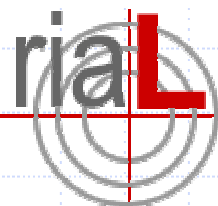




# SC-FAST Seawater Analysis

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Analytical Laboratory

# SC-2 with FAST Flow Injection



- ◆ Reduce analysis time
- ◆ Reduce memory effects
- ◆ Reduce ICP-MS cone salting and injector plugging
- ◆ Improve instrument efficiency



# SC-Fast Sea Water analysis on Element-XR

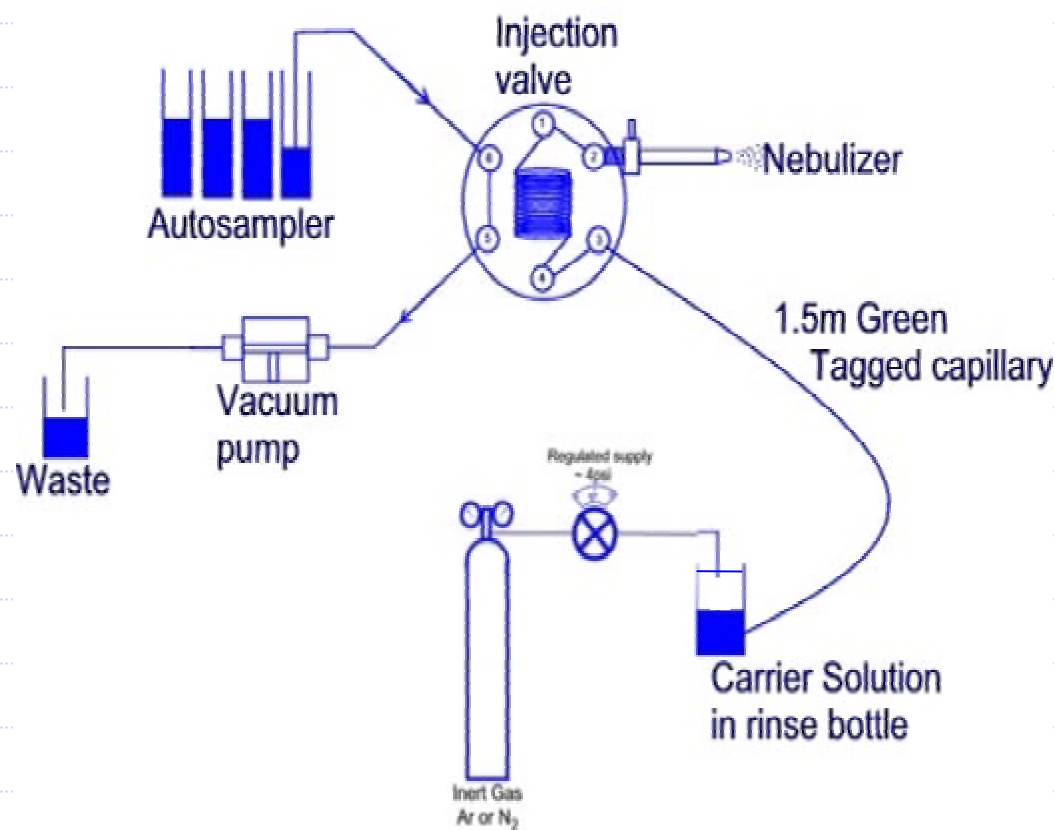


- ◆ 10% sea water (SW) diluted with 3% HNO<sub>3</sub>. (Real samples)
- ◆ Y internal standard
- ◆ Analysis Time
  - SC-FAST 10 sec load time; 2 min analysis time.
  - SIS 1 min load time; 2 min analysis time; 1 min rinse
- ◆ 120 unknown samples.
- ◆ 70 standards, blanks and CRMs.
- ◆ Matrix match Std curve
- ◆ 4 point curve, 1 Blank, 1 NASS-5 every 12 unknowns
- ◆ Total 180 injections of SW and 10 injections of acid blank (only SW injections plotted).
- ◆ No cleaning of cones between day

