Using Prognostic Meteorological data in support of a PSD permit application

Jay McAlpine
EPA R10

Ranil Dhammapala
WA Dept of Ecology

Content used with permission from High Test Sands and

RAMBOLL

Project basics

- Silica smelter with > 500 tpy SO_2 & >900 tpy NO_x proposed in Newport, WA
- No representative met data nearby (IDT site not QC'd)
- For permit modeling, Appendix W of 40 CFR part 51 requires either:
  - 5 yrs of representative NWS airport data, or
  - 1 yr of on- site met data, or
  - 3 yrs of recent prognostic met data with a MPE

EPA Region 10 Technical Support

Q: Does the State need to provide a formal determination that it is cost prohibitive or infeasible to collect adequately representative site-specific meteorological data?

A: No. OAQPS confirmed 3 options are on “equal footing”

Project basics

- UW 4km WRF forecast archives have continuous verification stats online
- But f12-23 performance at ASOS sites was poor
  - Worse than EPA 12km CONUS WRF!
  - Forecast vs hindcast?
- Decided on analysis-nudged hindcast 4km & 1.33km WRF runs

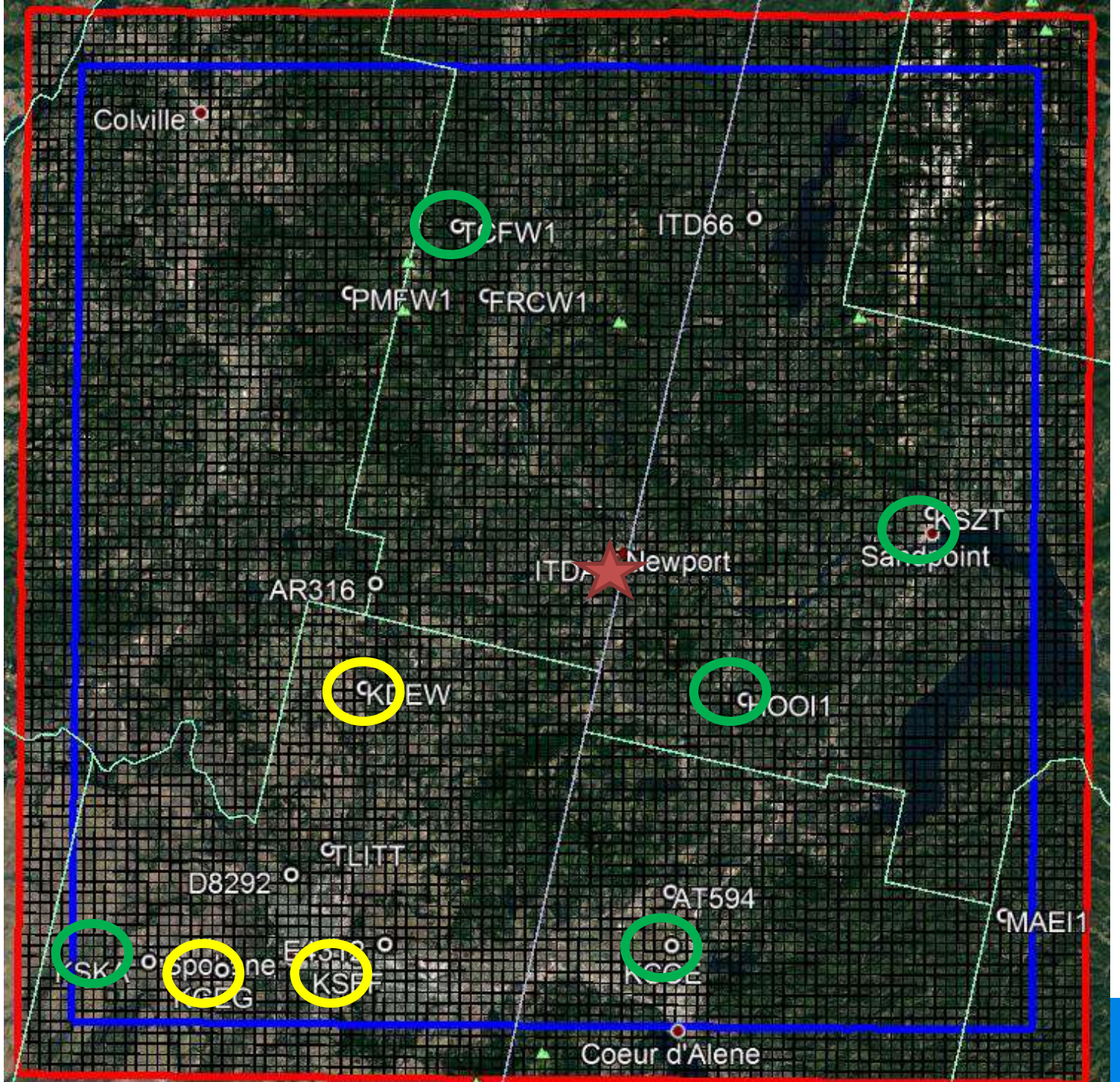
Model Performance Evaluation

How many verification sites are enough?

How well does the model need to perform?

