

UC Peer Review

Comments on LTADS DFR

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Presentation Outline

- Peer Reviewers
- Summary of Reviewer Comments
- Response to Comments
- Next Steps



Peer Reviewers

- Professor Emeritus Thomas Cahill, UC Davis
- Professor Keith Stolzenbach, UCLA
- Professor Gail Tonnesen, UC Riverside
- Professor Akula Venkatram, UC Riverside
- Professor Anthony Wexler, UC Davis

Critical Comments

- Report should be more comprehensive
- Deposition estimates can be refined

Report Should Be More Comprehensive

❖ Place LTADS in context

- Large body of existing literature

❖ Additional analyses warranted

- Meteorology
- Transport characterization
- Emission source characterization
- Atmospheric deposition to land surfaces

Deposition Estimates Can Be Refined

- ❖ New P measurement correction factors
- ❖ Pollutant depletion over Lake Tahoe
- ❖ Dry dep similarity wind profiles not valid in complex terrain (use turbulent flux and surrogate surface data)
- ❖ TWS under-measures large particles
- ❖ Dry dep methodology used (C & V_d) has no measurements over Lake Tahoe
- ❖ Wet dep methodology not standard formulation (parameters difficult to measure/estimate)

Dep Estimates Can Be Refined (2)

- ❖ **Use a hierarchy of air quality models to improve calculations and interpretations**
- ❖ **Use results of special studies to construct Tahoe emission inventory**
- ❖ **Characterize pollutant budget**
(inflow, emissions, wet dep, dry dep, outflow)
- ❖ **P_{fine} may be underestimated due to Cs being below detection method used**

Comment Discussion

❖ Place LTADS in context (integrate large body of literature on Tahoe)

- Staff is aware of prior work and included some
- Literature includes variety of conclusions
- Staff believes some conclusions in literature are premature
- Regulatory timelines and staffing resources & commitments do not permit a critical review and an integration of the info into a compendium of air quality at Tahoe

Comment Discussion

❖ **Additional analyses warranted**

- Staff agrees that more analysis could and should be done but timelines and ARB commitments limited staff to preparing a report focused on the major needs of the water clarity modelers
- If modeling is to be done, major improvements will be needed to the emissions inventory, aerometric measurements, and meteorological modeling
- This comment is the motivation behind the workshop today – ARB staff must move on to other AQ issues
 - What data were collected during LTADS?
 - What additional analyses can LTADS data support?
 - What additional data and research is still needed to address issues?

Comment Discussion

❖ P measurement correction factors needed

- P historically not a focus of XRF analysis
- Silicon detector calibration factor (P x 1.42)
- New self absorption correction factors for soil matrix
 - Size dependent

Comment Discussion

❖ Pollutant depletion over Lake Tahoe

- Road dust emission source shallow
- Rapid depletion of large particles
- Depletion algorithm must be consistent with limited (monthly TSP) shoreline and buoy measurements ($\mu\text{g}/\text{m}^3$)

Site	Winter	Spring	Summer	Fall	Annual
SLT-SW	29	16	19	21	22
SOLA	30	15	17	22	22
Buoys (W/E)	5/5	9/10	8/8	8/6	7/7
Thunderbird	4	5	9	7	6
Lake Forest	18	16	20	18	18

Comment Discussion

- ❖ **Dry dep similarity wind profiles not valid in complex terrain (use turbulent flux and surrogate surface data)**
 - Staff agrees and therefore used meteorological data from piers & buoy to better approximate theory
 - Future work could use flux data DRI collected
 - Staff dropped plans to install additional surrogate surface samplers due to complex logistics

