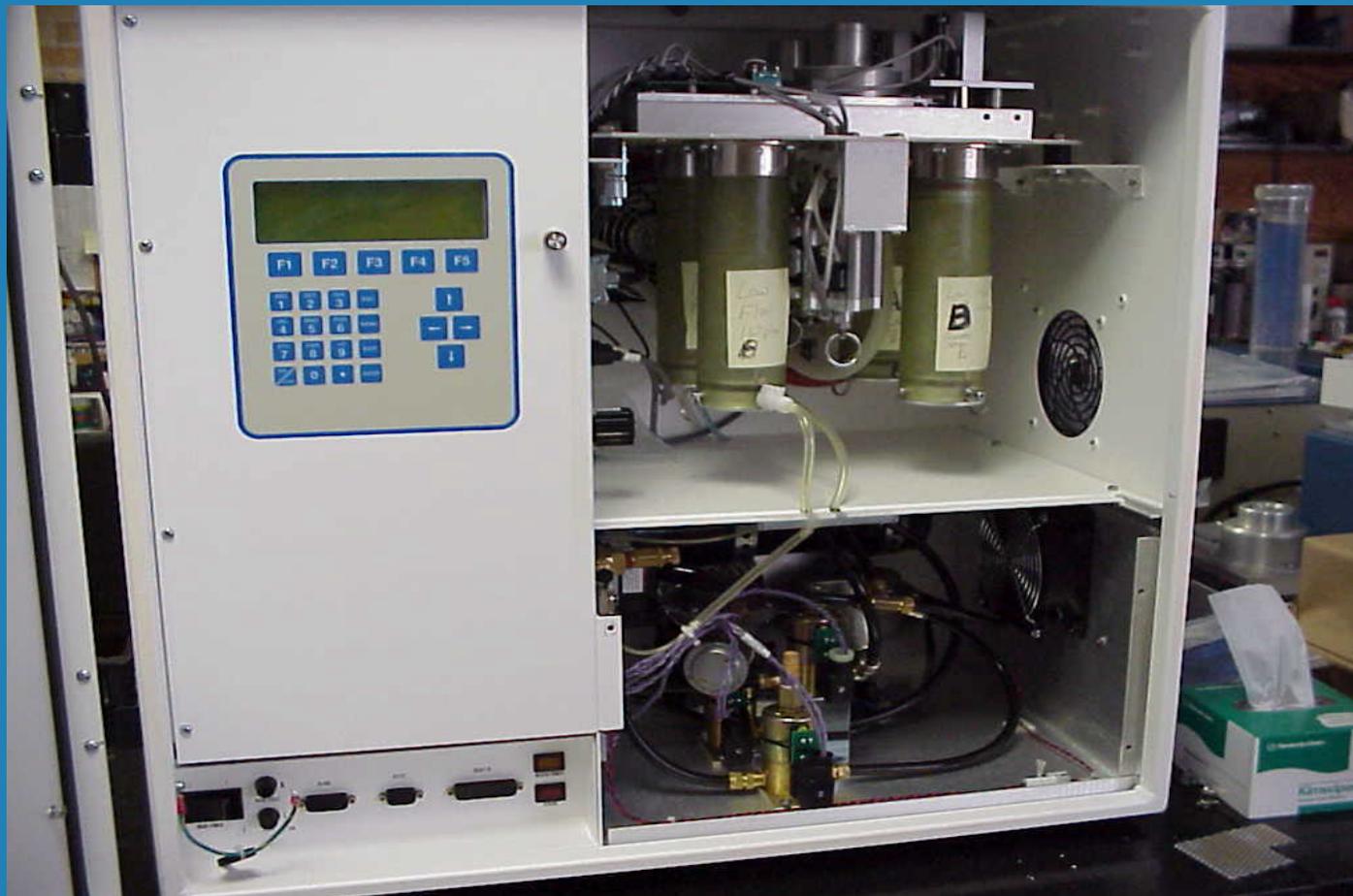# COMPARISON OF COLLOCATED DICHOTOMOUS SEQUENTIAL AIR SAMPLERS AND A PM $_{2.5}$ FRM AIR SAMPLER

