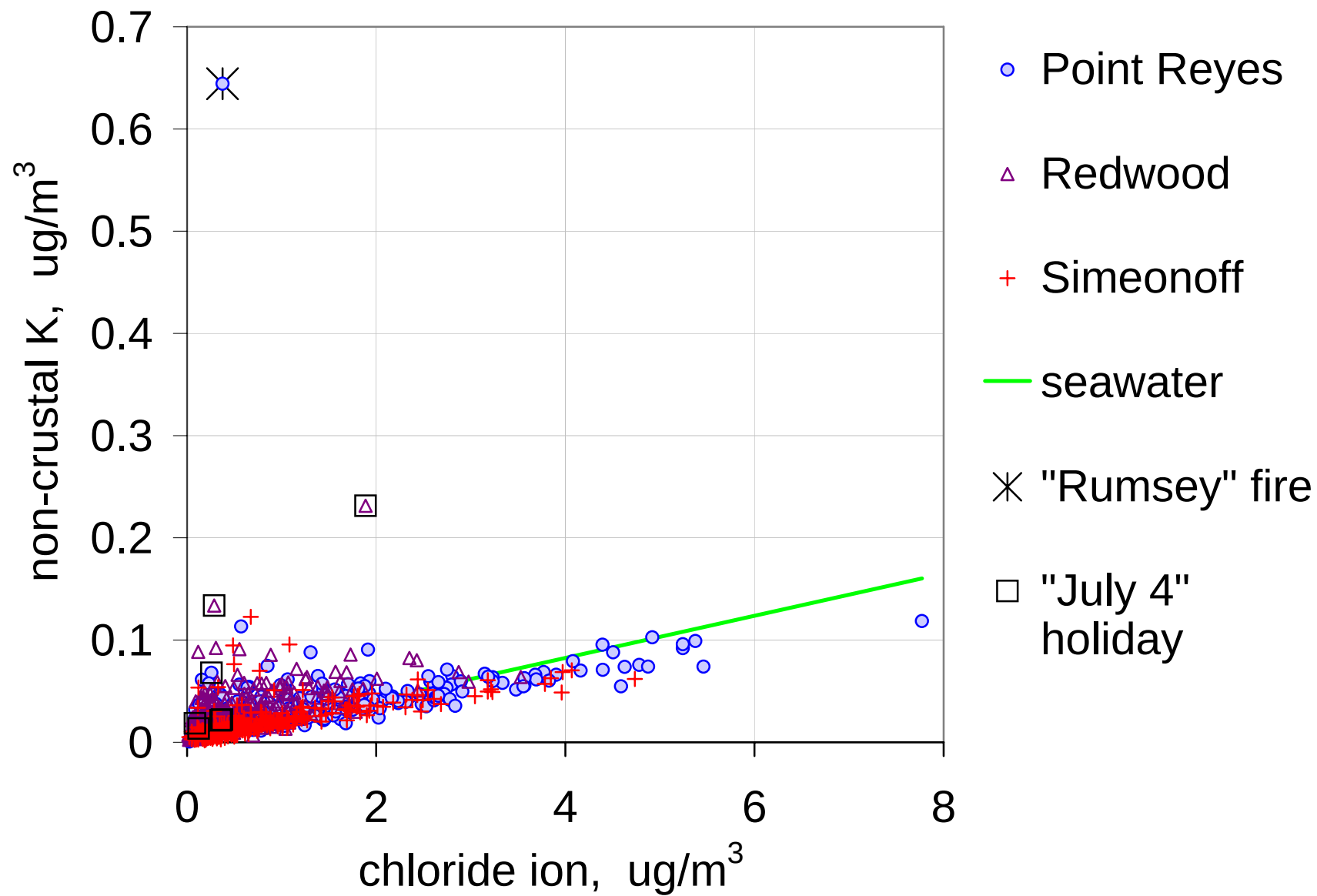


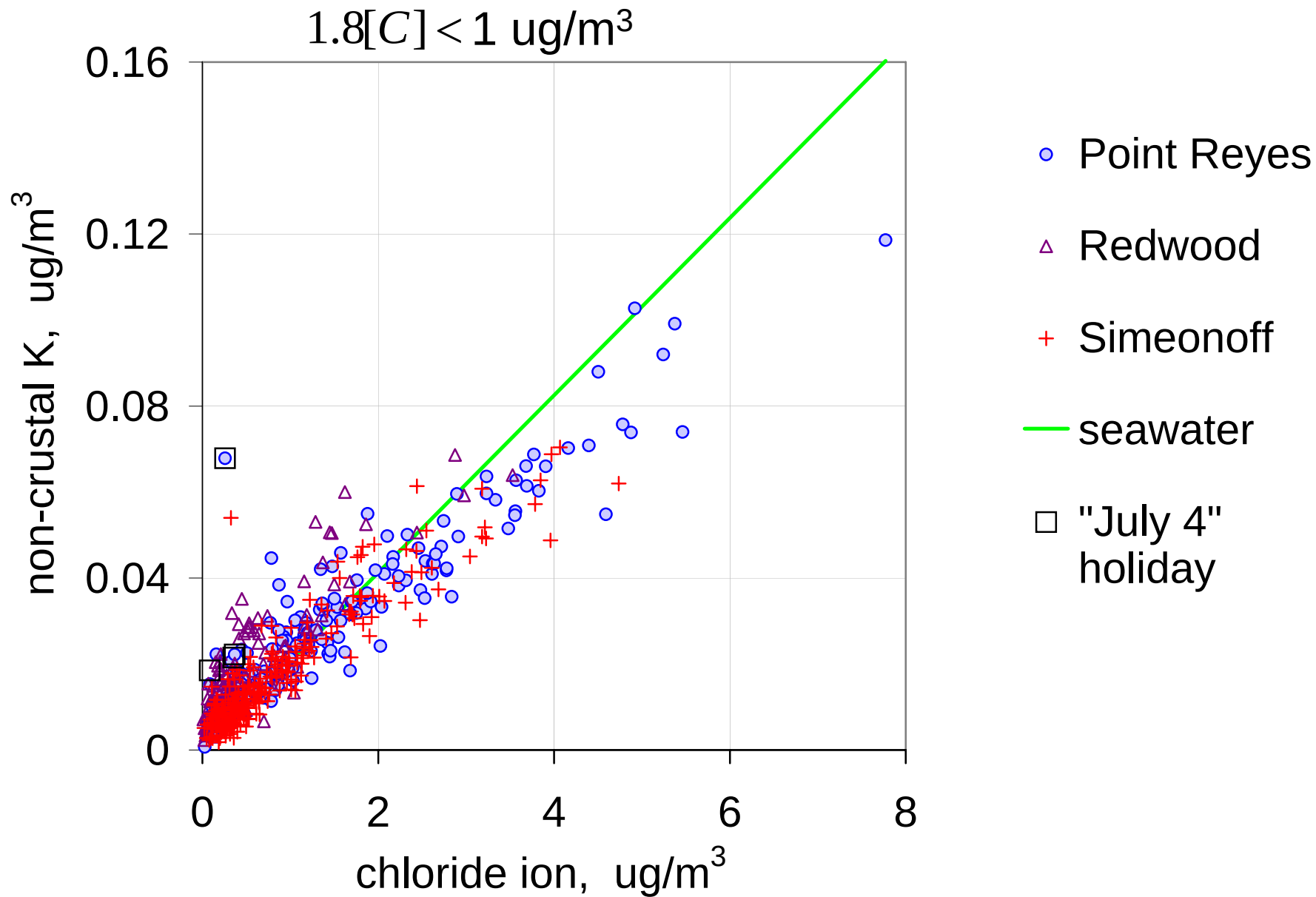
Source: Bay Area Air Quality Management District

