

# Field Evaluation aeroQUAL S500 OZU



# Background

- From 02/10/2015 to 04/14/2015, three **aeroQUAL S500 (model OZU, 0-0.15 ppm)** units were deployed in Rubidoux at SCAQMD stationary ambient monitoring site and were run side-by-side with a Federal Equivalent Method (FEM) instrument measuring the same pollutant
- aeroQUAL S500 OZU (3 units tested):
  - Gaseous sensors (**metal oxide; non-FRM, non-FEM**)
  - Each unit measures: Ozone (pphm)  
**Unit cost: ~\$500**
  - Time resolution: 1-min
  - Units IDs: AQ #1, AQ #2, AQ #3
- SCAQMD FEM instruments:
  - Ozone instrument; **cost: ~\$7,000**
  - Time resolution: 1-min

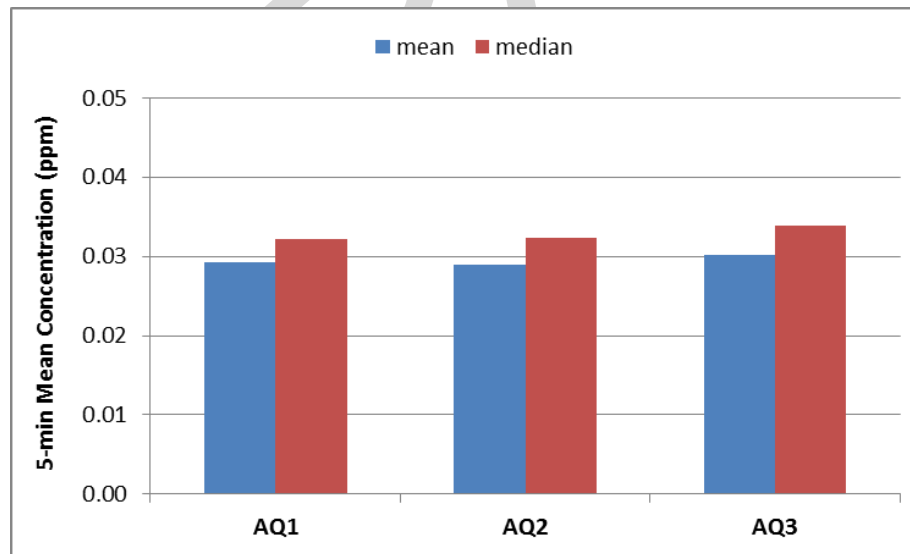


# Data validation & recovery

- Basic QA/QC procedures were used to validate the collected data (i.e. obvious outliers, negative values and invalid data-points were eliminated from the data-set)
- Data recovery for ozone from all three units was close to 100%

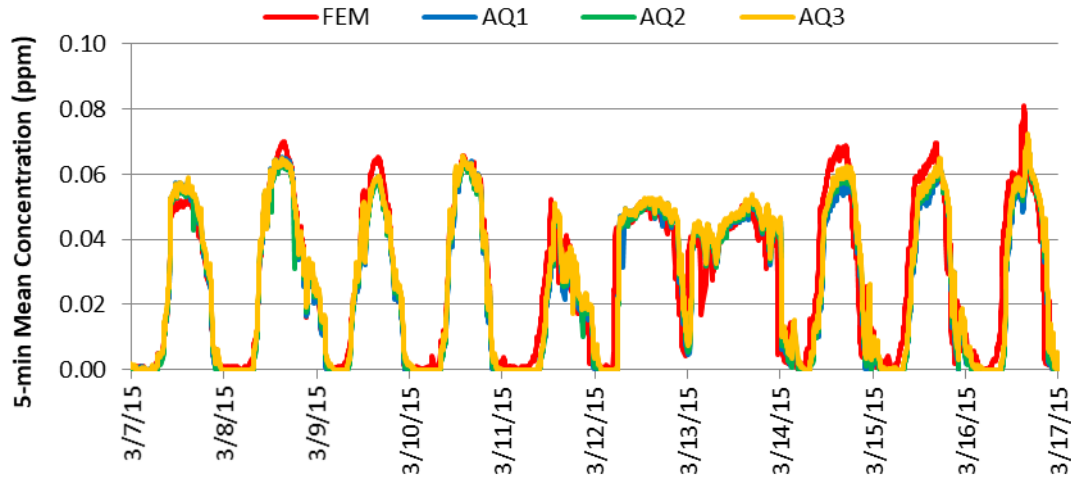
## aeroQUAL S500; intra-model variability