Also used in eval

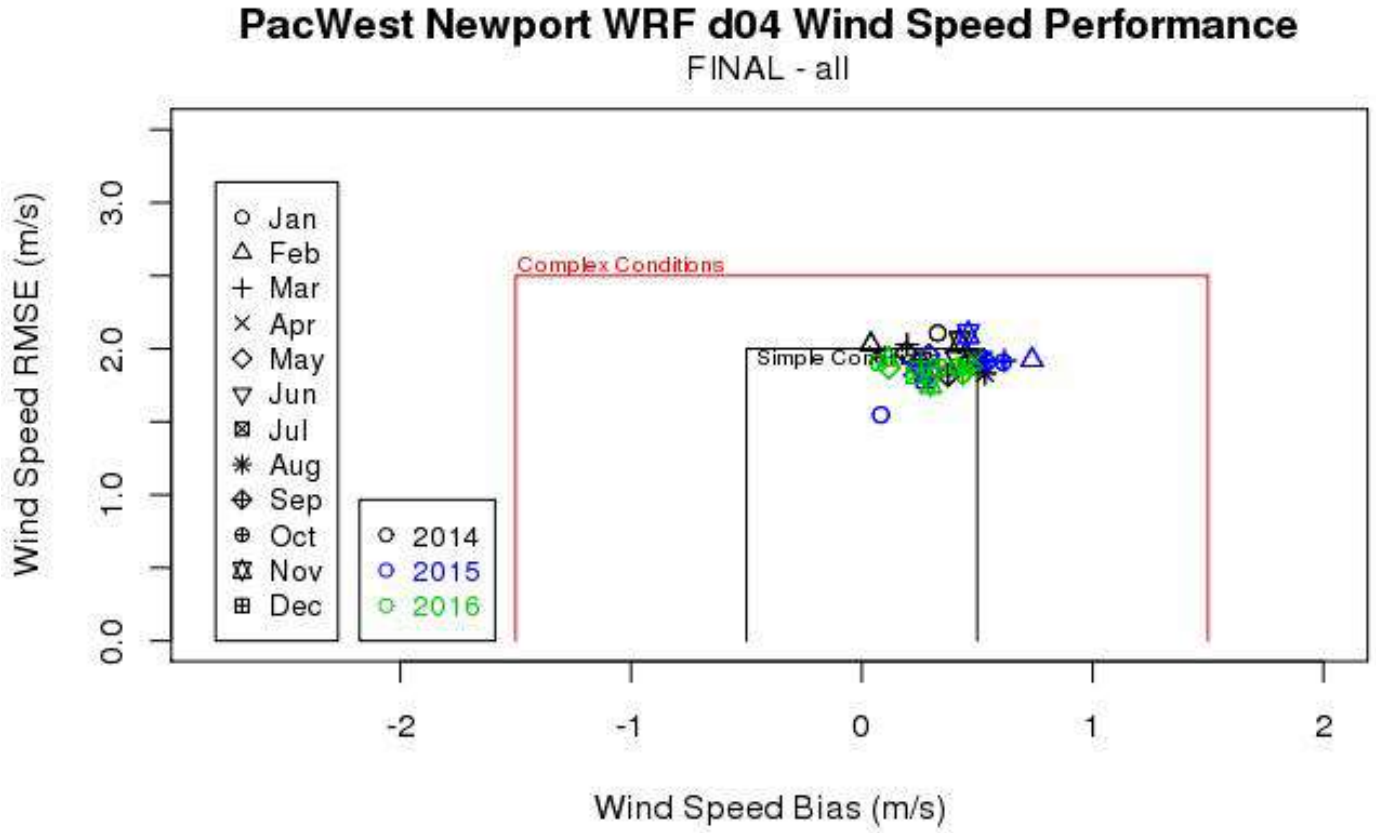
1 min ASOS



1.33km domain (133km x 133km)

