

Air Modeling: Where is it Open to Challenge?

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Principal



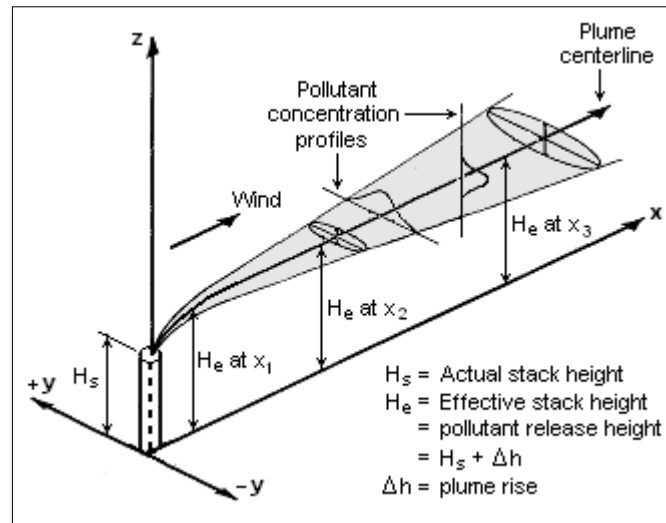
Osman Environmental Solutions

Outline

- Introduction
- Components of Air Modeling Analysis--Where it is Challengeable?
 - Model Selection
 - Model Setup/Switches
 - Emissions Inventory
 - Meteorological Data
 - Receptors
 - Background Concentrations
- Conclusions

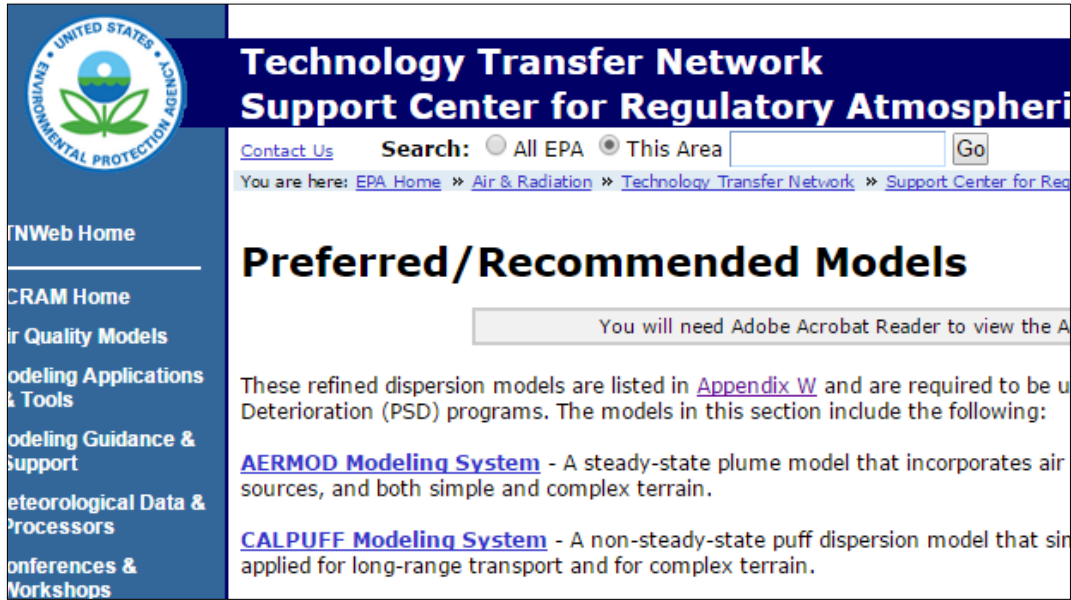
Introduction

- Air modeling is mathematical simulation of transport of pollutants through atmosphere
- Frequently used in permitting efforts, but also non-permitting applications
- Designed as regulatory tool, so inherently conservative
- Science and art



