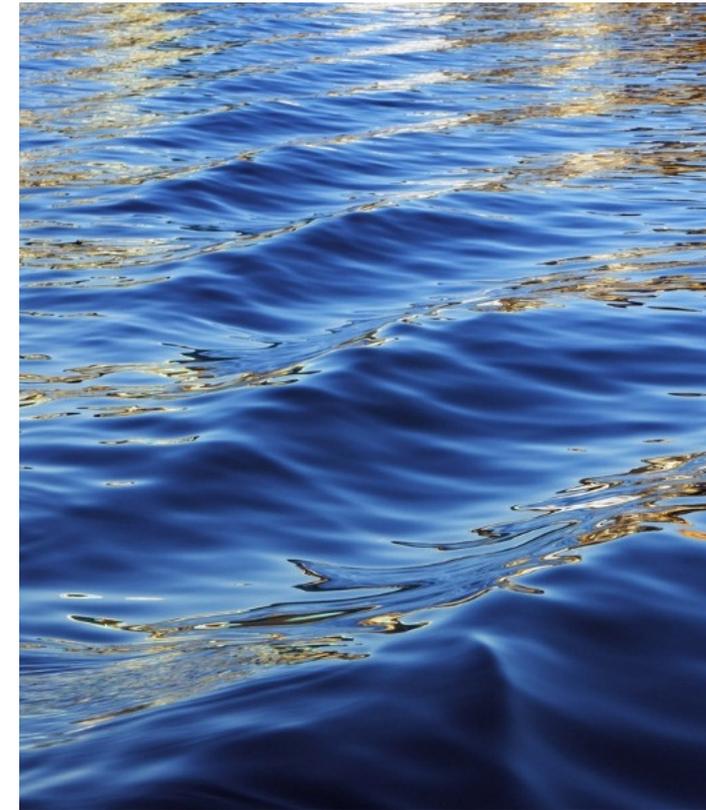


# Developments in the use of model datasets for air permitting in the Pacific Northwest

Jay McAlpine, PhD  
Air Quality Scientist

Office of Air and Waste  
EPA Region 10  
Seattle, WA

NW AIRQUEST 2017 Annual Meeting  
Richland, WA