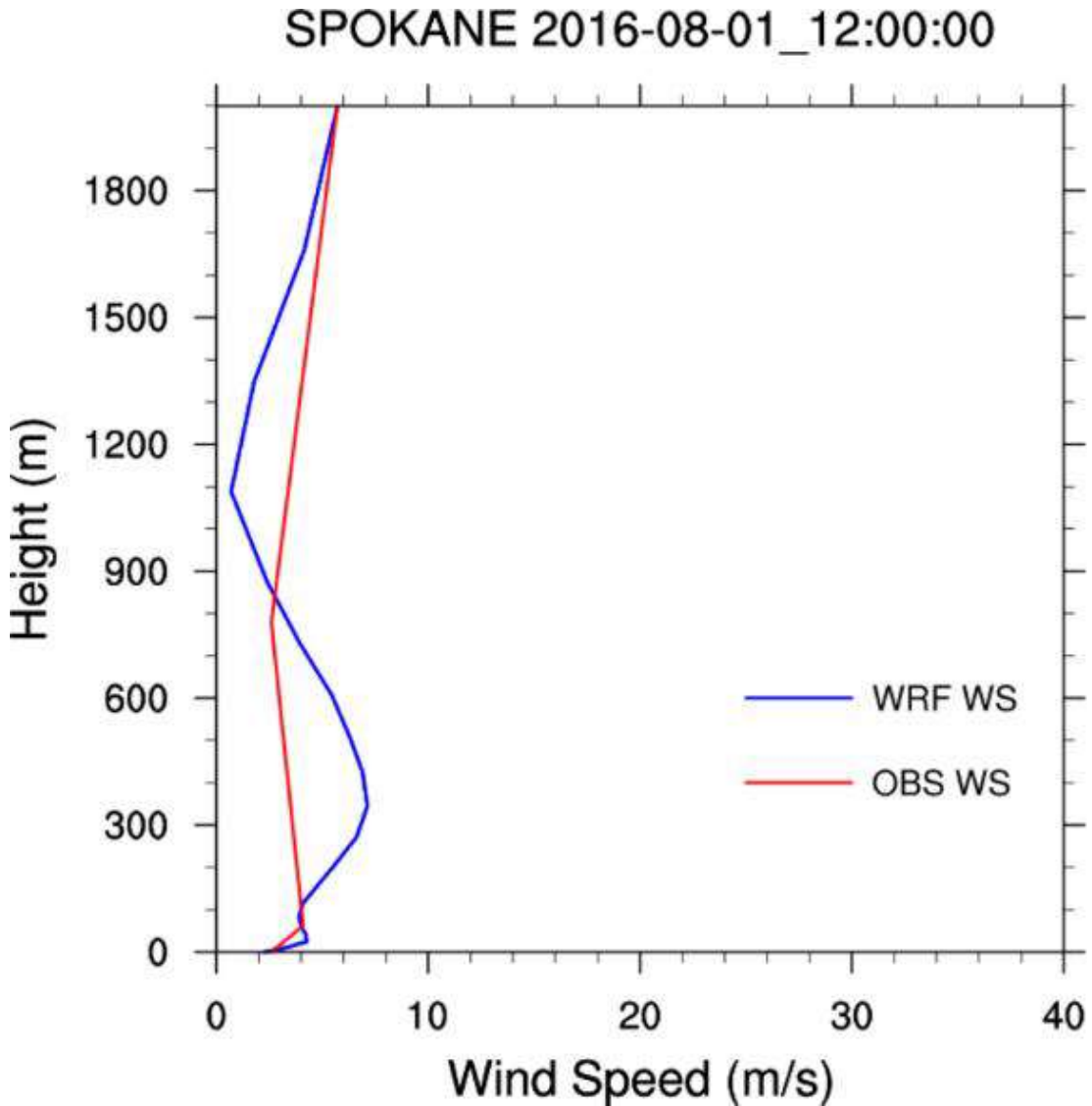
Comparisons made

- METSTAT soccer plots
  - Domainwide & site-by-site
- WRF vs PRISM precip
  - Interpolated obs data