- Very low measurement variability was observed between the three aeroQUAL S500 units



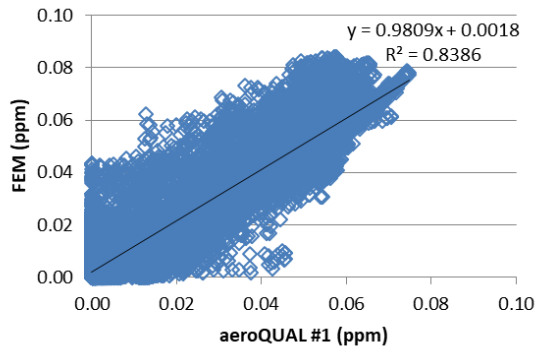
# aeroQUAL S500 vs FEM (Ozone; 5-min mean)

## aeroQUAL S-500 vs FEM - Ozone

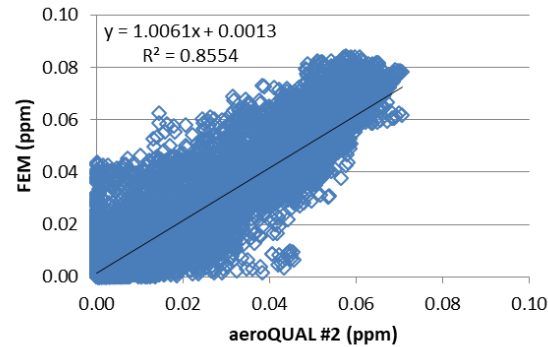


- All ozone measurements correlate very well with the corresponding FEM data ( $R^2 > 0.83$ )