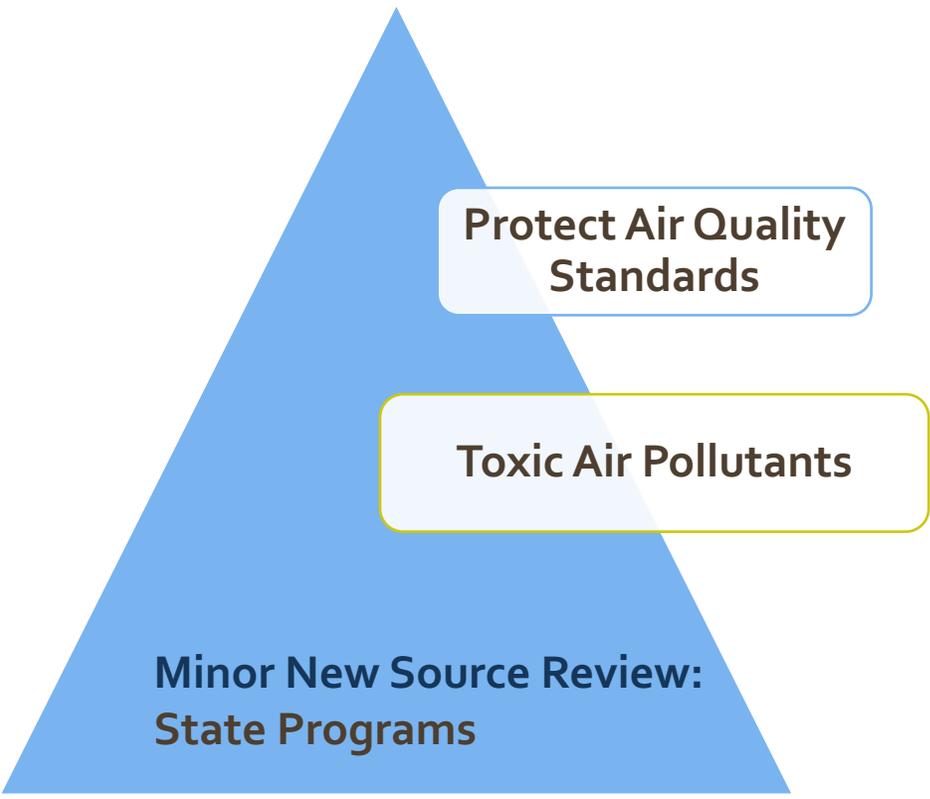
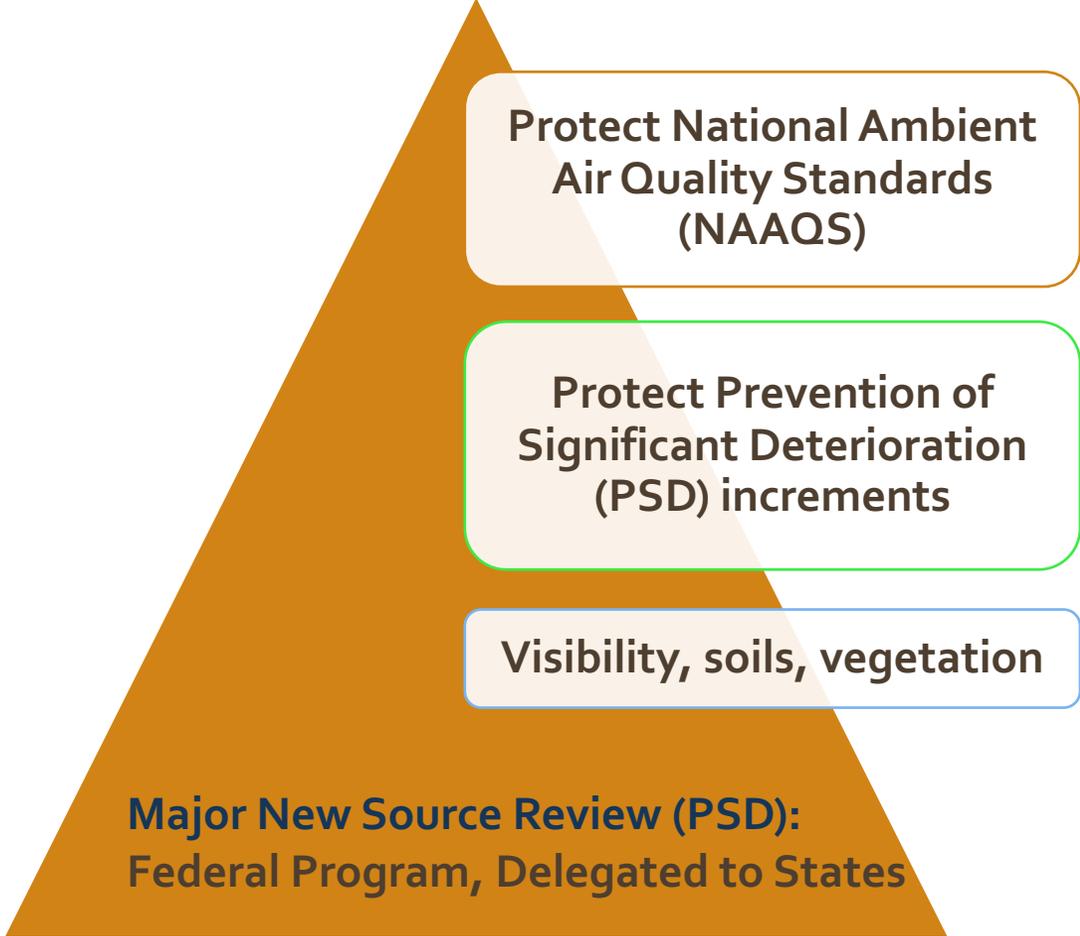
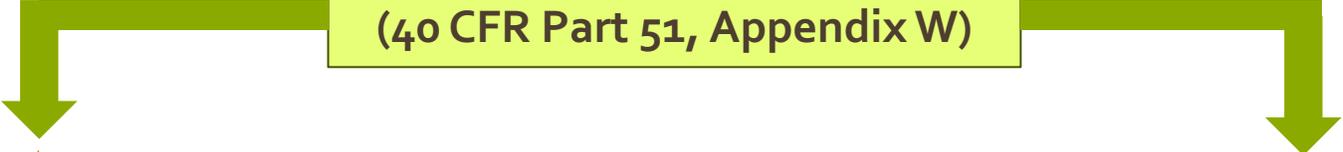
# NW AIRQUEST PRODUCTS AND APPLICATIONS



- ✓ Background air quality lookup tool
- UW WRF meteorology to drive air quality models?
- AIRPACT data to develop screening emission values?