# Pressurized Gas Delivery System of Carrier Solution



- ◆ Pulse free delivery
- ◆ Controlled low flow rates
- ◆ No peristaltic pump tubing
- ◆ Ensures low background

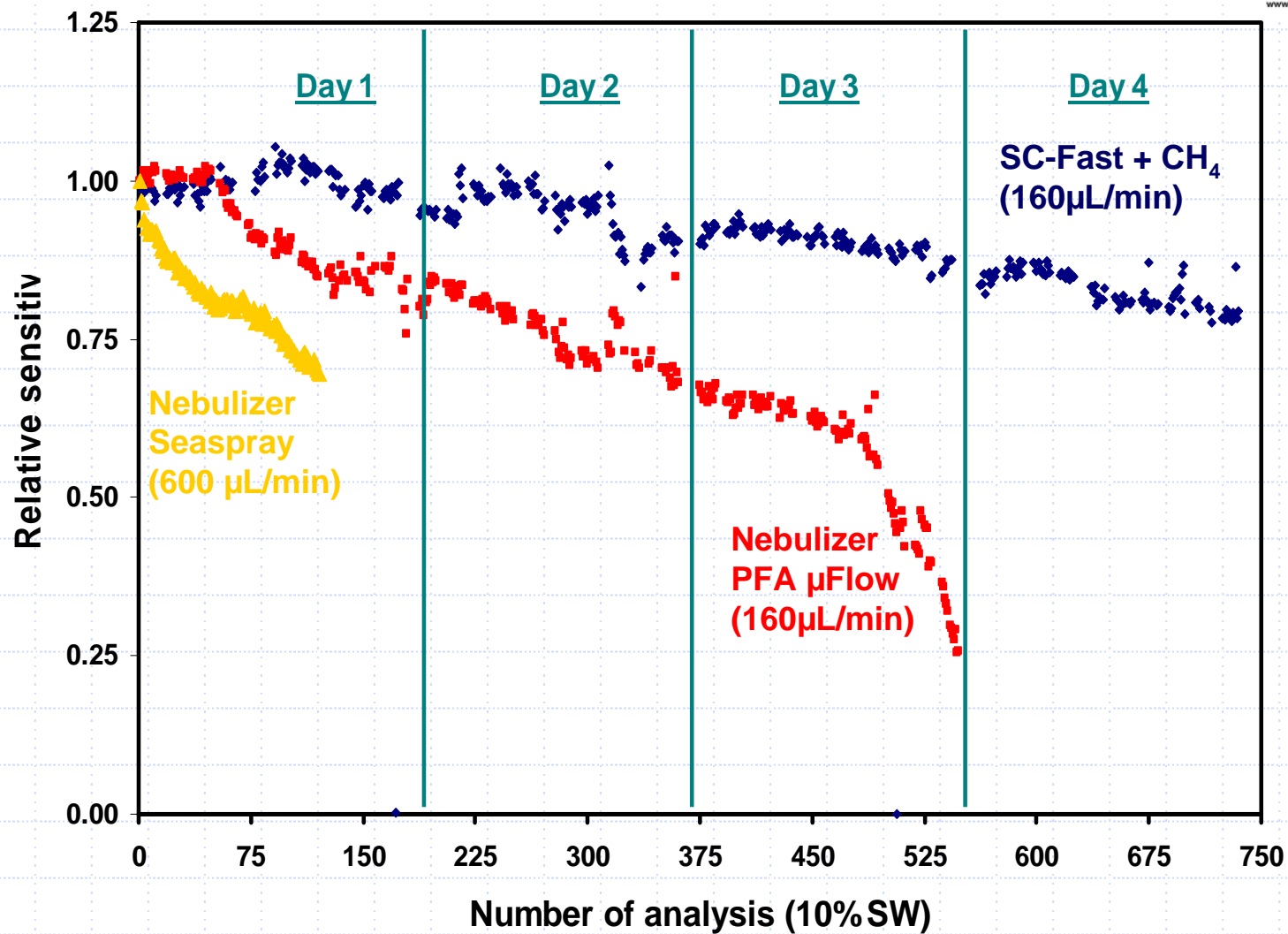


# System set-ups



Standard Set-up	PFA MicroFlow	SC-FAST + CH <sub>4</sub>
Sea spray (600µL/min)	µFlow (160µL/min)	µFlow (160µL/min)
Glass spray Chamber	PFA spray Chamber	PFA spray Chamber
1500W	1500W	1500W
Tuned on 10% SW	Tuned on 10% SW	Tuned on 10% SW