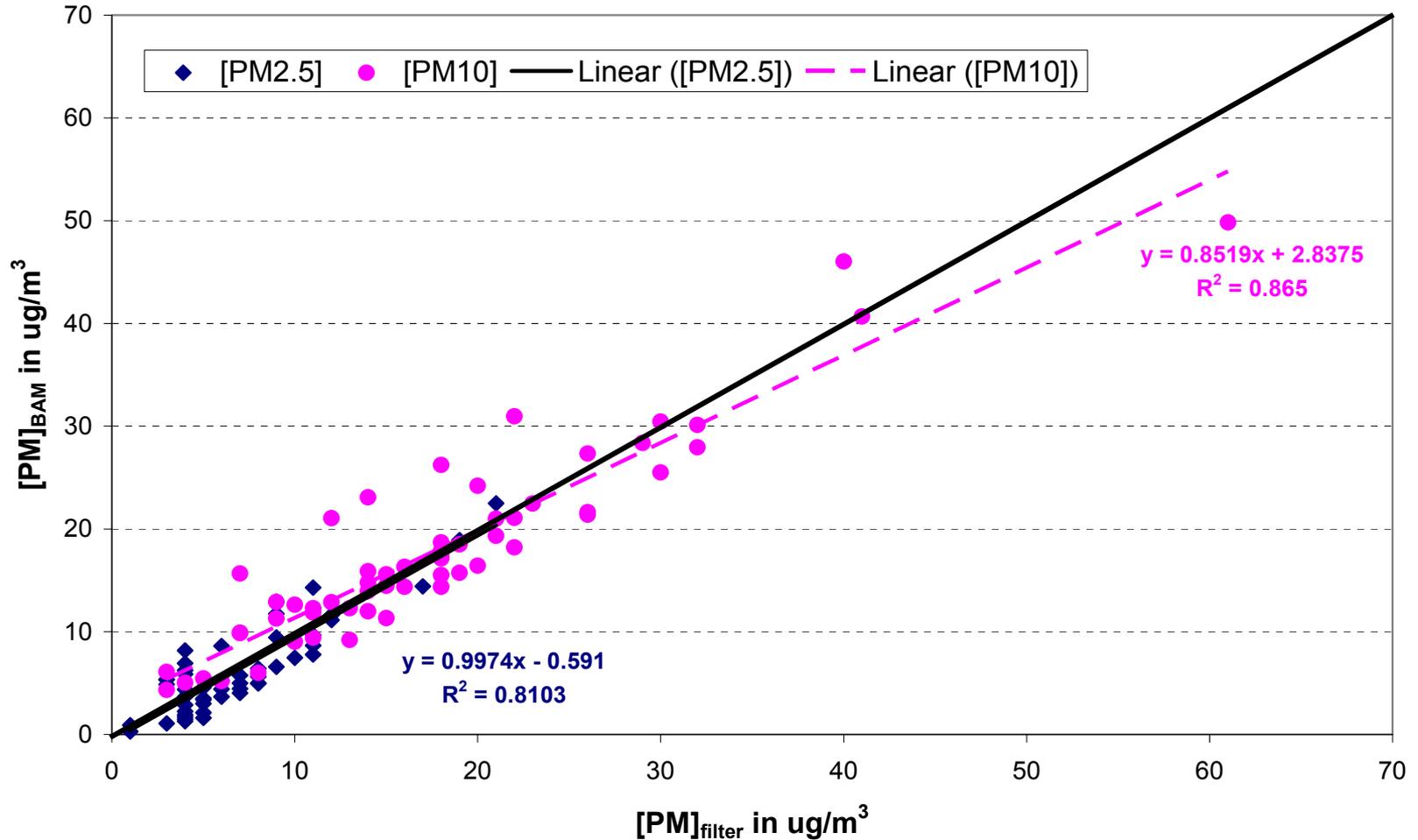
Comment Discussion

❖ **TWS under-measures large particles**

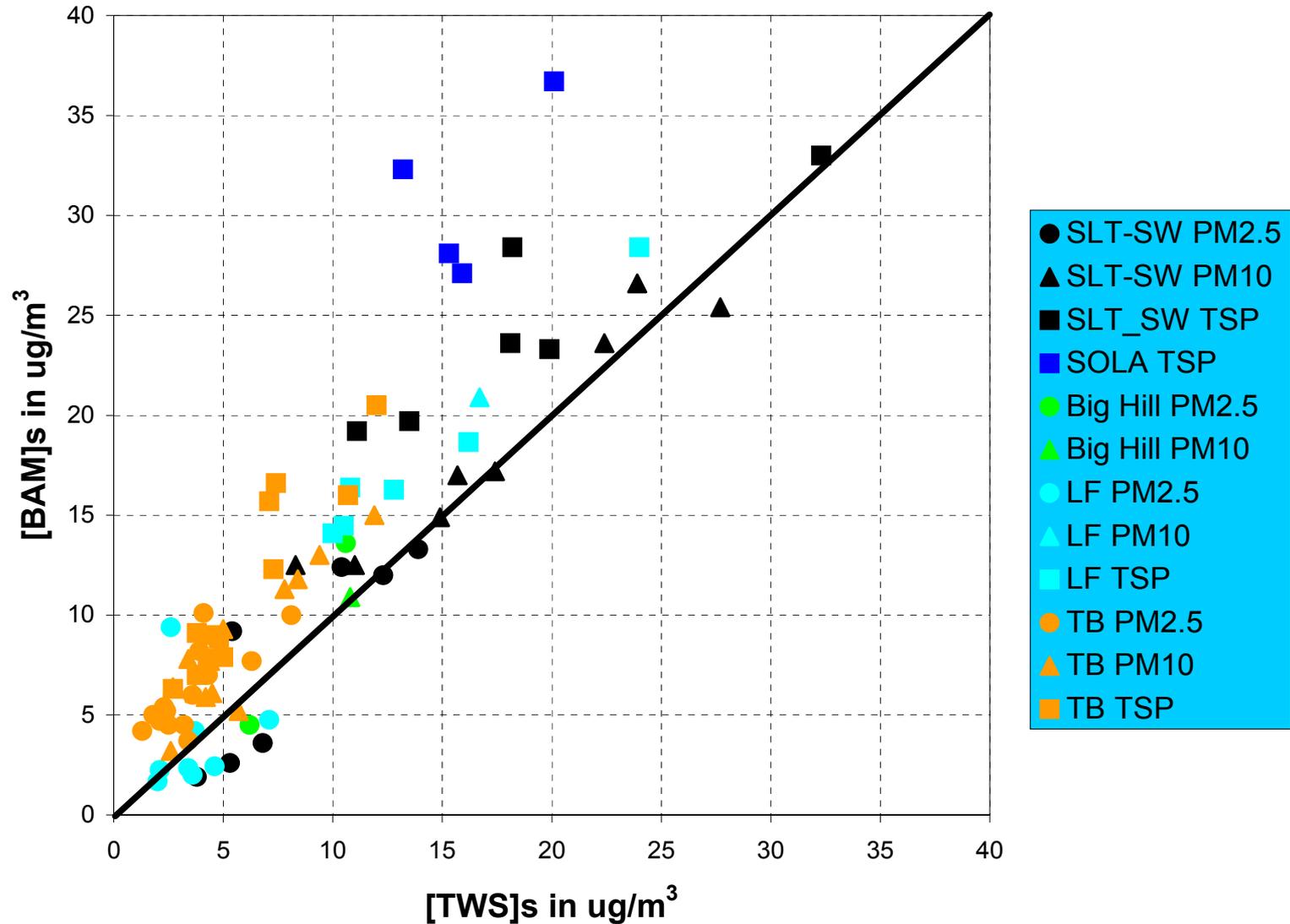
- Comparison of TWS measurements with BAM and FRM measurements does indicate a TWS bias toward smaller concentrations, particularly for TSP

Comment Discussion

PM Methods Comparison - SLT-Sandy Way - 2003



Comment Discussion



Comment Discussion

❖ **Dry dep methodology based on concentrations & V_d but has no measurements over Lake Tahoe itself**

- V_d developed from buoy and pier meteorological data
- Have limited (once/month) 24-hr PM & specie data for 2 buoys to guide assumptions
- Have summer & fall AQ data (NH_3 , HNO_3 , O_3 , NO_y , PCs) aloft (aircraft) and some winter/spring AQ data (NO_y , PCs) on lake (boat) to guide assumptions

Comment Discussion

❖ **Wet dep methodology not standard formulation (parameters difficult to measure/estimate)**

- Not intended to be a rigorous treatment
- Staff questions reasonableness of using precipitation amounts in wet dep estimates as wet dep greatest in beginning of storm
 - Could use precipitation rate but data limitations
 - Staff used more accessible parameter – hours with precip

Comment Discussion

❖ Use a hierarchy of air quality models to improve calculations and interpretations

- Not possible within TMDL time frame
 - All models need their performance validated in specific settings