# New Source Review: Air Quality Modeling Requirements

Guideline on Air Quality Models  
(40 CFR Part 51, Appendix W)



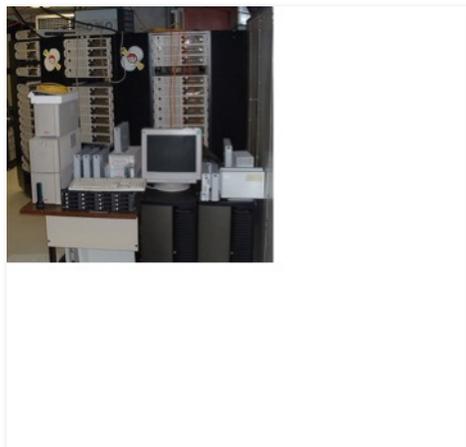
# Guideline on air quality models: big change #1

## Meteorological Input to Near-Field Dispersion Models (AERMOD):

Pre-2017:



Post-2017:



### Appendix W, Section 8.4.5:

- Prognostic meteorological data can be used for a regulatory modeling applications.
- Requirements:



•WRF → MMIF → AERMET



Representative grid cell



Reviewing authority approval



Model evaluation: "demonstration through statistical comparisons with surface and upper-air observations."



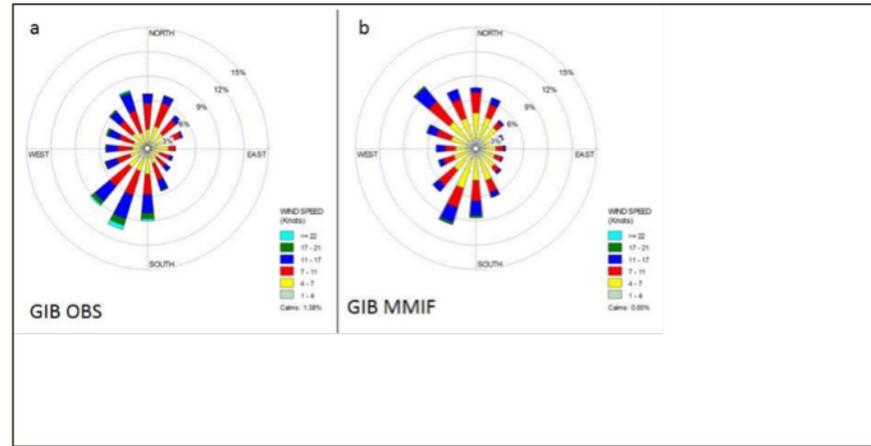
3 years of data





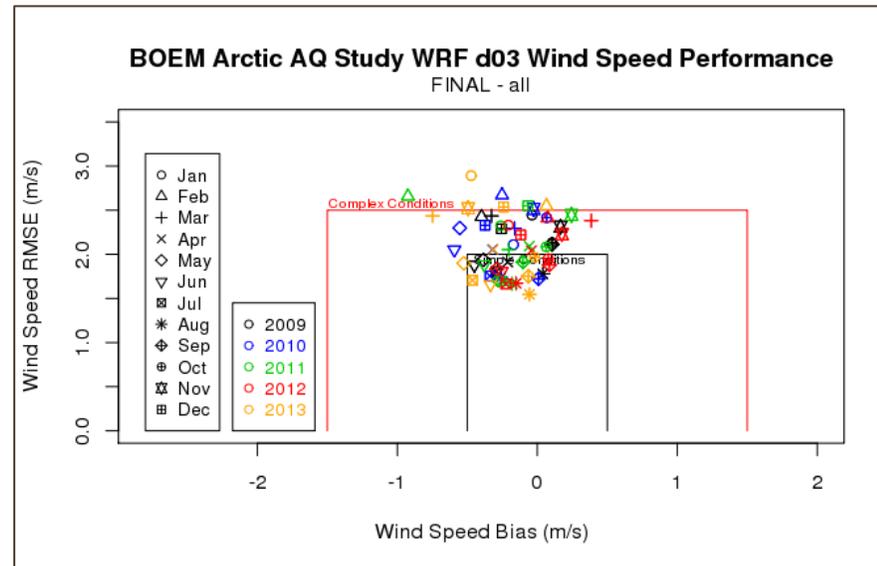
# Performance Analysis Checklist: proposed

1) Wind-rose comparisons



2) Upper-air profile comparisons

3) Monthly error and bias “soccerplots”