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GANDY BRIDGE MONITORING SITE IN TAMPA, FLORIDA

DICHOTOMOUS PARTISOL®-PLUS MODEL 2025 SEQUENTIAL AIR SAMPLER

Calculating Particulate Concentrations with Dichotomous Air Sampler Data

C_{fine} = PM$_{2.5}$ concentration (μg/m^3)

C_{coarse} = PM$_{coarse}$ concentration (μg/m^3)

V_{fine} = volume of air through PM$_{2.5}$ filter (m^3)

V_{coarse} = volume of air through PM$_{coarse}$ filter (m^3)

V_{total} = total volume of air through sampler (m^3)

M_{fine} = particulate mass on fine filter (μg)

M_{coarse} = particulate mass on coarse filter (μg)

Calculating Particulate Concentrations with Dichotomous Air Sampler Data

$$C_{fine} = M_{fine}/V_{fine}$$

$$c_{coarse} = (M_{coarse}/V_{total}) - [(C_{fine} \cdot V_{coarse})/V_{total}]$$
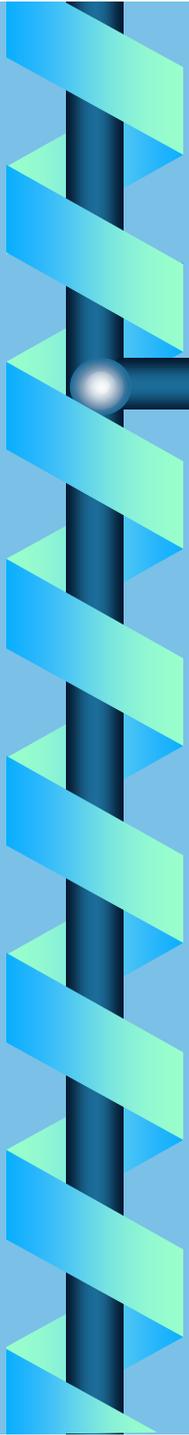
FORMULAS FOR BIAS AND PRECISION

X_i = ambient air concentration of sample i measured at sampler X (μg/m^3)

Y_i = ambient air concentration of sample i measured at collocated sampler Y (μg/m^3)

n = number of paired samples

%RB = percent relative bias

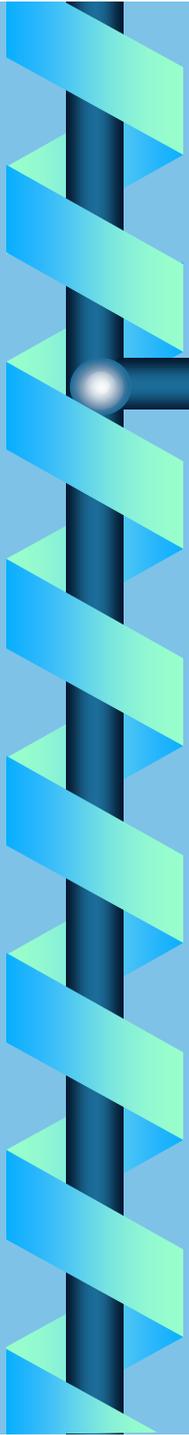%RSD = percent relative standard deviation