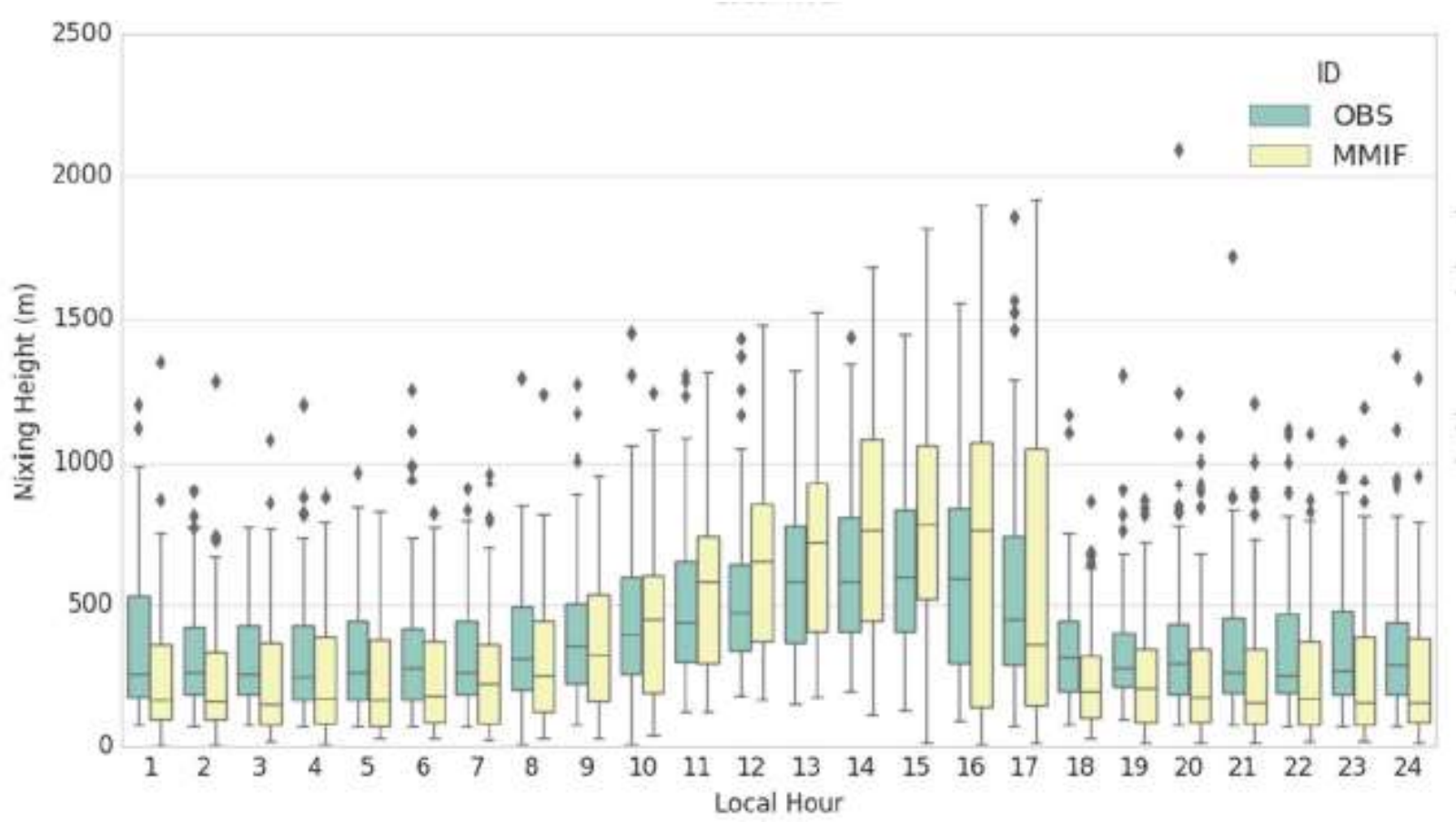
Comparisons made

- Vertical T & WS profiles



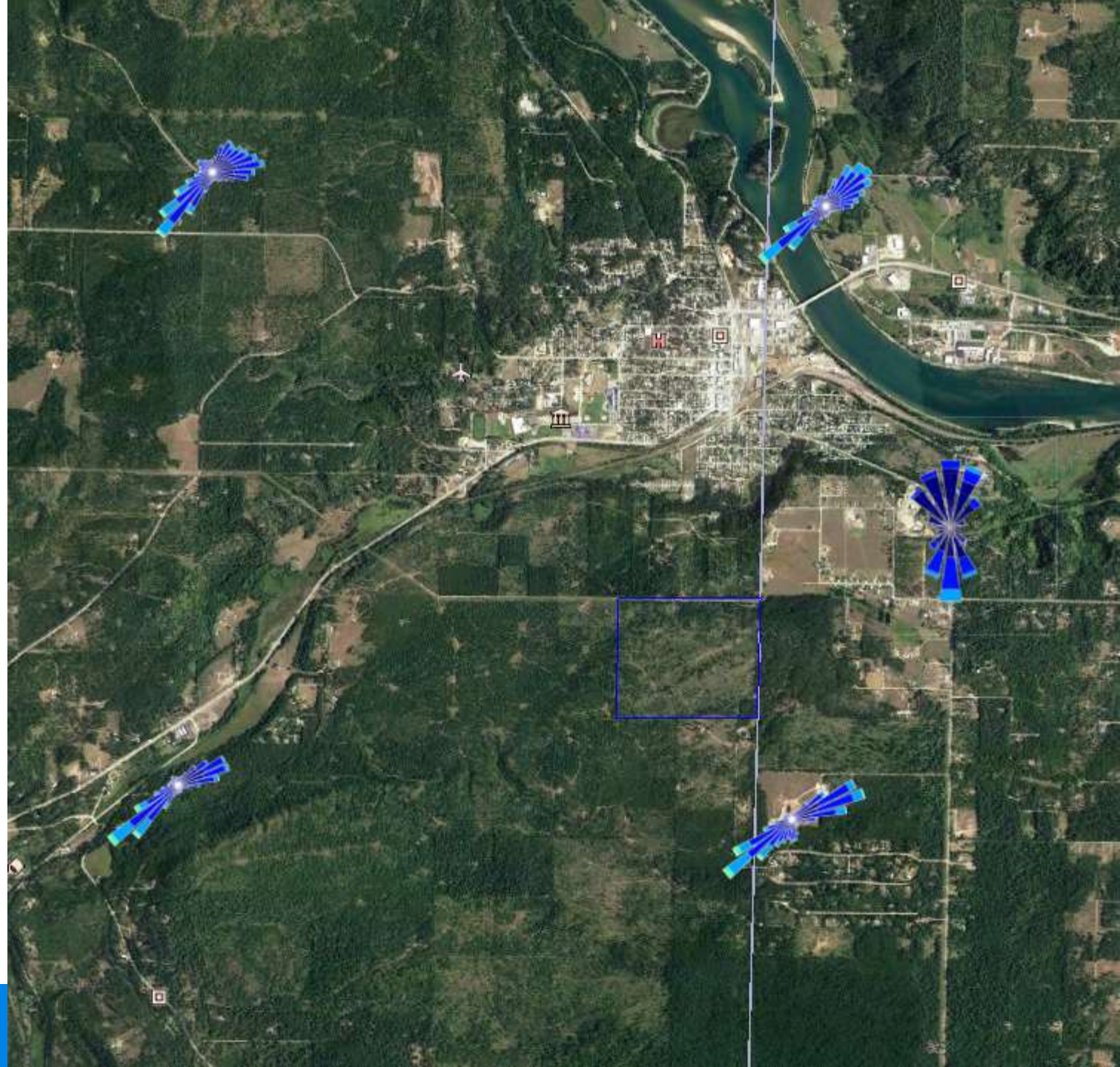
Comparisons made

- AERMET PBL from MMIF vs onsite



Comparisons made

Windroses on terrain



AERMOD results: MMIF vs onsite

- AERMET with on-site vs MMIF at same location
  - Check if prognostic data leads to lower DVs than obs
  - AERMET calculates mixing heights, not WRF or MMIF
  - Used hypothetical sources
  - Q-Q & boxplots, Robust High Concentration
- Overall, MMIF more conservative
  - WRF predicted more stable and unstable hours and less neutral hours compared to observations
  - WRF's persistence of WDs at low speeds generally results in more conservative concentrations