4) Scatterplots

6) AERMOD comparisons:  
Robust High Concentration

## Example analyses:

**EPA** United States Environmental Protection Agency EPA-454/R-15-004  
July 2015

### Evaluation of Prognostic Meteorological Data in AERMOD Applications

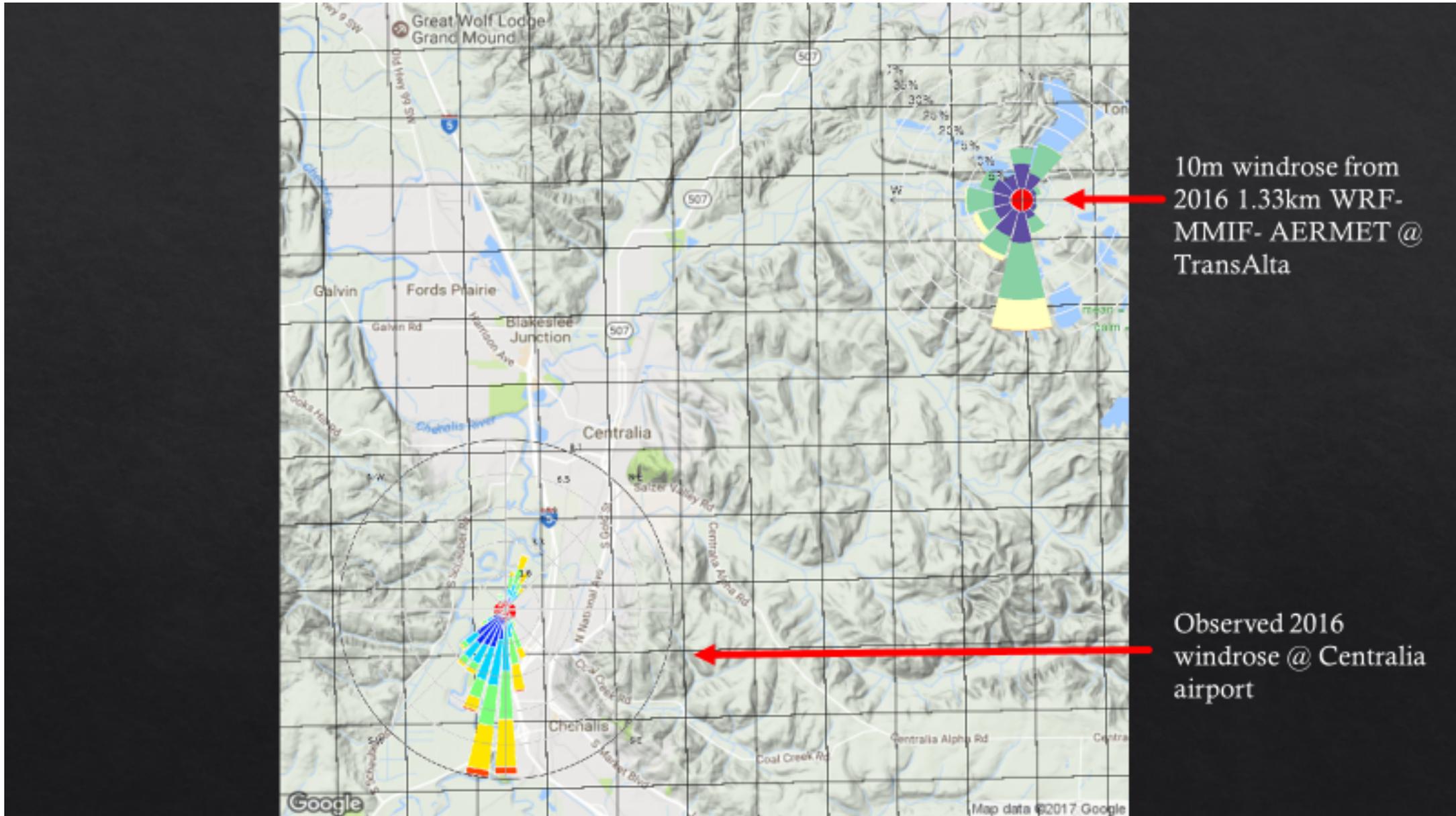
U.S. Environmental Protection Agency  
Office of Air Quality Planning and Standards  
Air Quality Assessment Division  
Air Quality Modeling Group  
Research Triangle Park, North Carolina