Components: Model Selection

- EPA-approved models listed in 40 CFR 51, Appendix W
 - Each model has certain strengths
 - AERMOD and CALPUFF most common
- Open to Challenge?
 - Typically not much, AERMOD almost always used
 - May be instances where CALPUFF can be argued to be superior model



The screenshot shows the EPA Technology Transfer Network website. The header includes the EPA logo and the text "Technology Transfer Network Support Center for Regulatory Atmospheric". Below the header is a search bar with "All EPA" and "This Area" radio buttons, and a "Go" button. A breadcrumb trail reads "You are here: EPA Home » Air & Radiation » Technology Transfer Network » Support Center for Regulatory Atmospheric". The main content area is titled "Preferred/Recommended Models" and contains a message: "You will need Adobe Acrobat Reader to view the A...". Below this, it states: "These refined dispersion models are listed in [Appendix W](#) and are required to be used for PSD programs. The models in this section include the following:"

- [AERMOD Modeling System](#) - A steady-state plume model that incorporates air sources, and both simple and complex terrain.
- [CALPUFF Modeling System](#) - A non-steady-state puff dispersion model that is applied for long-range transport and for complex terrain.

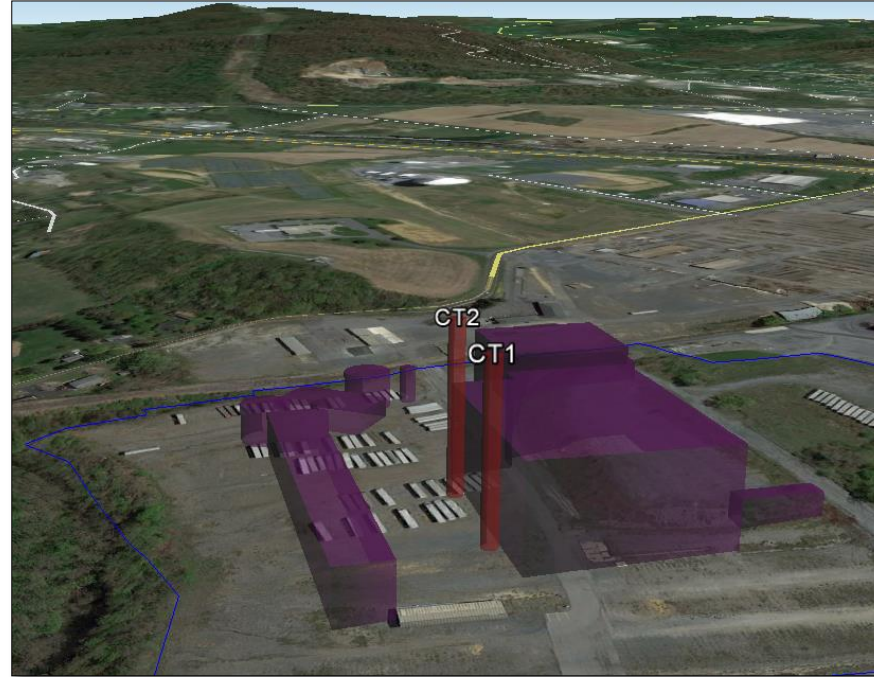
The left sidebar contains a navigation menu with the following items: "TNNWeb Home", "CRAM Home", "Air Quality Models", "Modeling Applications & Tools", "Modeling Guidance & Support", "Meteorological Data & Processors", and "Conferences & Workshops".