Average Concentration

$$\overline{C}_i = (Y_i + X_i)/2$$

$$\overline{C} = \frac{1}{n}\sum_{i=1}^{n}\overline{C}_i$$

Average Relative Bias

$$\% RB_i = \frac{(Y_i - X_i) \cdot 100\%}{\overline{C}_i}$$

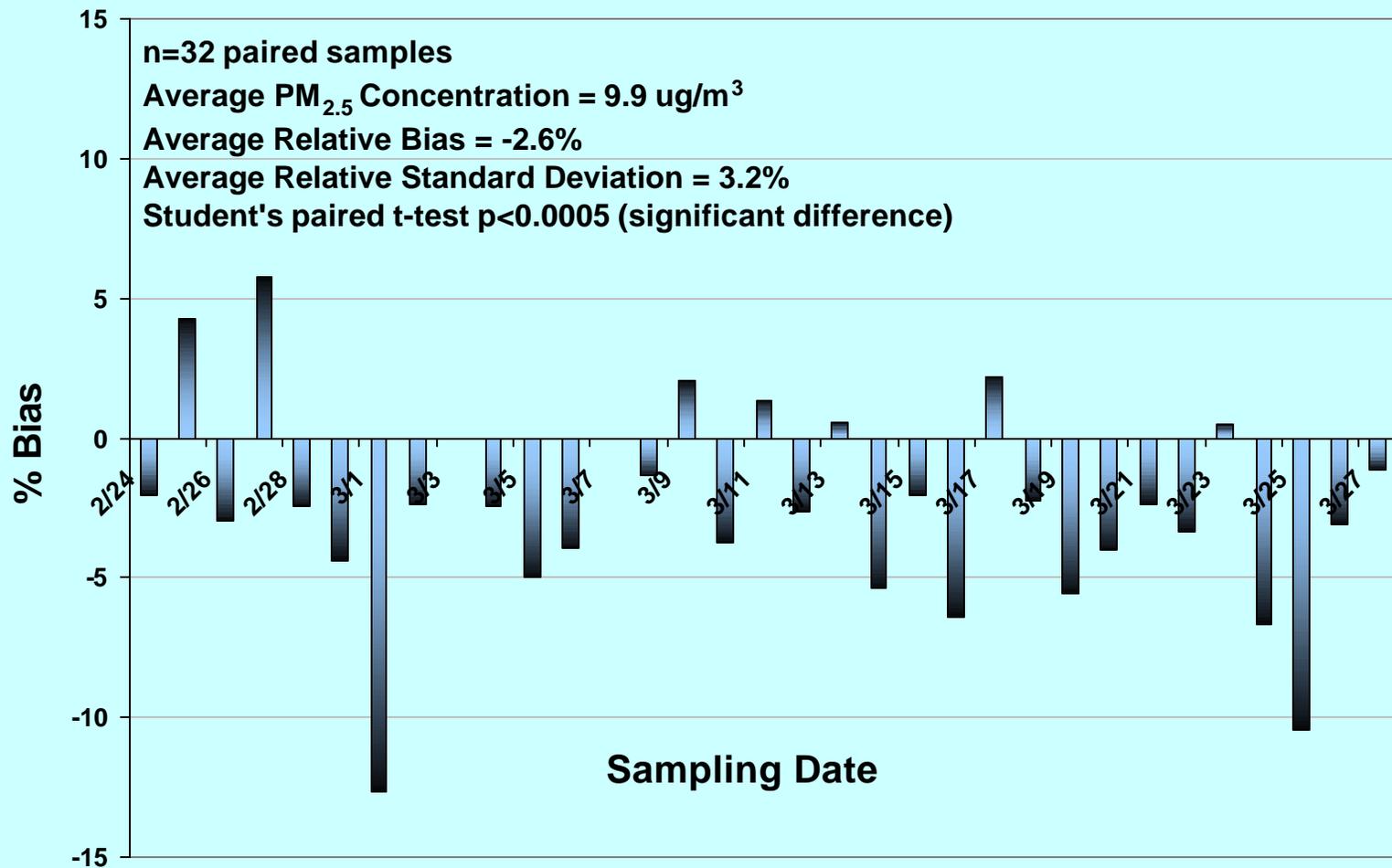$$\% \overline{RB} = \frac{1}{n} \sum_{i=1}^{n} \frac{(Y_i - X_i) \cdot 100\%}{\overline{C}_i}$$