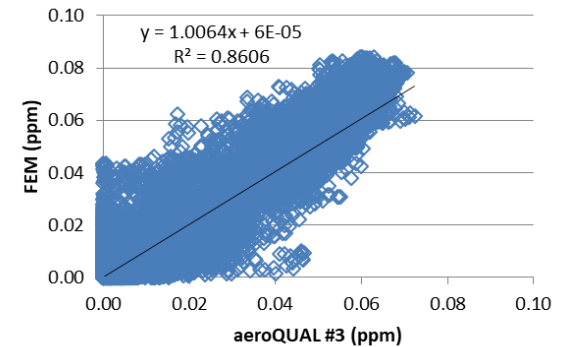
### Ozone



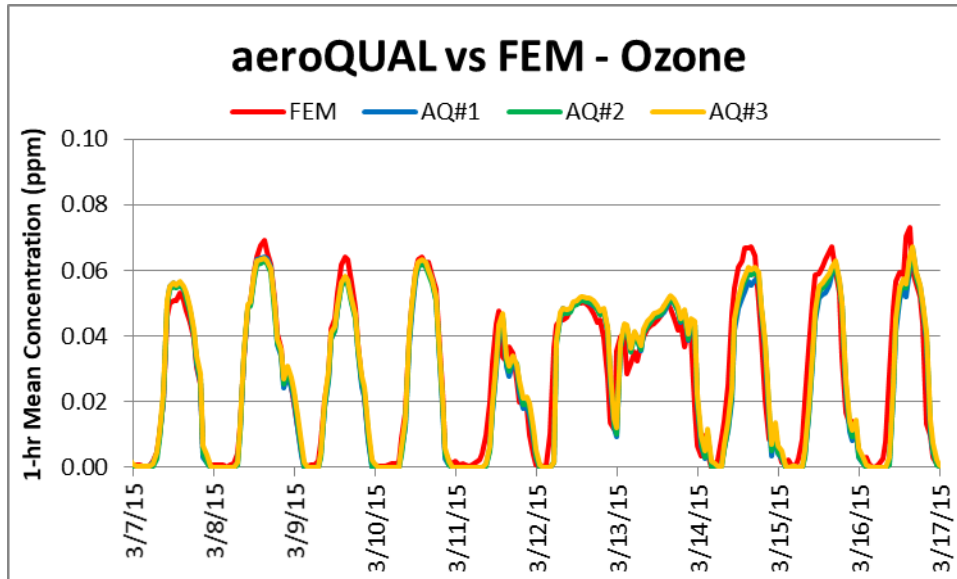
### Ozone



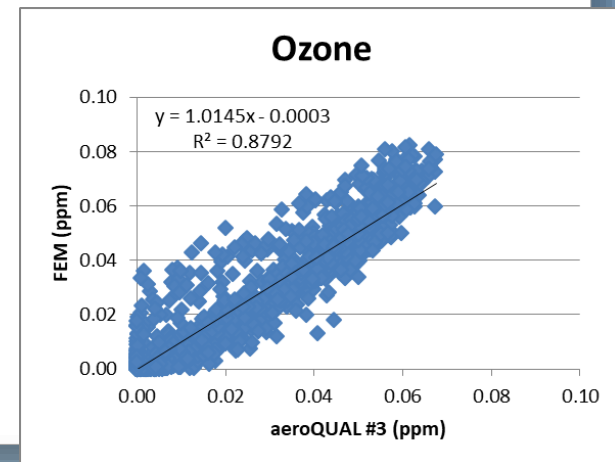
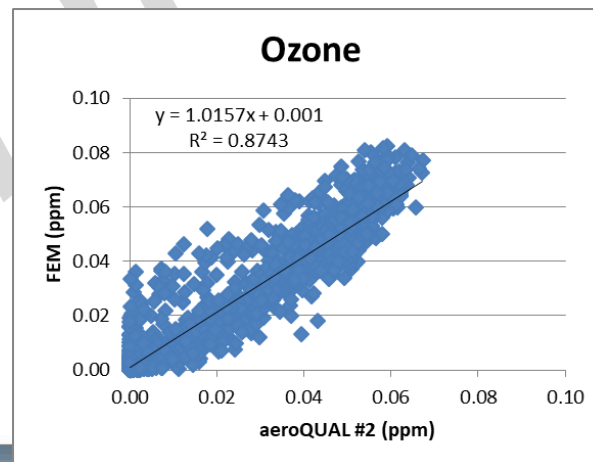
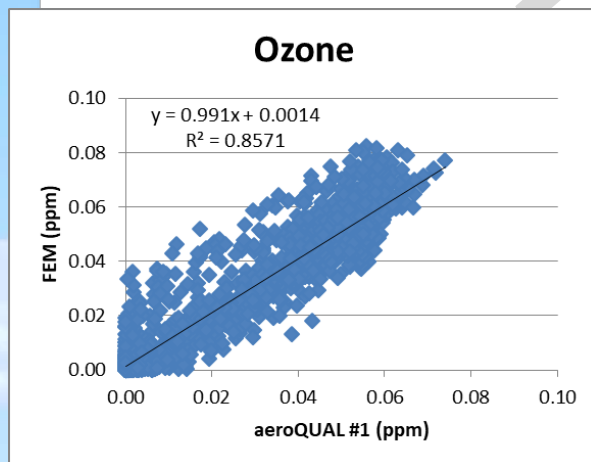
### Ozone



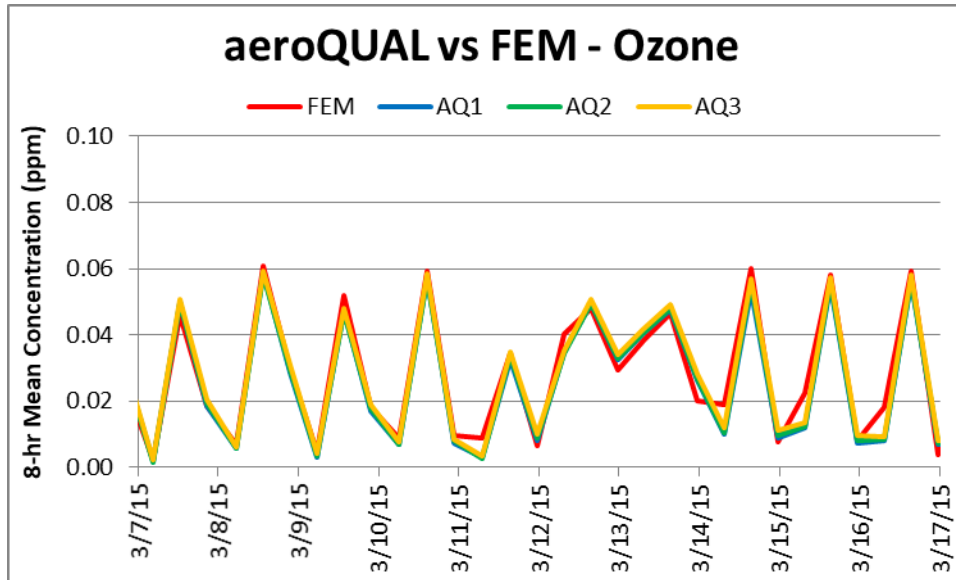
# aeroQUAL S500 vs FEM (Ozone; 1-hr mean)