1 min uptake, 2 min analysis, 1 min wash	1 min uptake, 2 min analysis, 1 min wash	10 sec uptake, 2 min analysis 10% SW
10% SW	10% SW	2min 10 sec/sample
4 mins/sample 120 unknowns = 14hrs	4 mins/sample 120 unknowns = 14hrs	120 unknowns = 7.25 hrs

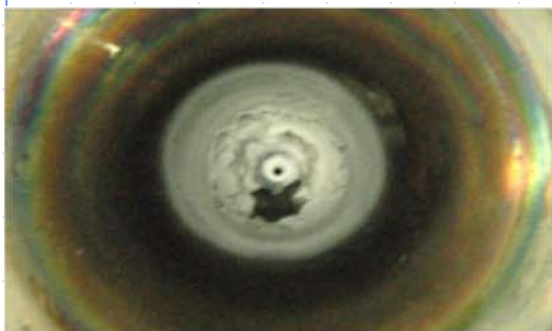
# Sensitivity Drift (Y)



# Cone Deposition



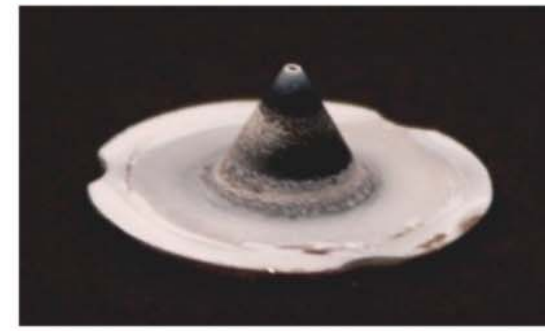
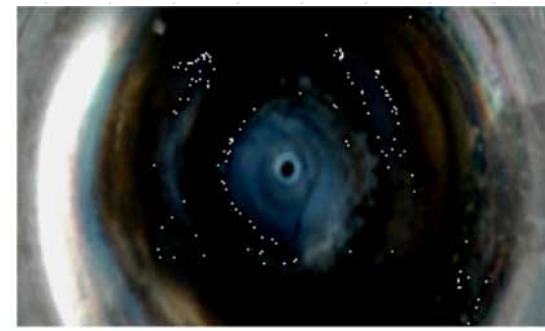
Cones after Sea Spray  
120 analysis



