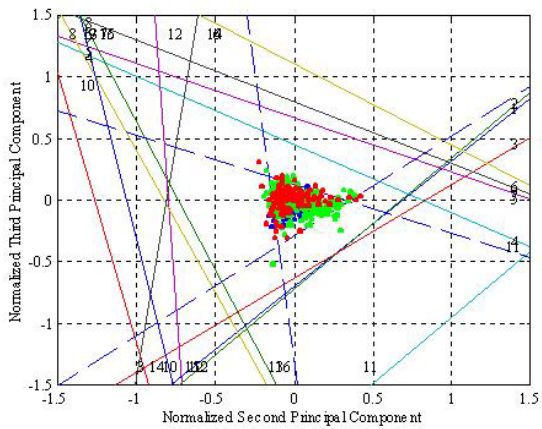
Workbook Summary

Key Points

Section 3 – Receptor Modeling Overview

- Multivariate receptor models help analysts understand what emission sources contribute to ambient $PM_{2.5}$ concentrations.
- It is more difficult to relate ambient concentrations of secondary PM to sources of precursor emissions than to identify sources of primary PM.
- Data are available at numerous sites; but before applying a receptor model, differences in MDLs, methodologies, collection, etc. need to be understood.



PMF and Unmix are ideally suited for the new, larger data sets available.

Key Points

Section 4 – Building a Concentration Data Set

Analysts need to

- Develop a conceptual model of the airshed
- Ensure that data are of sufficient quality
- Select appropriate species
- Populate the final data set, including uncertainties for PMF and treatment of missing or below detection data
- Ensure that data meet model requirements

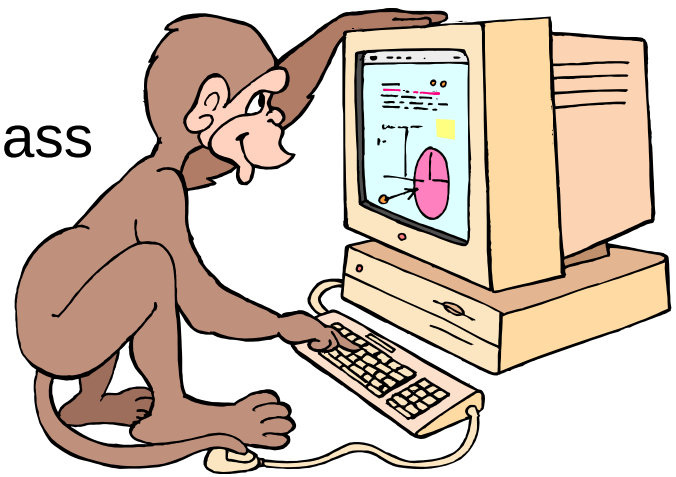
As with any model, garbage in = garbage out!

Key Points

Section 5 – Interpreting Model Diagnostics

- While it may be tempting to skip model diagnostics – DON'T
- Did the receptor model find a solution?
  - For PMF, inspect convergence results, Q value
  - For Unmix, inspect feasibility of the solutions
- Does the solution reproduce the original data reasonably well?
  - Inspect standardized residuals
  - Inspect reconstructed vs. modeled regression results for species and mass
- Is the solution robust?
  - Review sampling variability

Receptor modeling is an iterative process.



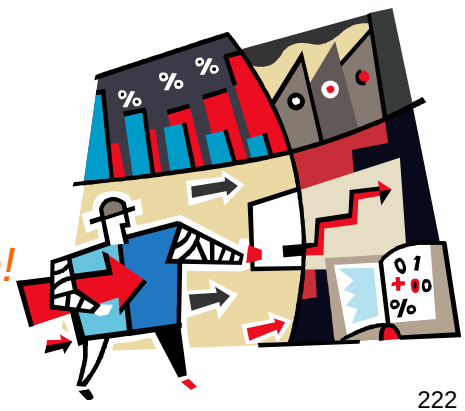
Key Points

Section 6 – Overview of Interpreting Results

This section is intended to provide a brief look at how to interpret and apply model results,

- Showing how source apportionment fits into an overall "weight-of-evidence" approach
- Providing discussion and examples of suggested pre- and post-source apportionment analyses
- Illustrating how to use trajectories and meteorological data to identify areas of influence
- Reconciling source apportionment results with emission inventories

This section is a work in progress; stay tuned for more to come!



Applicability to Other Data Sets

While this workbook focuses on the application of receptor models to routine $PM_{2.5}$ data from national networks, the same concepts for preparing data sets, interpreting model diagnostics, and interpreting results apply to other data sets

- Other $PM_{2.5}$ data such as continuous speciated data, dichotomous samplers, size-resolved data (e.g., DRUM or MOUDI samplers)
- VOC data including PAMS program data in which over 50 species with 1-hr or 3-hr resolution are available. Particular attention to covariance is needed with these data.
- Air toxics data which may contain VOCs, PM metals, and semi-volatile organic compounds. Challenges with these data sets are that some nontoxic species useful to identify source types are not routinely reported with toxics data, and that there is often a mixture of concentration units among the species.
- Meteorological variables that can be examined to understand common patterns to aid in forecasting or episode selection.
- Data from multiple sites (i.e., Paatero et al., 2003) to investigate spatial variability and trends
- Particle number and size distribution data (Zhou et al., 2004, Kim et al., 2004) to better understand particle formation.

References

Kim E., Hopke P.K., Larson T.V., and Covert D.S. (2004) Analysis of ambient particle size distributions using UNMIX and positive matrix factorization. *Environ. Sci. Technol.* **38** (1), 202-209.

Zhou L.M., Hopke P.K., Paatero P., Ondov J.M., Pancras J.P., Pekney N.J., and Davidson C.I. (2004) Advanced factor analysis for multiple time resolution aerosol composition data. *Atmos. Environ.* **38** (29), 4909-4920.