OCS Study  
BOEM 2015-049

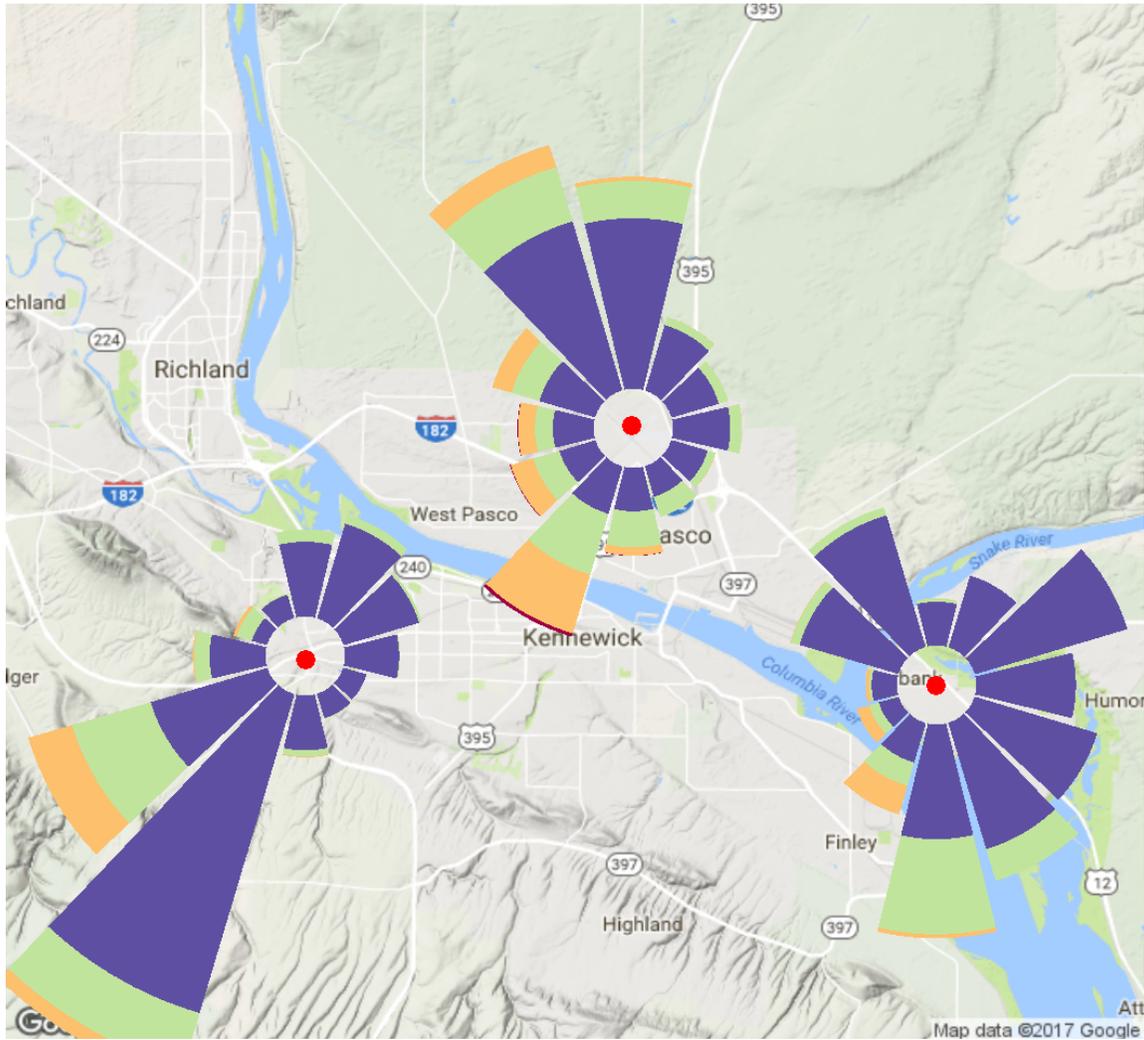
### Arctic Air Quality Modeling Study Meteorological Model Performance Evaluation: 2009-2013 BOEM Arctic WRF Dataset

**BOEM** US Department of the Interior, Bureau of Ocean Energy Management, Alaska OCS Region  
**ERG** Eastern Research Group, Inc., 8050 Cal Center Drive, Suite 325, Sacramento, CA 95826  
**RAMBOLL ENVIRON** Ramboll Environ US Corporation, 19200 137<sup>th</sup> Ave, NE, Suite 310, Lynnwood, WA 98036-4754