Average Relative Standard Deviation

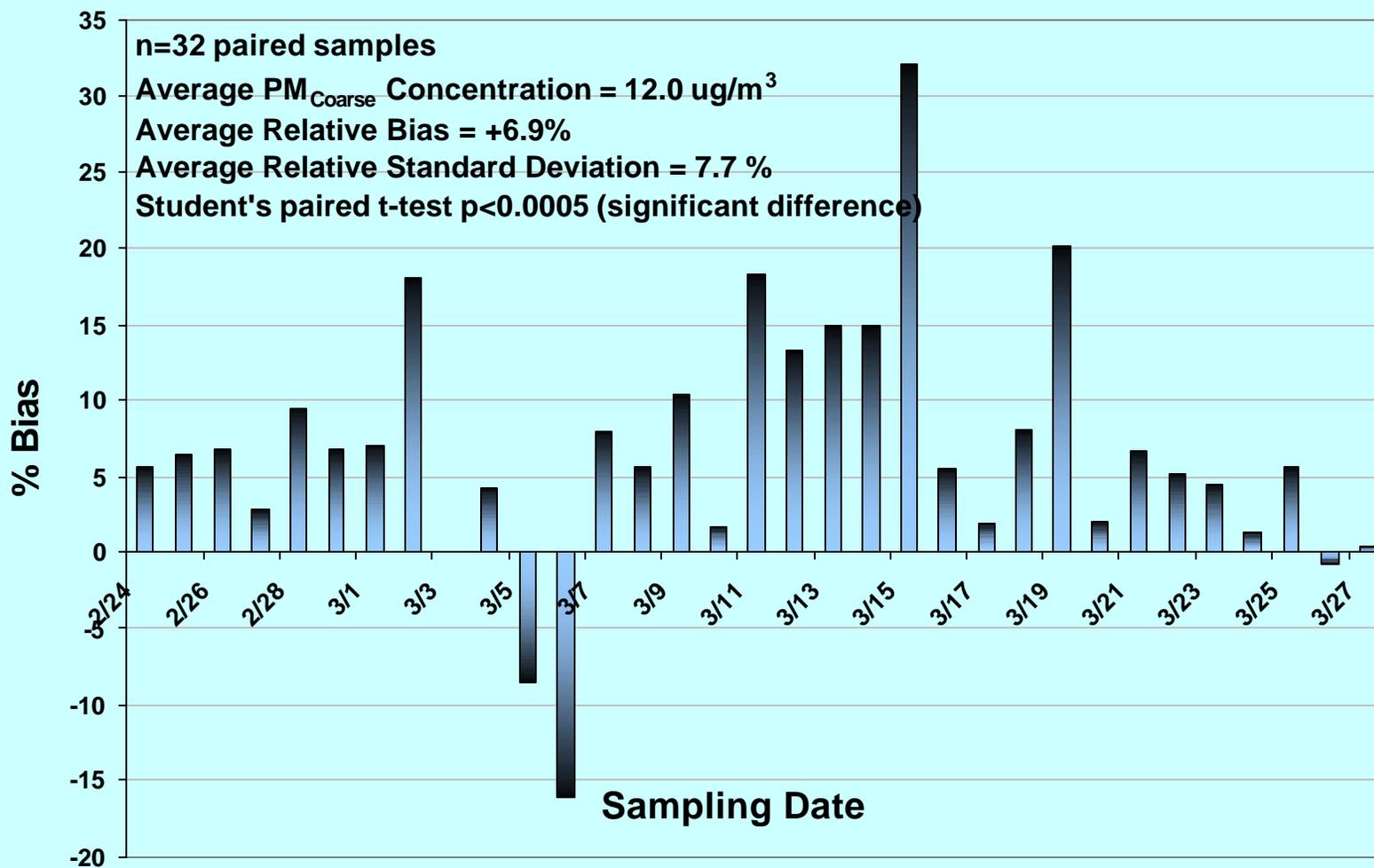$$\% RSD_i = \frac{\left| \% RB_i \right|}{\sqrt{2}}$$

$$\% \overline{RSD} = \sqrt{\frac{1}{n} \sum_{i=1}^{n} \% RSD_i^2}$$

Comparison of Dichotomous Sampler PM$_{2.5}$ Concentrations

n=32 paired samples
Average PM$_{2.5}$ Concentration = 9.9 ug/m^3
Average Relative Bias = -2.6%
Average Relative Standard Deviation = 3.2%
Student's paired t-test p<0.0005 (significant difference)