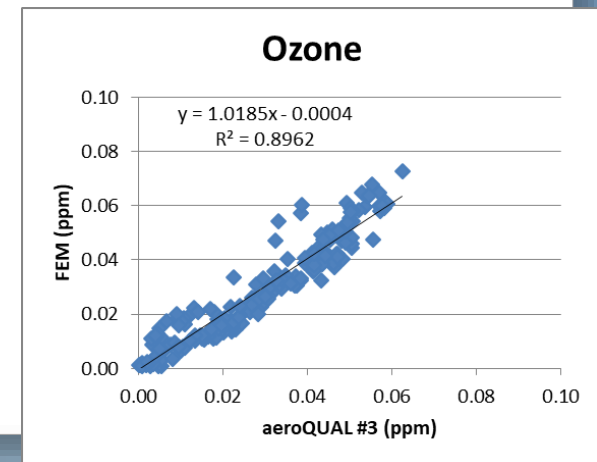
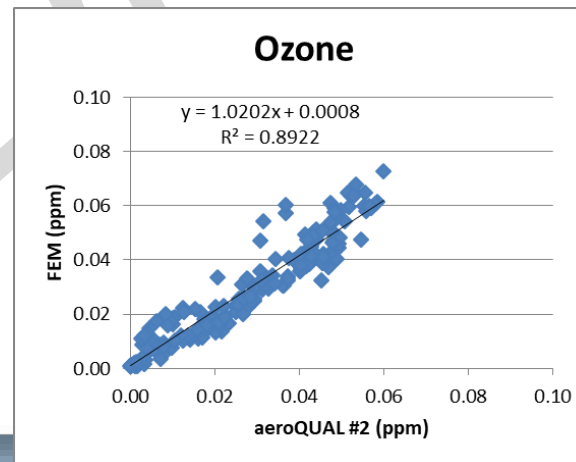
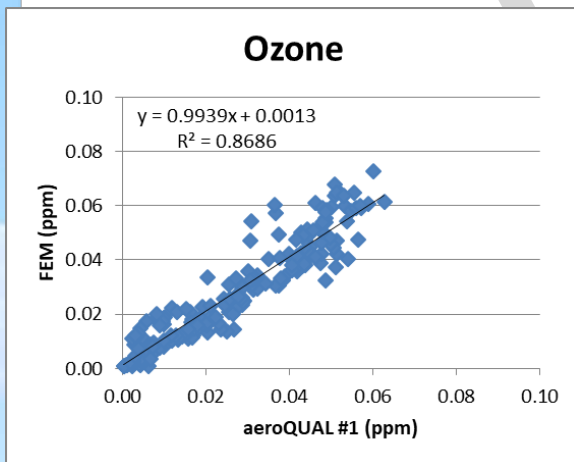
- All ozone measurements correlate very well with the corresponding FEM data ( $R^2 > 0.85$ )