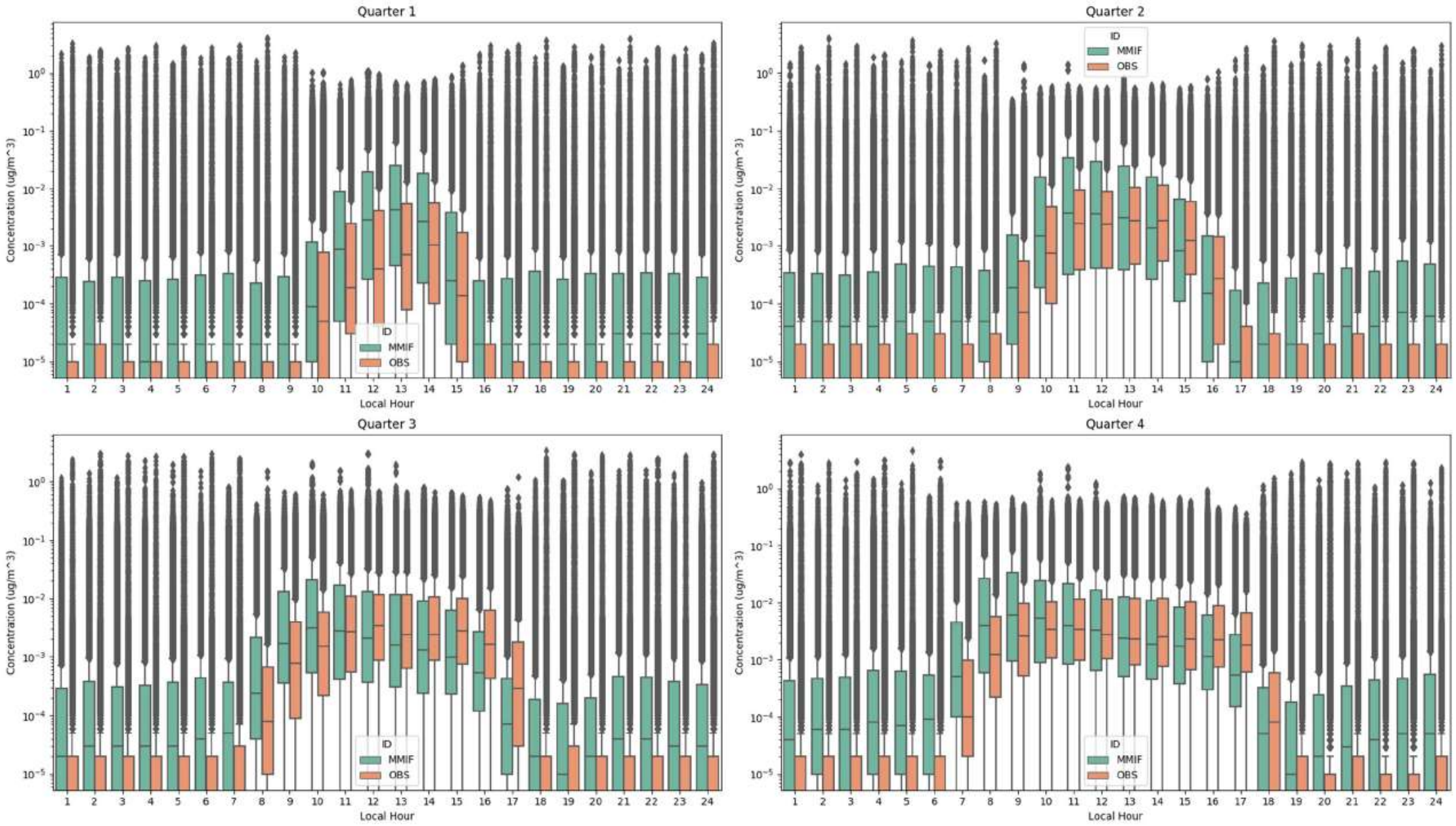
