

Quality assurance and quality control, QA/QC

- Siting of station
- Choice of methods
- Sampling
- Sample storage
- Analysis
- Reporting
- Intercomparison

Sampling

- PM₁₀: Air flow, undamaged filter, leakage
- Gas wash bottle: volume of solution
- Precipitation: Volume measurement, contamination check with de-ionised water
- All verifications should be noted in the sampling protocol that has to be filled in and signed at each occasion.

Analysis

- Start with the most unstable items (pH, NH_4^+ , conductivity).
- Check the conductivity of your de-ionised or distilled water.
- Check temperature of refrigerator.
- Use analysis quality (p.a.) of chemicals.
- Note the date when you received the chemicals and when they were first opened.
- Use ampoules (when possible) to prepare standard solutions.
- Use mass instead of volume for making dilutions.
- Check your analytical balance.
- Make duplicate analysis whenever possible.
- Always analyse a reference solution.
- Let another person check your calculations.
- Note all verifications in a diary.

Checking results

- Is PM_{10} reasonable
- Are gas phase concentrations reasonable

Precipitation

- Calculate ion balance
- Check measured with calculated conductivity
- Contamination? (high NH_4^+ and pH indicates bird dropping contamination).

	$\text{mS m}^{-1} (\text{mg/l})^{-1}$	$\text{S m}^{-1} \text{M}^{-1}$	$\text{mS m}^{-1} (\text{eq/l})^{-1}$
H^+	35	35.0	35.0
NH_4^+	0.41	7.4	7.4
Ca^{2+}	0.30	11.9	5.9
Mg^{2+}	0.44	10.6	5.3
Na^+	0.22	5.0	5.0
K^+	0.19	7.3	7.3
HCO_3^-	0.07	4.5	4.5
Cl^-	0.22	7.6	7.6
NO_3^-	0.12	7.1	7.1
SO_4^{2-}	0.17	16.0	8.0

$$\Sigma \text{ cations} \approx \frac{\text{EC}}{13} - 2000 \cdot 10^{-\text{pH}}$$

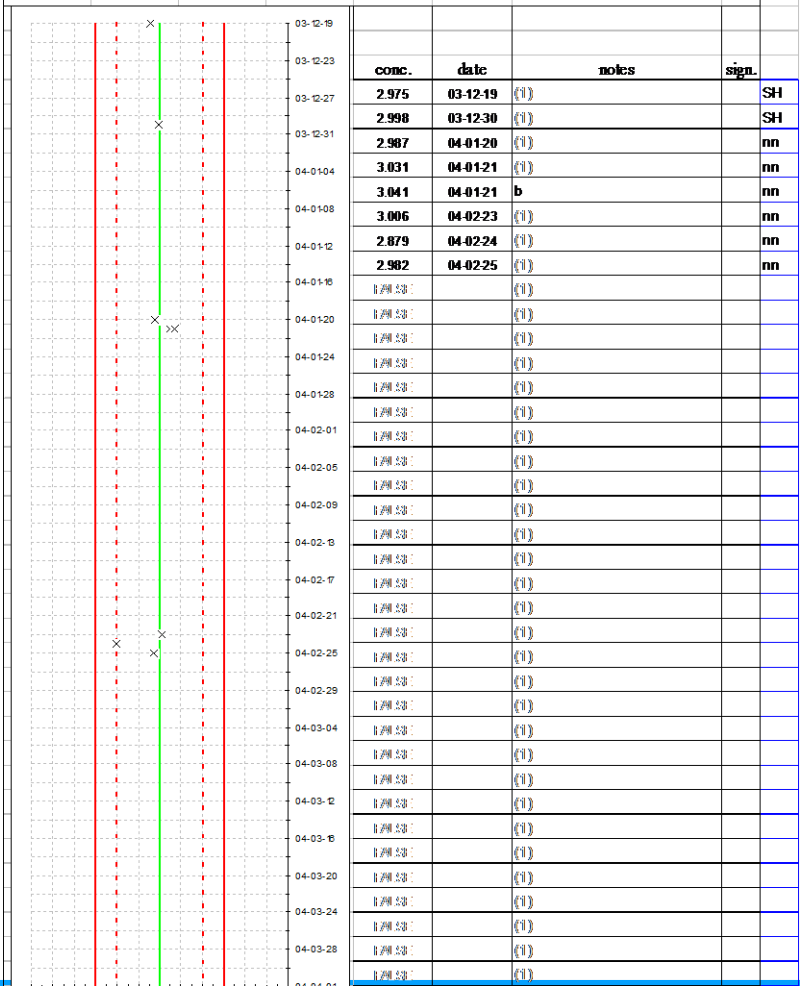
[meq/l] [mS/m]