# Example: WA Dept. Ecology Projects



# Example: WA Dept. Ecology Projects



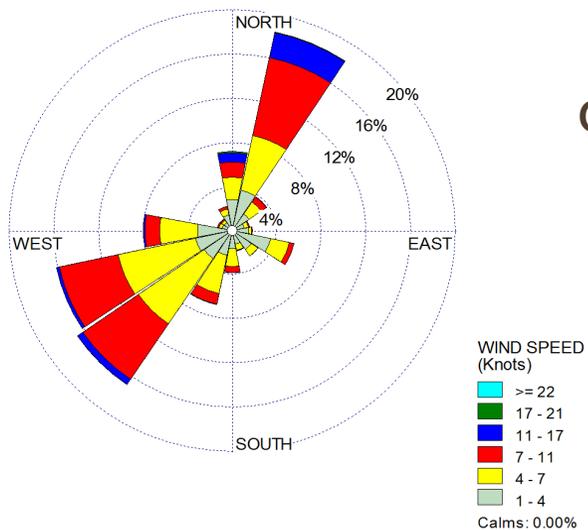
Observed Tri Cities Ozone Study (Aug 2016)



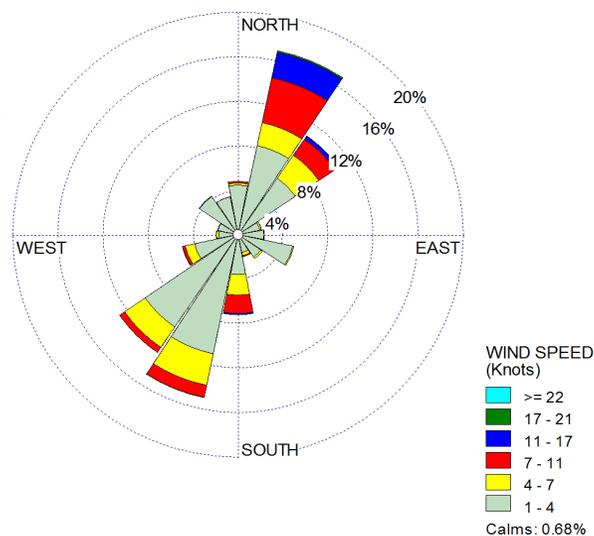
1.33km WRF-MMIF Tri Cities Ozone Study (Aug 2016)

# Example: Idaho Dept. Environmental Quality

WRF:

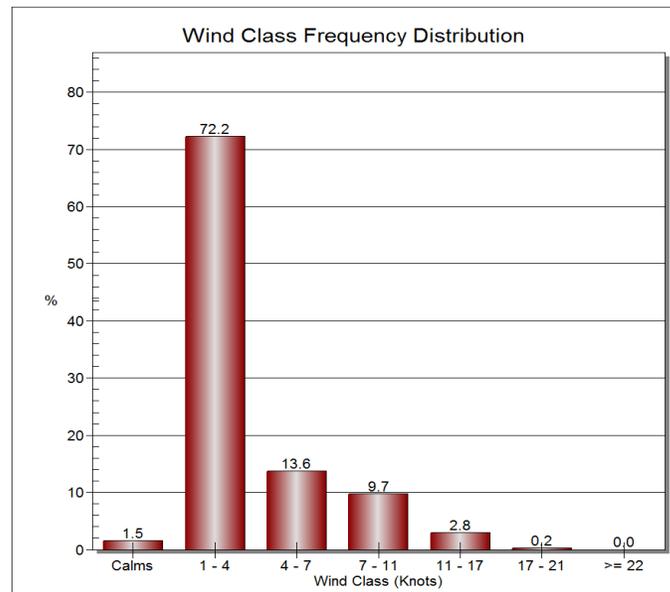
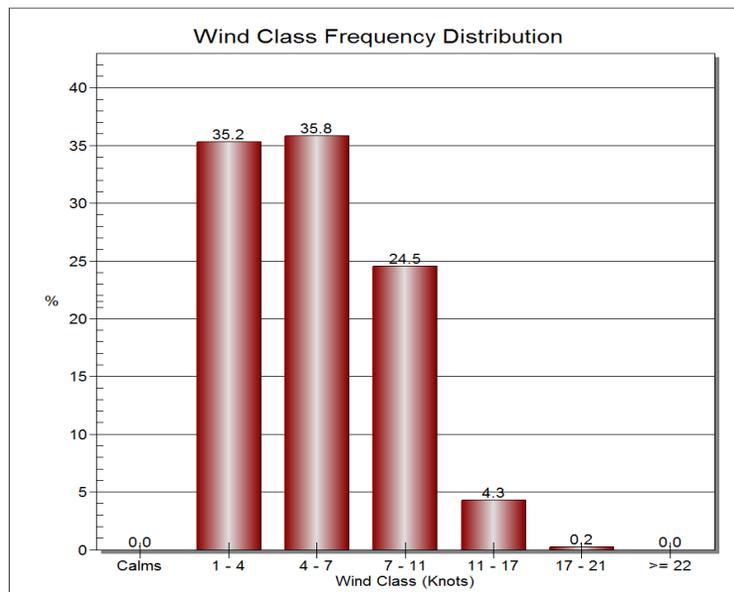