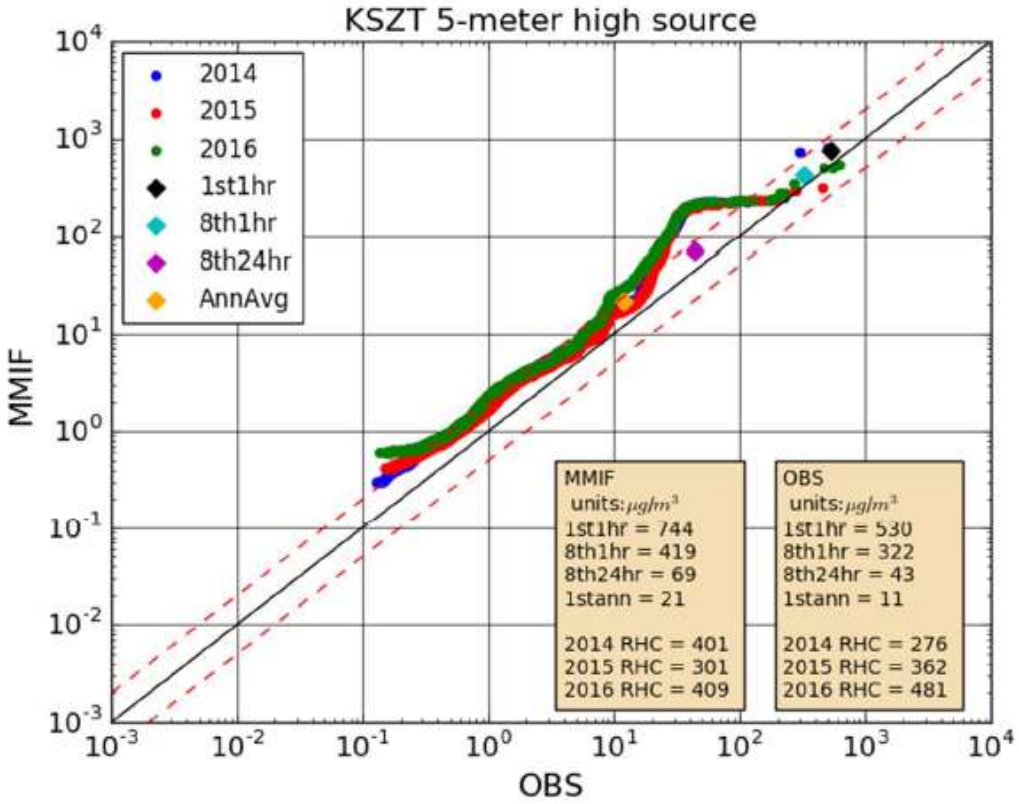