 - Other AQ modeling efforts that overlap Tahoe basin are not yet completed; results will be uncertain
 - Sophisticated modeling effort would require major efforts to upgrade EI and meteorology model

Comment Discussion

❖ Use results of special studies to construct Tahoe emission inventory

- LTADS source profiles are limited in number & have variable results
- LTADS activity profiles are limited but qualitatively useful
- Default motor vehicle emission factors might not be appropriate at Tahoe's elevation and temperatures

Comment Discussion

❖ Characterize pollutant budget

(inflow, emissions, wet dep, dry dep, outflow)

- Considered in study design but schedule and resources not sufficient for comprehensive characterization
 - **Inflow** – Big Hill data provides upper bound
 - **Emissions** – LTADS addressed foundational info
 - **Dry & Wet Dep** – estimated by LTADS
 - **Outflow** – not addressed by LTADS

Comment Discussion

❖ **P_fine may be underestimated due to Concs being below detection method used**

- All P measurements are crude
- Staff used 40 ng/m³ for total P, which is consistent with independent approaches using new P correction factors:

$$P = f(\text{PM})$$

$$[P] = \frac{1}{2} \text{ the uncertainty of DRI zero measurements}$$

$$[P] = [P]_{\text{ALS}} + \frac{1}{2} \text{ the MDL}$$



Thank You
Peer Reviewers!

Next steps

Any questions?

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Any answers?