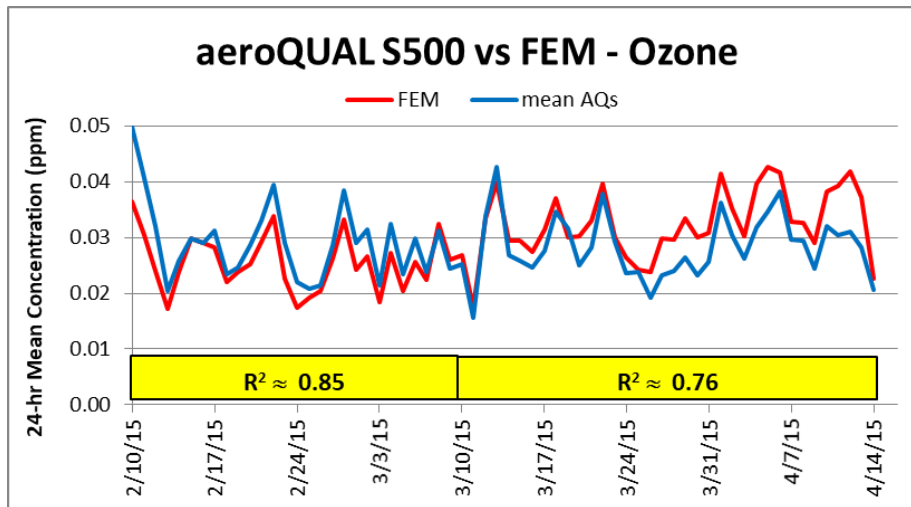
# aeroQUAL S500 vs FEM (Ozone; 8-hr mean)



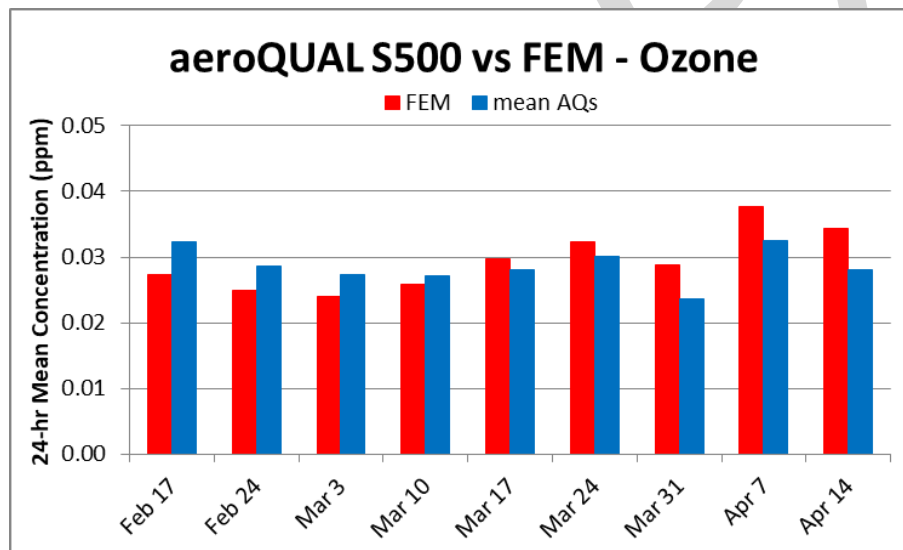
- All ozone measurements correlate very well with the corresponding FEM data ( $R^2 > 0.86$ )



# aeroQUAL S500 vs FEM



- During the first month of field deployment, the aeroQUAL sensors consistently overestimated the RIVR FEM ozone monitor ambient concentrations
- During the second month of field deployment, the sensors consistently underestimated the RIVR FEM ozone monitor ambient concentrations



In both cases, the correlation between the sensors and the FEM was very good.

# Discussion

- Overall, during the two month of field deployment, the three aeroQUAL Series 500 Ozone sensors performed very well and showed:
  - Minimal down-time over a period of about two months
  - Very low intra-model variability
  - Very good correlation to a substantially more expensive FEM instrument
- More specifically, during the first month (2/10-3/10), the aeroQUAL sensors **consistently overestimated** the Rubidoux ambient ozone concentration measurements. Their 24-hr mean values correlate well with the corresponding FEM ozone monitor values with an  $R^2: 0.768 \pm 0.033$
- During the second month (3/11-4/14) of field deployment, the aeroQUAL sensors **consistently underestimated** the Rubidoux ambient ozone measurements. Their 24-hr mean concentration values correlate well with the FEM ozone monitor with an  $R^2: 0.757 \pm 0.008$ . This change, during the second month, may be an indication of sensor degradation as expected especially in the case of metal oxide sensor technology.
- Laboratory Chamber testing is necessary to fully evaluate the performance of the aeroQUAL Series 500 sensors over different / more extreme environmental conditions

➤ These are preliminary results