Components: Model Switches

- Settings in model that govern how model executes
- Many States publish specific modeling guidelines
 - PADEP has “DRAFT Checklist for Air Quality Modeling Protocol, Prevention of Significant Deterioration Analysis” (October 8, 2008)
- Open to Challenge?
 - Typically not much, regulatory defaults almost always used
 - CALPUFF switches are complicated, may be challengeable

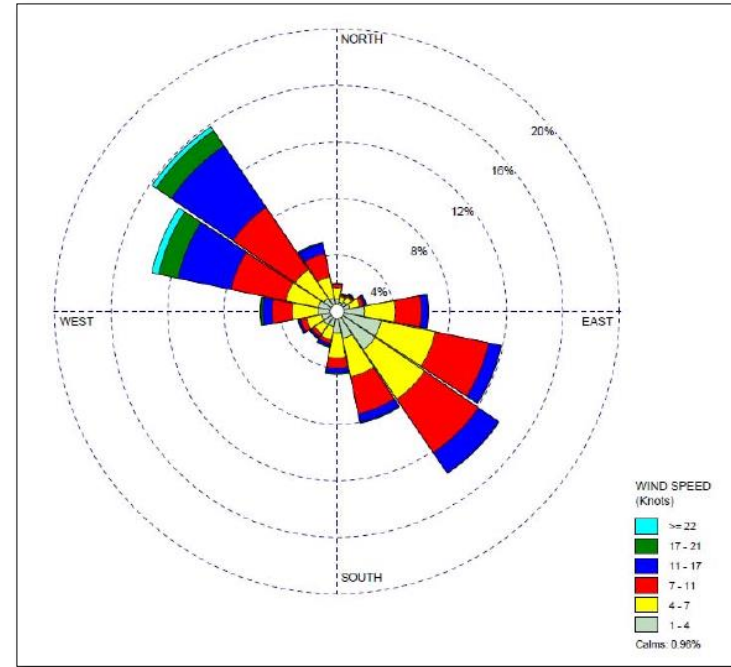
Components: Emissions Inventory

- Descriptive information about sources being addressed in modeling analysis
 - Different information required for different source types
 - Multiple ways to calculate emission rates (1-hr, startup/shutdown, etc.)
 - May need to include both project and offsite sources
- Open to Challenge?
 - Good opportunity
 - Has analysis accounted for all appropriate sources?
 - Are emission rates properly calculated?