Cones after  $\mu$ Flow  
540 analysis

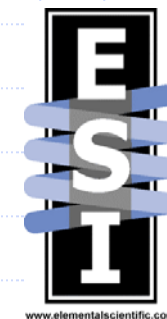


Cones after CH<sub>4</sub> SC-Fast  
740 analysis



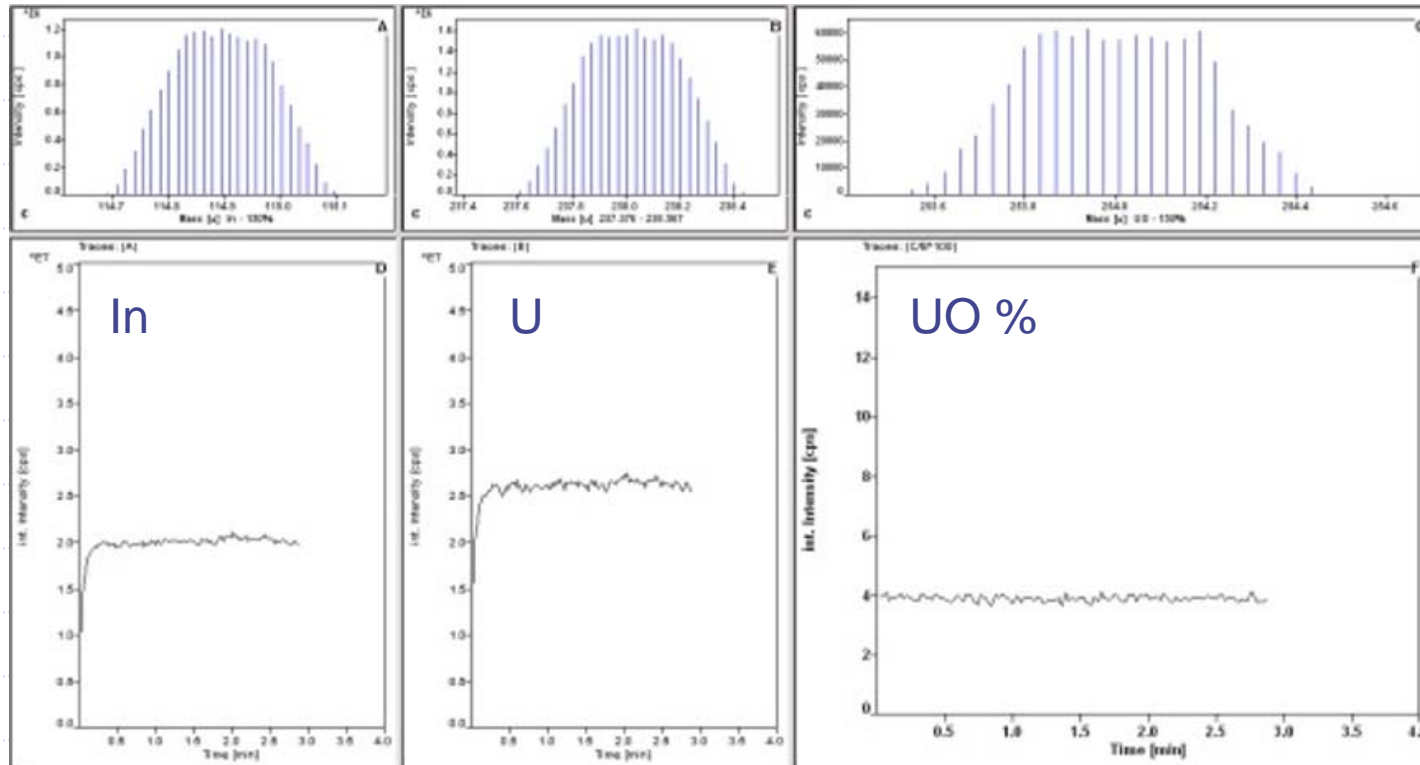
- 30% reduction in salt loading
- More effective rinsing between samples
- <20% Drift

# Analysis Time



	Standard Introduction System	SC-FAST
Sample Measurement time	4min	2min 10sec
No. of samples	190	190
Dead Time/sample	25sec	7.5sec
Total time	14hr	7hr 15min
Time saved per run =		6hr 45min