Comparison of Dichotomous Sampler PM$_{coarse}$ Concentrations

Comparison of Dichotomous Sampler and FRM PM$_{2.5}$ Concentrations

n=24 paired samples
Average PM$_{2.5}$ Concentration = 12.0 ug/m^3
Average Relative Bias = -1.3%
Average Relative Standard Deviation = 3.1%
Student's paired t-test p>0.05 (no significant difference)
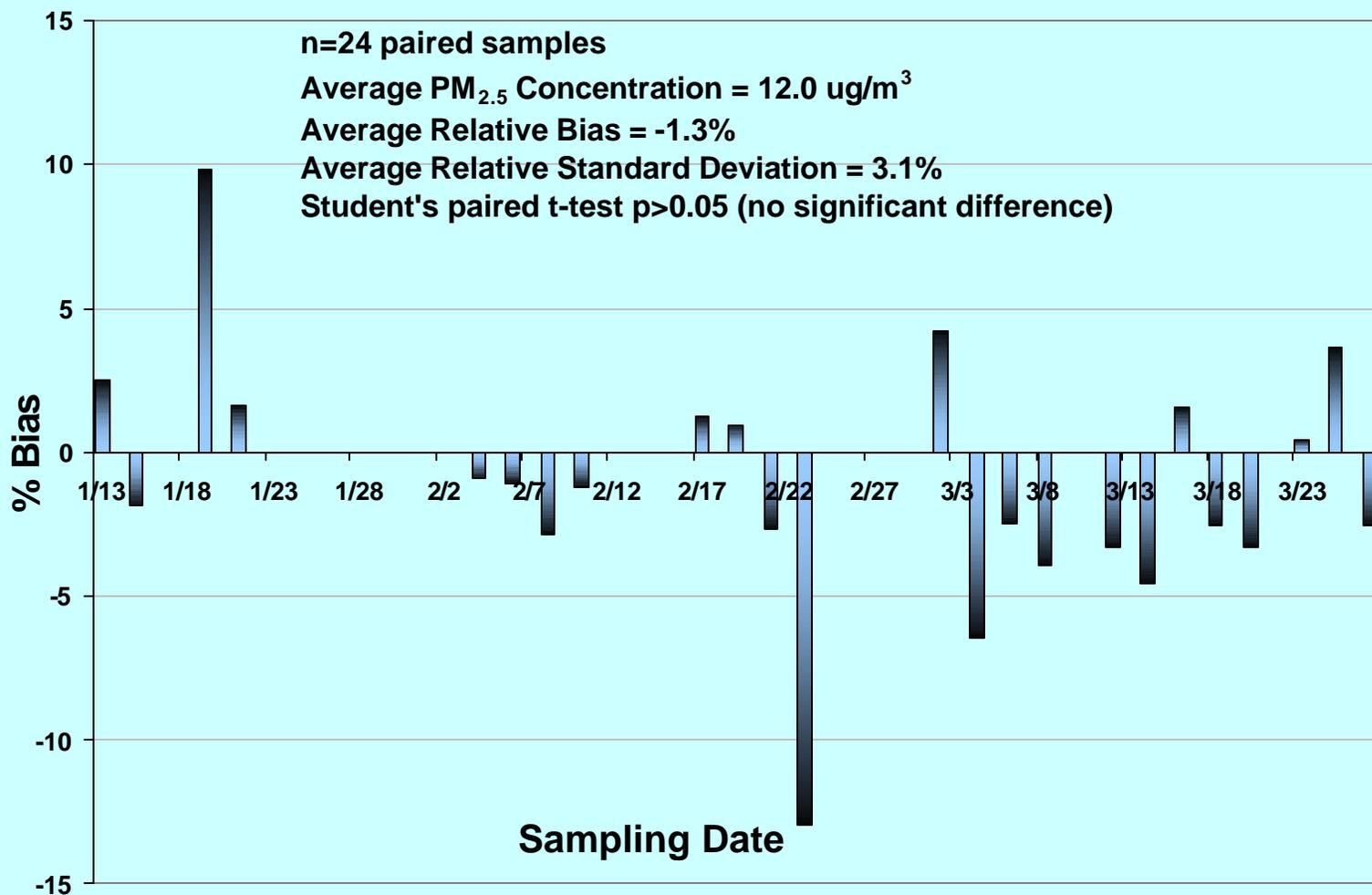
Dichot to Dichot

- The average relative standard deviation and average relative bias were below 10% for PM_{coarse} concentrations and below 5% for $PM_{2.5}$ concentrations

- A detectable bias was present for the both the PM_{coarse} and $PM_{2.5}$ concentrations

Dichot to PM$_{2.5}$ FRM

- The average relative standard deviation and the average relative bias were below 5% for PM$_{2.5}$ concentrations

Future Work

- Comparison of the dichotomous sequential particulate matter air sampler with a collocated PM_{10} FRM air sampler