Components: Meteorological Data

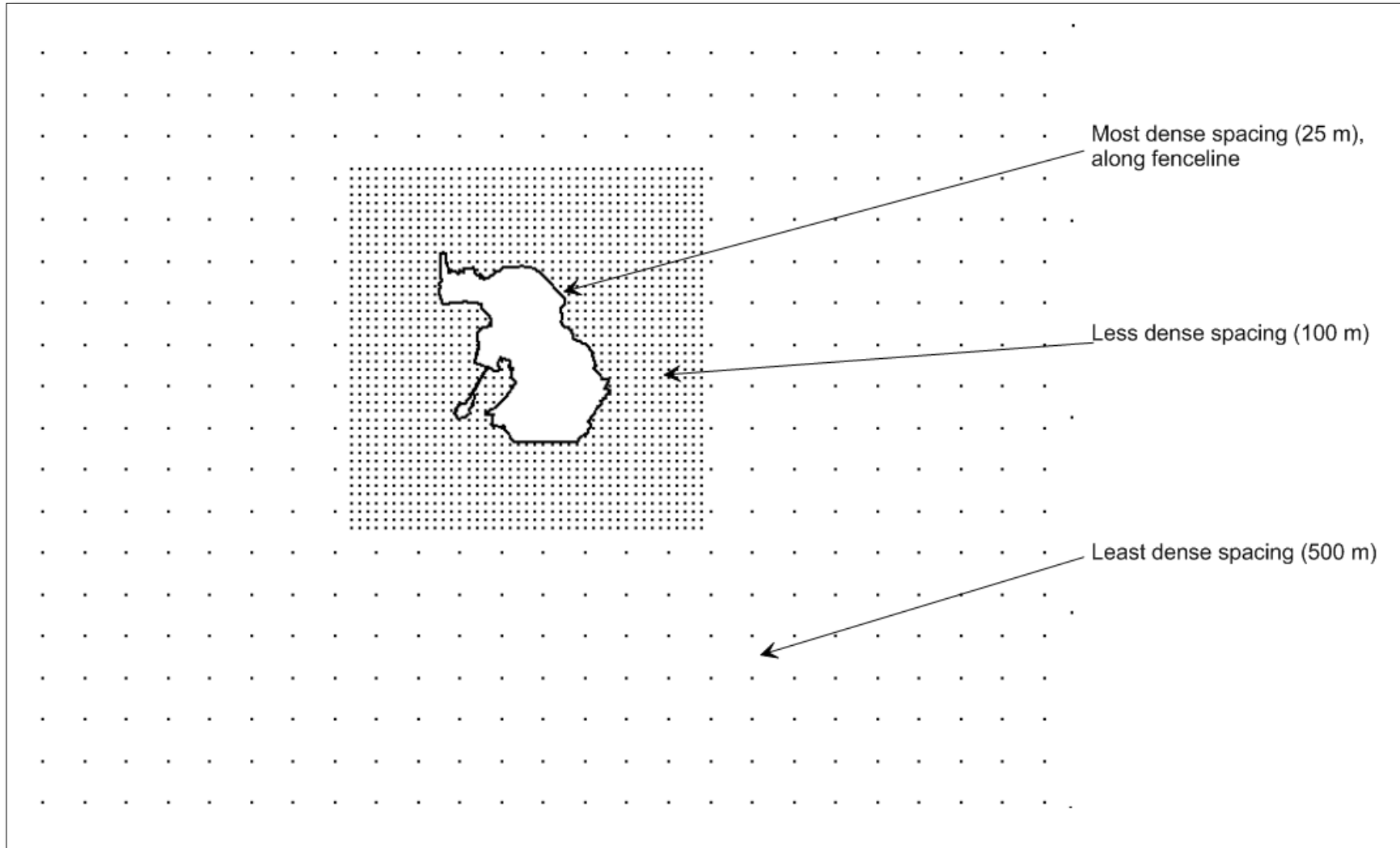
- Required by nearly all models
- Need to be
 - Representative of area being modeled
 - Sufficiently complete
- Usually from nearby airport, but can be on-site
- Some states provide data for applicants; PADEP typically does not
- Open to Challenge?
 - Typically not, but it can be extremely challengeable in some cases
 - Are data representative of area being modeled?
 - If on-site data, have they been QA'd and processed properly?