Observed:



AERMOD test case ( $\mu\text{g}/\text{m}^3$ )

		Sandpoint ASOS	Sandpoint Grid Cell	Source Location Grid Cell
		NWS 2011-15	MMIF 2016	MMIF 2016
NO <sub>x</sub>	1hr High	274	386	436
	1hr H8H	187	237	244
	Annual	4.7	8.4	7
PM <sub>10</sub>	24hr - high	135	192	166
	24hr H2h	129	156	163
	Annual	28	55	41



# Guideline on air quality models: big change #2

## Single source PM<sub>2.5</sub> and Ozone air quality impacts

- Traditional models (AERMOD): no photochemistry
- Photochemical models: expensive!

“on January 4, 2012, the EPA granted a petition submitted on behalf of the Sierra Club on July 28, 2010,<sup>18</sup> which requested that the EPA initiate rulemaking regarding the establishment of air quality models for ozone and PM<sub>2.5</sub> for use by all major sources applying for a PSD permit”



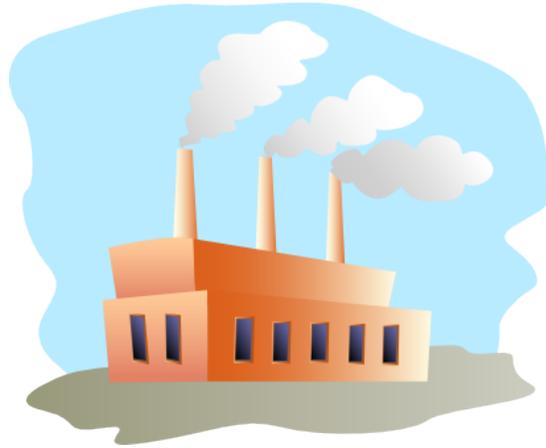
## Tier 1 assessment

- Existing technical info and assessments
- Relationships between emissions and AQ impacts
- MERPs: Model Emission Rates for Precursors

## Tier 2 assessment

- Photochemical modeling of sources

# Tier 1 assessment: How can AIRPACT datasets be used?



Precursor emissions:  
 Ozone: NO<sub>x</sub> and VOCs  
 PM<sub>2.5</sub>: NO<sub>x</sub> and SO<sub>2</sub>

Concentrations  
 Below NAAQS

- Brute force method:
  - Model with source
  - Model without source

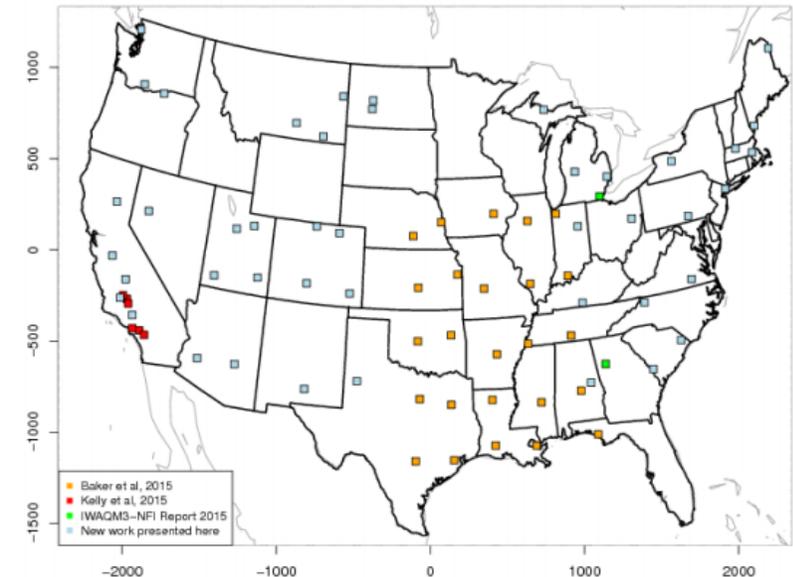
EPA-454/R-16-006  
 December 2016

Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and PM<sub>2.5</sub> under the PSD Permitting Program

