Particulate Matter (PM2.5) in Manchester

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Devices

Five types of devices measured PM2.5 in Manchester:

- AQMesh - AQM389
- Aeroqual - AQY874
- AriSense - Ari086
- Purple Air - PA2, PA5, PA9
- Zephyr - Zep311

This report aims to show how well the devices have performed throughout the study measuring PM2.5 in Manchester.

Interpreting the Data

Interpreting the data

- Time-series - the darker red colour shows the overlap betweeen the lcs measurements and the reference measurements taken.
- RMSE - the closer the value is to 0, means that the reference values closely matched the tested sensors values.
- Bias - the difference between average sensor measurements and the average reference measurements
- CRMSE - similar to the RMSE but with the bias subtracted. This measures error around an average.
- R-squared (r2) - a value closer to 1 indicates the regression predictions fit more accurately.
- Drift - a gradual increase shows a larger effect of RMSE, CRMSE or bias that the device possesses.

Equations Used

$$\text{RMSE}(R,\ L)\ =\ \sqrt{\frac{\sum_{i=0}^{n-1}(R_i-\ L_i)^2}{n}}$$

- R = reference measurement.
- L = LCS measurement
- n = number of measurements
- $\sum$ = sum of

$$\text{CRMSE(R, L)} = \sqrt{\text{mean}(L_i - R_i - \overline{L} + \overline{R})^2}$$

- R = reference measurement.
- L = LCS measurement
- $\overline{L}$ = mean LCS measurement
- $\overline{R}$ = mean reference measurement

$$\text{Bias}(R,\ L) \quad = \quad |\overline{L} \quad - \quad \overline{R}|$$

- $\overline{L}$ = mean LCS measurement
- $\overline{R}$ = mean reference measurement

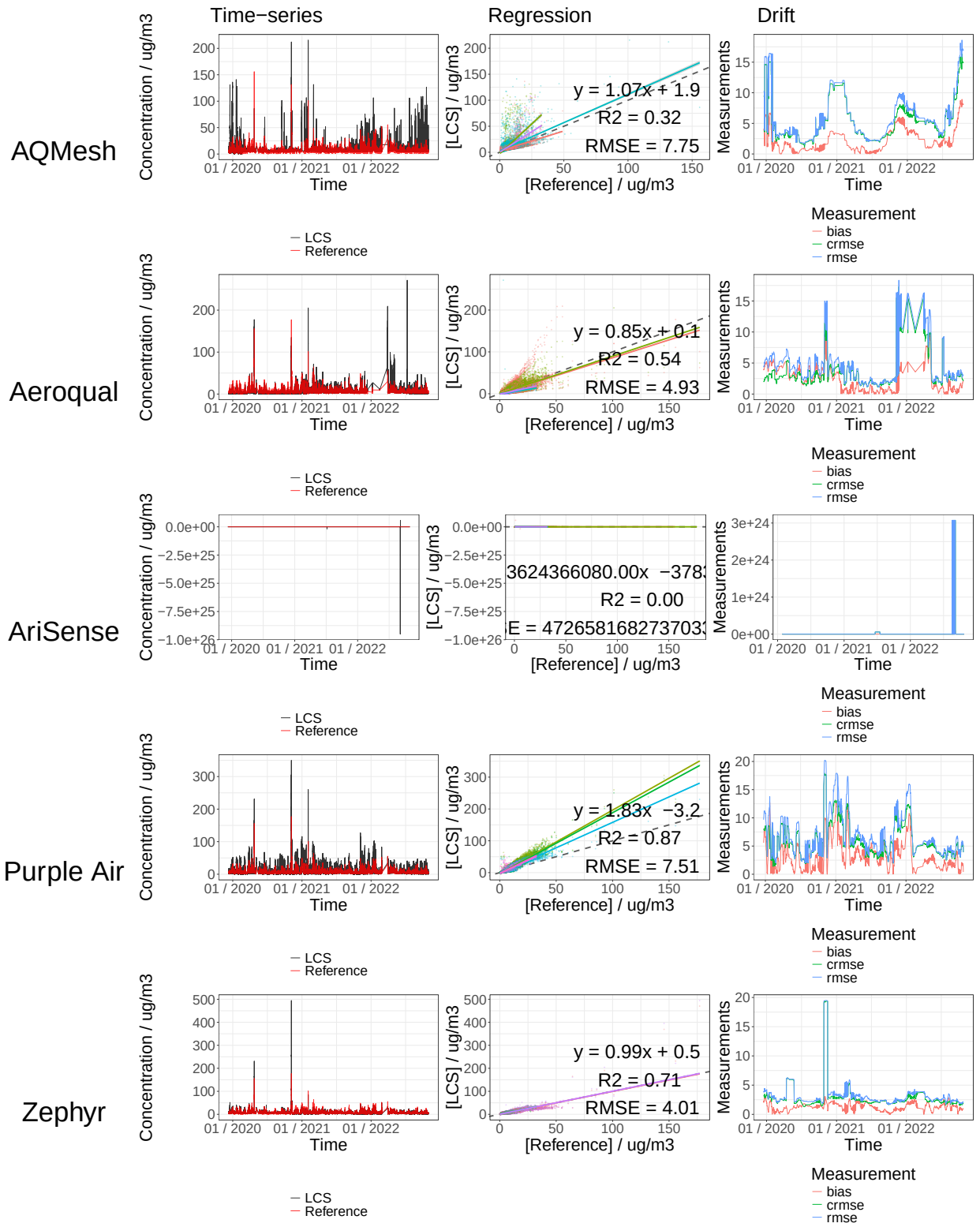

Figure 1: Quantiative evaluation. Column 1: Time-series plot of the LCS measurements (black line) vs the reference measurements (red line). Column 2: Regression plot of the instruments in London against reference data. The grey line represents y=x. Column 3: Measure of drift plot (blue line indicates root mean squared error (RMSE), the red line represents the mean bias and the green line shows the centered root mean squared error (CRMSE)).