# Tuning

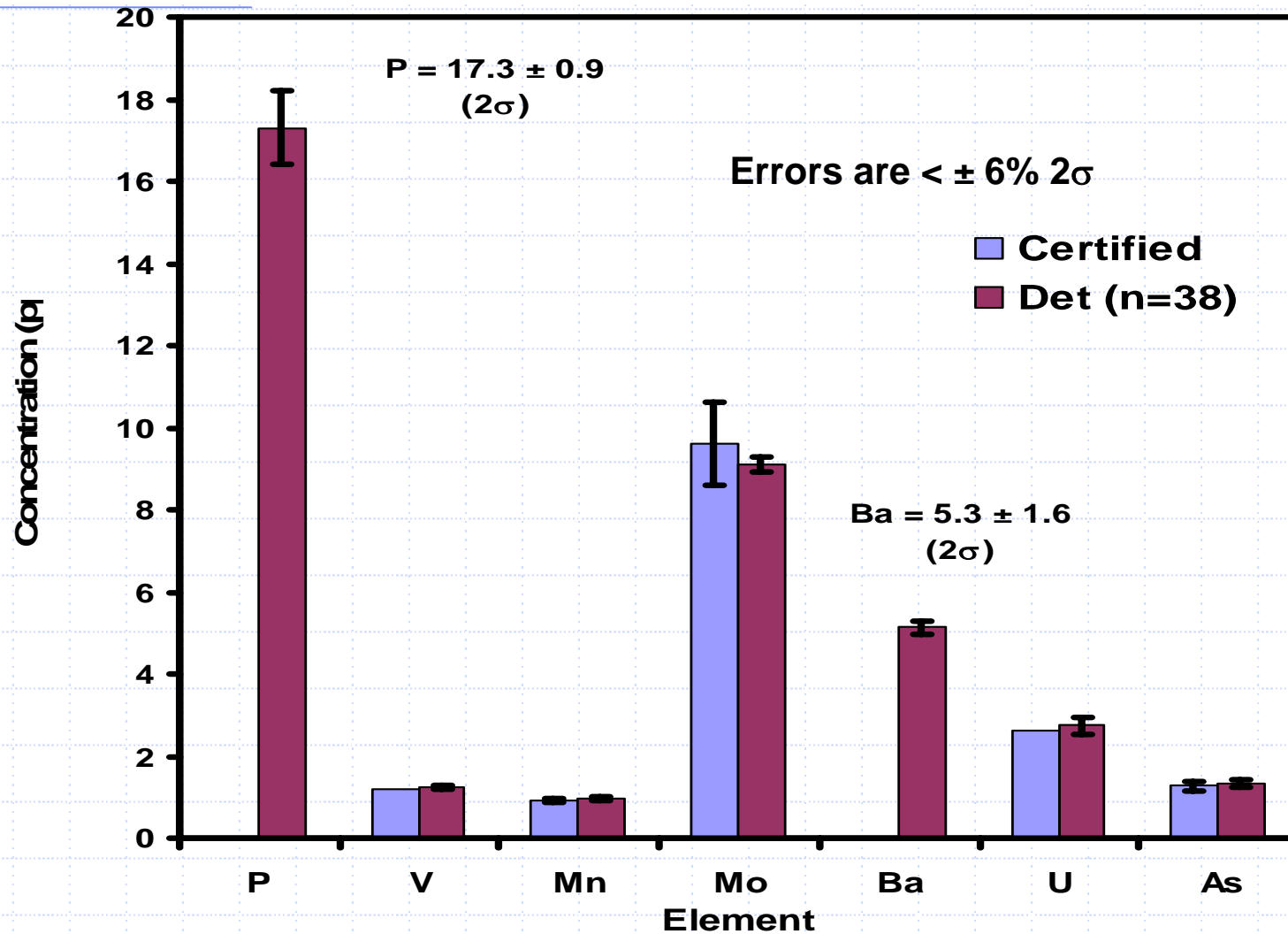


1ppb Tune, PFA-ST flow rate 160 $\mu$ L/min  
PFA Spray chamber with CH<sub>4</sub> addition

# NASS-5 (n=38) 4 Days



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# SC-Fast: Detection Limits

**Detection limits (160 $\mu$ L/min, PFA spraychamber )**  
**SC-FAST with CH<sub>4</sub> addition**

Element	Resolution	Blank (ppt)	DL (ppt)
P	MR	67.50	5.00
V	MR	0.18	0.18
Mn	MR	1.00	0.50
Mo	MR	0.64	1.11
Ba	MR	0.40	0.49
U	MR	0.00	0.04
As	HR	0.21	0.30

# Summary

- ◆ Maintains instrument sensitivity, accuracy and stability
- ◆ More effective rinsing of introduction system
- ◆ Reduces total matrix reaching cones
- ◆ Extends time between cone maintenance
- ◆ Dramatically reduces total analysis time



# Future Applications SC-FAST



- ◆ Automated LC-ICPMS interface
- ◆ Multiple injections per single analysis
  - Minimize sample loading to the ICPMS cones of aggressive samples (e.g.  $\text{H}_3\text{PO}_4$ )
  - Multiple collision/reaction cell conditions