## MERPs derived by EPA for hypothetical sources in the Western U.S.

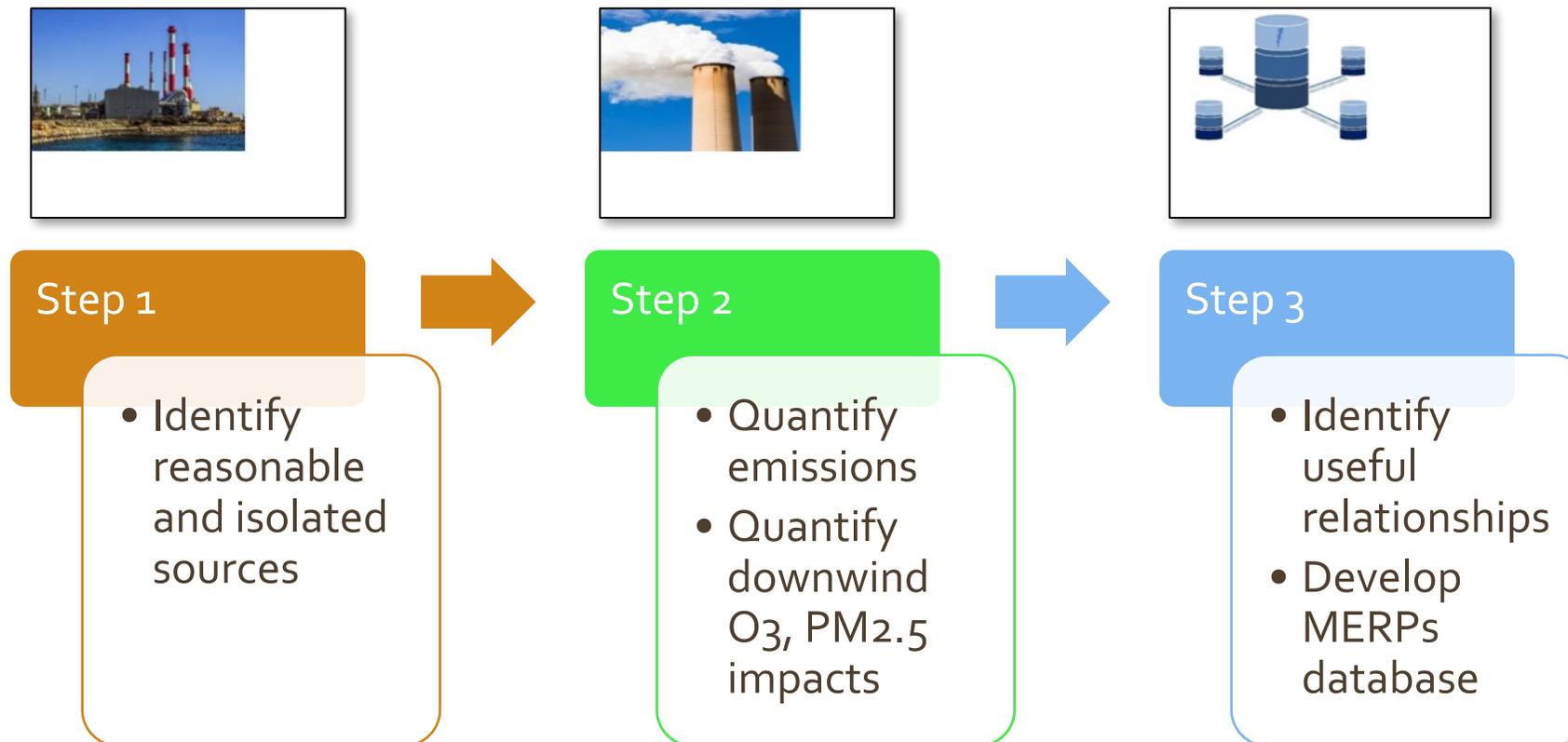
Precursor	8-hr Ozone	24-hr PM <sub>2.5</sub>	Annual PM <sub>2.5</sub>
NO <sub>x</sub>	184 TPY	1155 TPY	3184 TPY
SO <sub>2</sub>	--	225 TPY	2289 TPY
VOC	1049 TPY	--	--

Hypothetical Sources



# Tier 1 assessment: How can AIRPACT datasets be used?

- Can “passive” methods provide useful approach for determining MERPs?
- Can we identify single isolated sources and tie emissions to PM<sub>2.5</sub> and Ozone concentrations?





# Thank you!

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