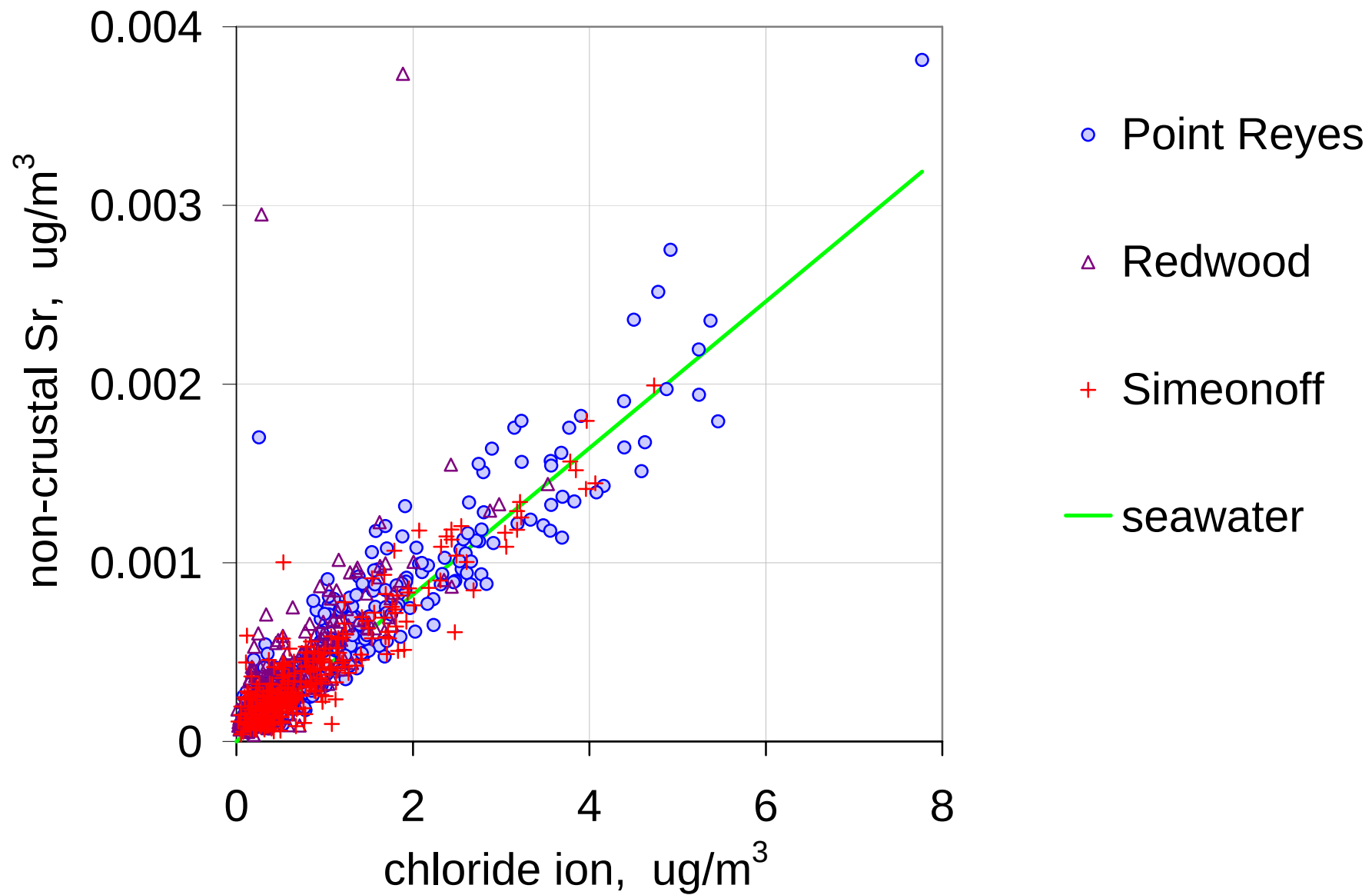
The Chronicle

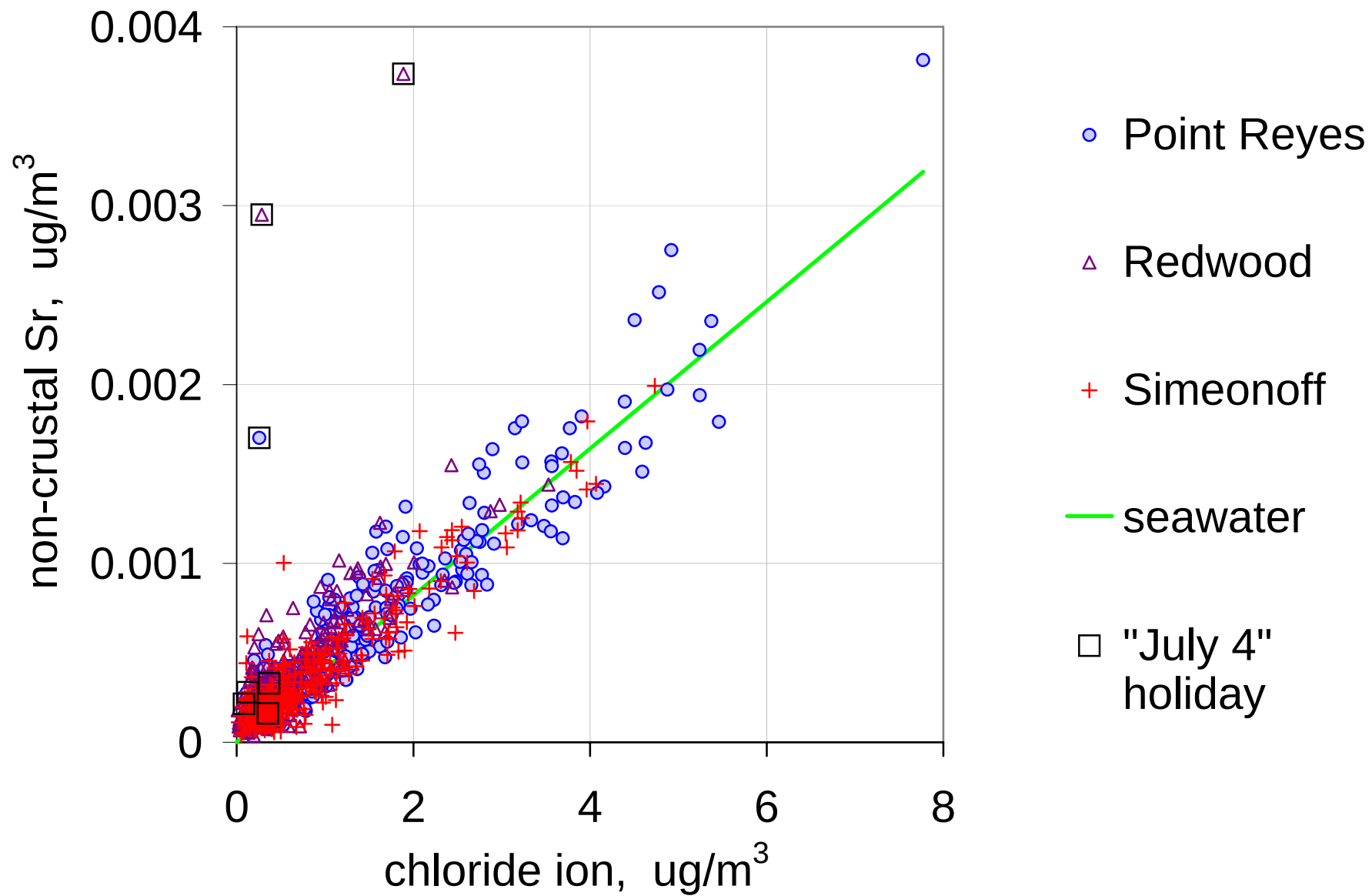












ratio	modules	m _g /seawater					
		PORE	REDW	SIME	CACO	MAVI	VIIS
Sr _{n-c} /Cl ⁻	A / B	1.08	1.23	0.97	1.20	1.18	1.17
K _{n-c} /Cl ⁻	A / B	0.96	1.23	0.96	1.31	1.17	1.20
Ca _{n-c} /Cl ⁻	A / B	0.99	1.18	0.99	1.18	1.24	1.08
Ca _{n-c} /Sr _{n-c}	A / A	0.92	1.00	1.03	0.96	1.07	0.93

$$X_{n-c} = [X] - \frac{a_{X,crust}}{a_{Fe,crust}} [Fe]$$