$$EC = \sum C_i \cdot f_i$$

start	stop	ml	mm	pH	EC 25	Cl ⁻	NO ₃ ⁻	SO ₄ ²⁻	NH ₄ ⁺	Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	ion balance	EC/EC
precipitation					mS/m	mg/l	mgN/l	mgS/l	mgN/l	mg/l	mg/l	mg/l	mg/l	+/-	c/m
92-09-15	92-09-30	550	17.5	4.40	1.72	0.00	0.000	0.640	0.000	0.000	0.00	0.00	0.00	1.00	1.00
92-09-30	92-11-03	4570	145	4.70	0.86	0.00	0.000	0.320	0.000	0.000	0.00	0.00	0.00	1.00	1.00
92-11-03	92-11-24	2220	70.7	4.36	3.08	1.63	0.495	0.601	0.323	0.06	0.12	0.97	0.09	1.04	0.94
92-11-24	92-12-30	3600	115	4.36	3.52	3.28	0.556	0.766	0.463	0.14	0.21	1.87	0.12	1.03	1.05
92-12-30	93-01-28	3440	109	4.75	4.65	8.23	0.383	0.878	0.281	0.42	0.62	4.82	0.21	1.03	1.00

X-card nitrate medium

Reference standard:	F23	number of values	8
Method	A1	average (x):	2.9874
Parameter, conc.	NO3-N 3.000 mg/L	variance (s ²):	0.002452
Alarm level (x±2s):	2.888 3.086	std. dev. (s):	0.04952
Action level (x±3s):	2.839 3.136	%CV:	1.66%
		difference from ref.	0.421%



Comparison with diffusive sampling

Station	Start	Stop	Temp °C	SO₂ µg/m³ STP	NO₂ µg/m³ STP
Bhutan, Stn 2	2003-09-03 10:00	2003-11-25 10:00	20.0	0.1	0.5
Bhutan, Stn 2	2003-11-25 10:00	2003-12-25 10:00	20.0	0.2	1.1
Bhutan, Stn 2	2003-12-25 10:00	2004-01-25 10:00	20.0	0.2	1.6
Maldives., Stn 4	2003-07-31 09:45	2003-08-30 10:15	20.0	<0.1	1.2
Maldives, Stn 4	2003-08-30 10:15	2003-09-30 12:00	20.0	0.2	0.3
Maldives, Stn 4	2003-09-30 12:00	2003-11-01 12:00	20.0	<0.1	0.3
Maldives, Stn 4	2003-11-01 12:00	2003-11-30 12:00	20.0	1.0	1.8
Nepal, Stn 1	2003-03-25 12:00	2003-06-07 12:00	20.0	0.6	6.4
Nepal, Stn 1	2003-03-25 12:00	2003-06-07 12:00	20.0	0.9	6.7
Nepal, Stn 1	2003-06-07 12:00	2003-07-31 12:00	20.0	0.3	2.8
Sri Lanka, Stn 3	2003-08-15 13:15	2003-10-02 17:15	20.0	0.8	2.6
Sri Lanka, Stn 3	2003-08-15 13:15	2003-10-02 17:15	20.0	0.8	2.5
Sri Lanka, Stn 3	2003-10-02 17:15	2003-11-05 15:15	28.0	0.5	2.5
Sri Lanka, Stn 3	2003-10-02 17:15	2003-11-05 15:15	28.0	0.6	2.4
Sri Lanka, Stn 3	2003-11-05 15:20	2003-11-29 11:00	28.0	<0.1	0.7
Sri Lanka, Stn 3	2003-11-29 11:05	2003-12-26 15:45	28.0	<0.1	0.8