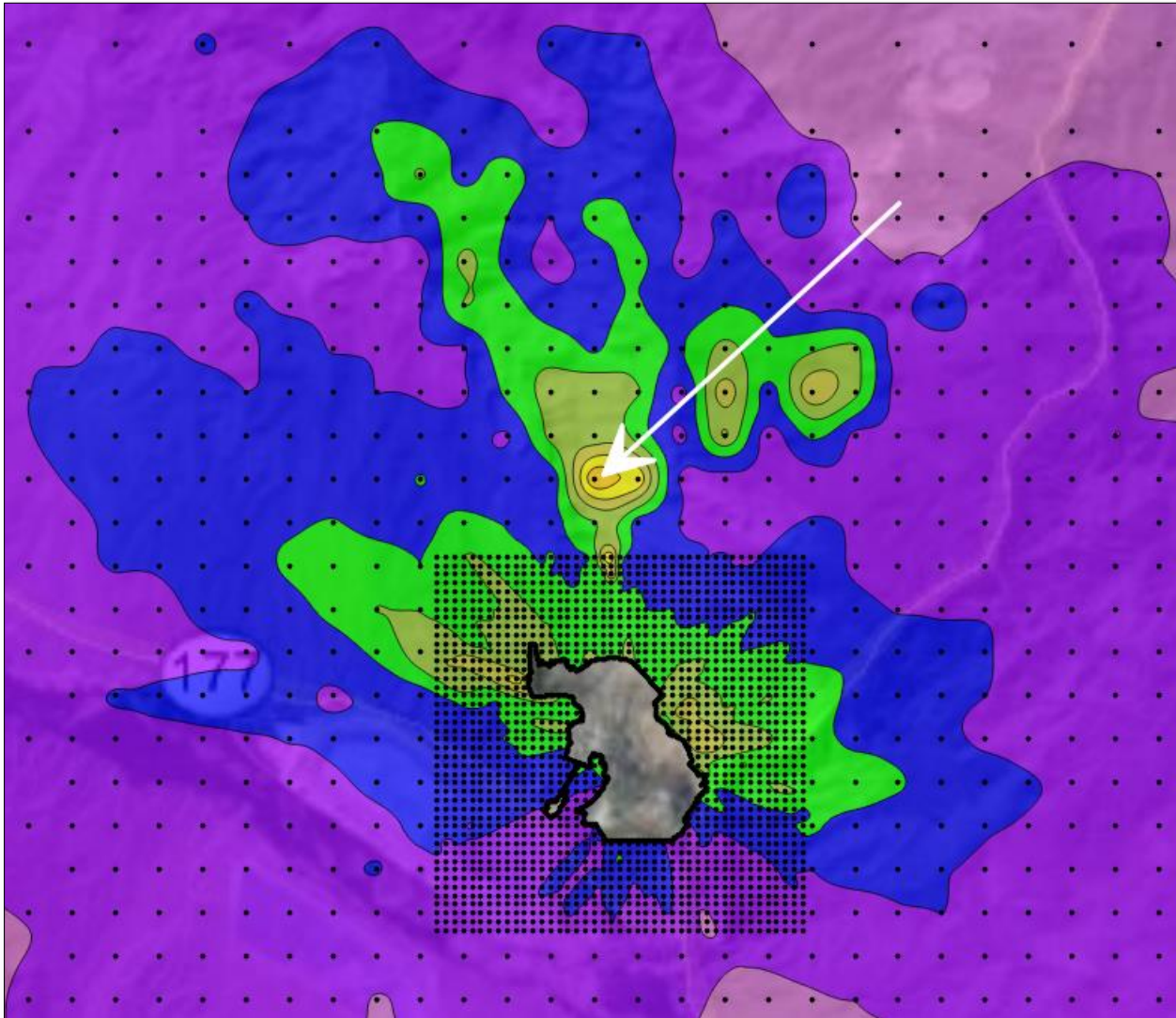
Components: Receptors

- User-defined locations where model is to predict concentration
- Placed in “ambient air”
- Increasing spacing with distance from source being modeled
- Open to Challenge?
 - Typically not, but it can be extremely challengeable in some cases
 - Controlling concentration must be in area of sufficient receptor density (typically 100 m or less)
 - Location of Ambient Air Boundary can be an issue