Figure 7-23. Distribution of Concentrations from 45-m Stack at HOOI1 - Observed vs. Modeled Meteorology (2014 - 2016)



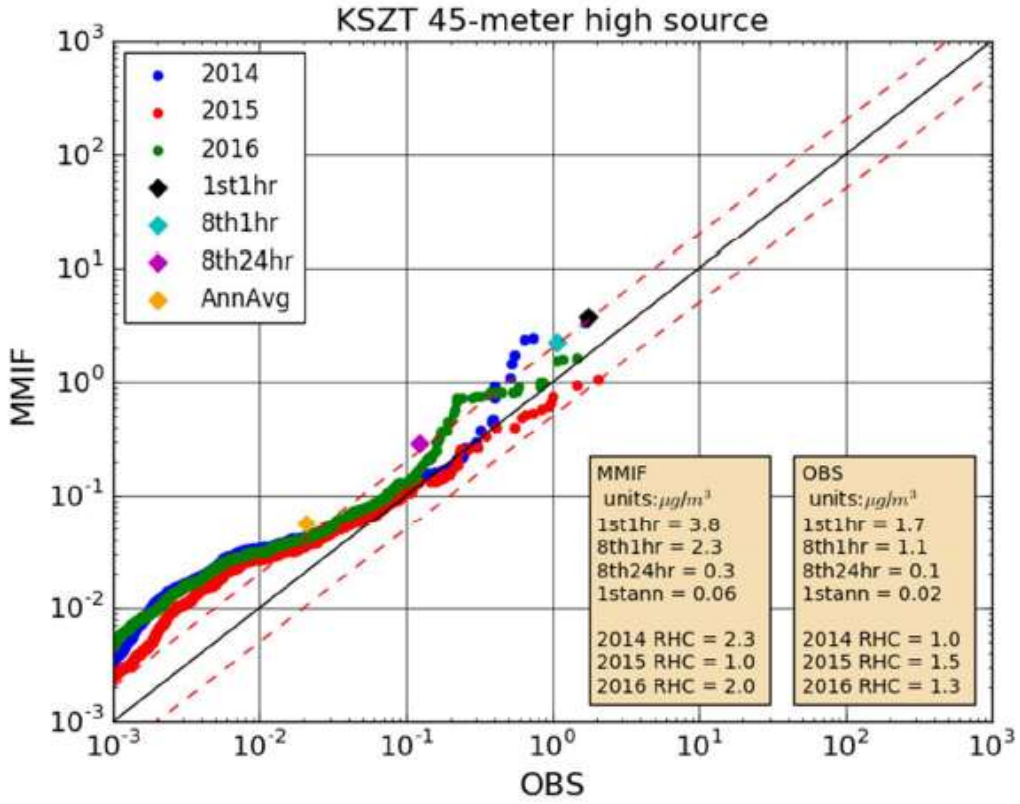


Figure 7-18. KSZT hourly AERMOD Concentrations - 5-m source (left) and 45-m source (right)

EPA Region 10 Technical Support

Recommendation:
Perform a qualitative theoretical evaluation of model performance at the project source site

- Wind rose at selected point vs terrain and land-use
- Evaluation of land-use parameters: WRF, AERSURFACE, Observed (visual)
- Determination of representative cell

Q&A

Jay McAlpine, PhD
Meteorologist, Regional Modeling Contact
206.553.0094
McAlpine.Jay@epa.gov

Ranil Dhammapala, PhD
Atmospheric Scientist
360-407-6807
ranil.dhammapala@ecy.wa.gov