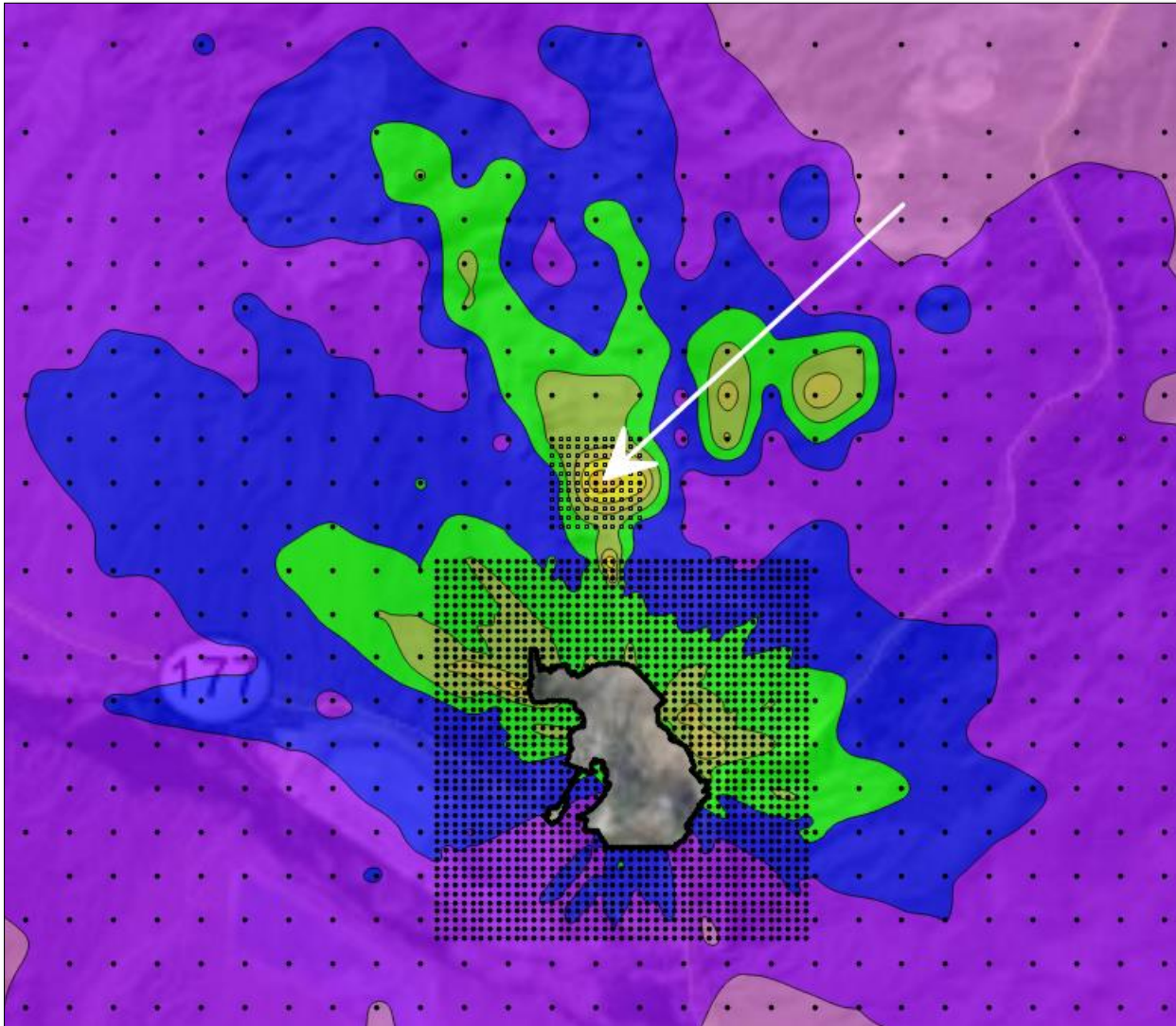
Components: Receptors



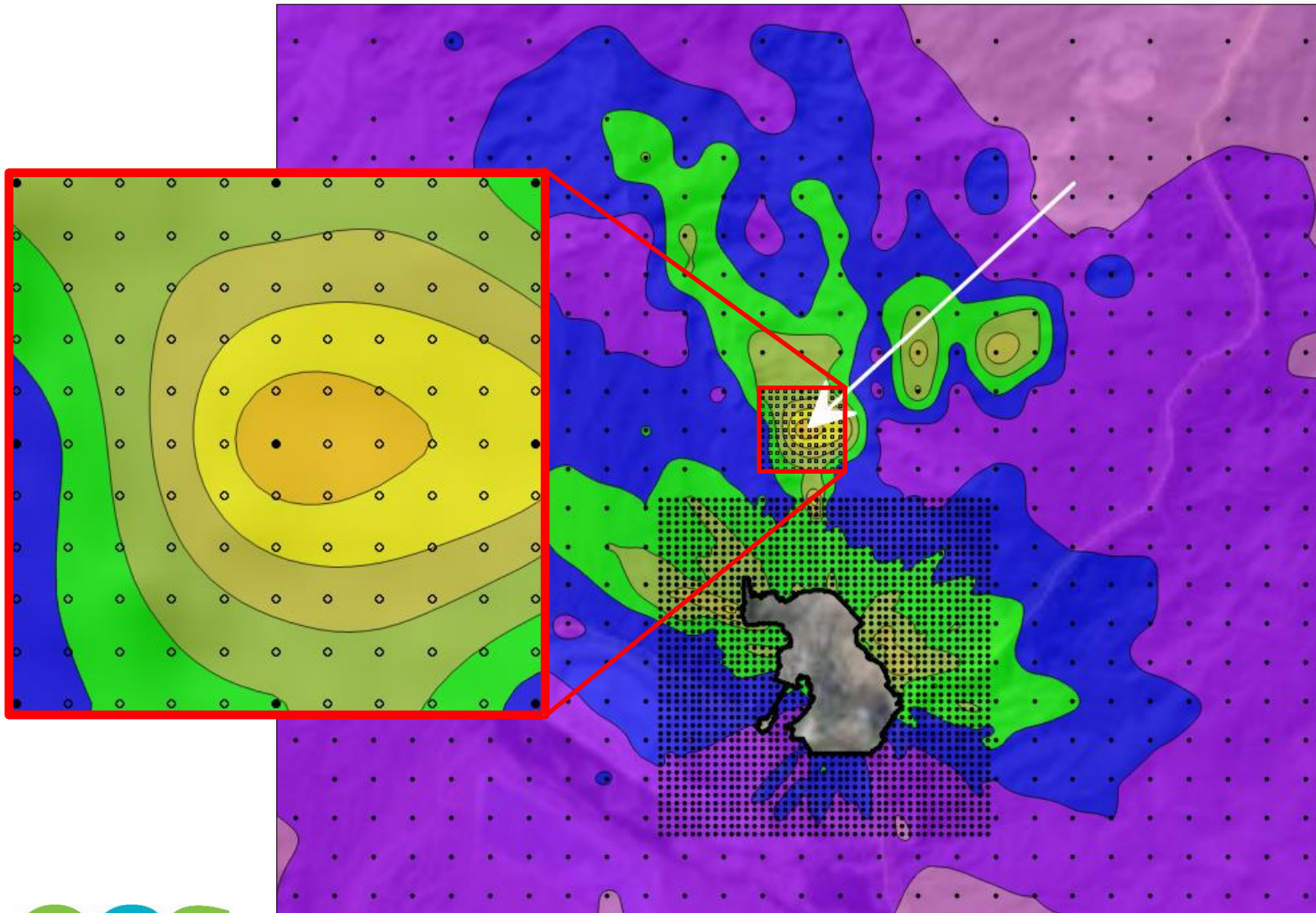
Components: Receptors



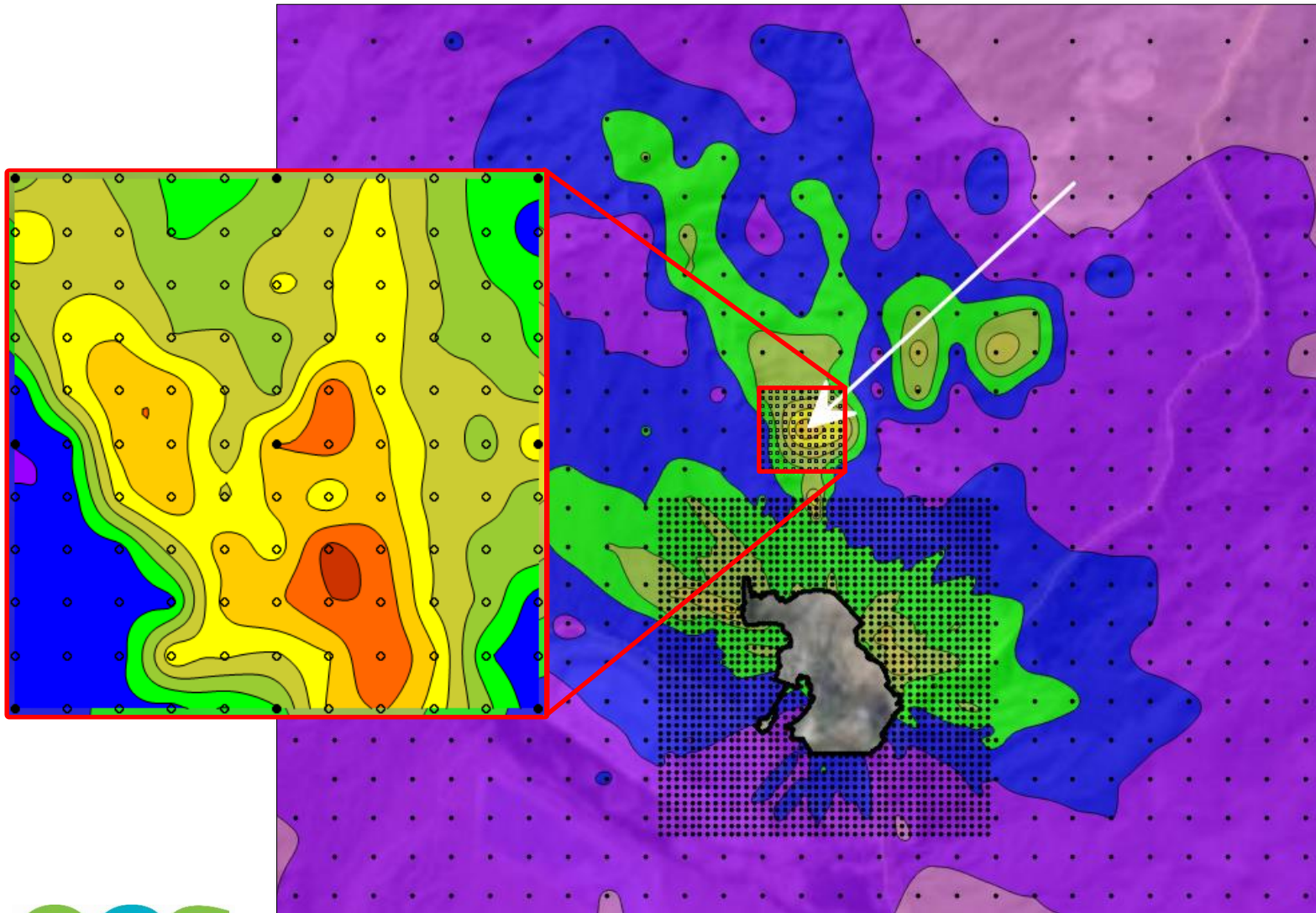
Components: Receptors



Components: Receptors



Components: Receptors



Components: Background Concentration

- Represent contribution from sources not included in modeling analysis (e.g., natural background, smaller sources not in emissions inventory, etc.)
- Included in some analyses (e.g., NAAQS), but not all
- Monitor data available from EPA, some States
- Many different ways to calculate background concentration, each with varying degrees of conservatism
- Open to Challenge?
 - Can be extremely challengeable if total concentration (modeled plus background) is close to NAAQS
 - Are data from a monitor that is representative of the area being modeled?
 - Were the data gathered correctly? (i.e., QA/QC procedures)
 - Is the background concentration calculated appropriately?

Conclusion

Component	Challengeable?	Notes
Model Selection	Typically not	<ul style="list-style-type: none">• AERMOD almost always used
Model Switches	Typically not	<ul style="list-style-type: none">• Regulatory default almost always used• CALPUFF switches can be challengeable
Emissions Inventory	Yes	<ul style="list-style-type: none">• Appropriate sources included?• Emission rates calculated properly?
Meteorological Data	Yes	<ul style="list-style-type: none">• Representative of area being modeled?• If from on-site tower, were they QA'd properly?
Receptors	Yes	<ul style="list-style-type: none">• Sufficient spacing?• Ambient Air Boundary properly defined?
Background Concentration	Yes	<ul style="list-style-type: none">• Representative of area being modeled?• Calculated properly?

Understanding various components of modeling analysis is critical to focusing in on which aspects are open to challenge.



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