

CALPUFF Modeling Course Outline – Tampa, Florida

March 10 – March 12, 2010

Wednesday March 10 - Day 1 – Morning

1. OVERVIEW (8:30 am - 12:30 pm)

- 1.0 Introduction
- 1.1 Background
 - 1.1.1 Puff vs. Plume models
 - 1.1.2 Comparison with other models
 - 1.1.3 Regulatory status
 - 1.1.4 Near-field applications
- 1.2 CALPUFF modeling system overview
- 1.3 Major features of the CALPUFF modeling system
 - 1.3.1 Geophysical & meteorological preprocessors
 - 1.3.2 Meteorological modeling
 - 1.3.3 Dispersion modeling
 - 1.3.4 Postprocessing & display

BREAK (10:30 – 10:45 am)

- 1.4 Summary of data requirements
 - 1.4.1 Minimum data requirements
 - 1.4.2 Advanced data inputs
- 1.5 Computer requirements
- 1.6 Typical applications and uses of the model
- 1.7 Ongoing and future developments
 - 1.7.1 Technical advances
 - 1.7.2 Ease-of-use considerations
 - 1.7.3 Evaluation studies

LUNCH (12:30 - 1:30 pm)

Wednesday March 10 - Day 1 – Afternoon

2. HANDS-ON COMPUTER EXERCISES (1:30 pm - 5:30 pm)

- 2.1 Installation of the software and new GUIs
 - 2.1.1 On-line datasets and links
- 2.2 Overview of Graphical User Interfaces (GUIs)
 - 2.2.1 Menu commands
 - 2.2.2 Online Help system
 - 2.2.3 Utilities, ISC3/AERMOD conversion program

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- 2.3 Test case simulations
 - 2.3.1 Sample model files and standard model test simulations
 - 2.3.2 No-Observations simulations (Sydney case study)

Thursday March 11 - Day 2 – Morning

3. TECHNICAL DESCRIPTION OF CALMET (8:30 am - 10:30 am)

- 3.1 Wind fields
 - 3.1.1 Initial guess field
 - Interpolation
 - Vertical extrapolation
 - Bias parameters
 - Use of prognostic wind fields (MM5, RUC, Eta, RAMS datasets)
 - 3.1.2 Diagnostic wind module (Step 1 adjustments)
 - Initial guess field
 - Kinematic effects
 - Terrain blocking
 - Slope flows
 - 3.1.3 Objective analysis (Step 2 adjustments)
 - Interpolation
 - Vertical extrapolation
 - Influence parameters
 - Smoothing
 - O'Brien adjustment
 - Divergence minimization
- 3.2 Boundary layer modules
 - 3.2.1 Overland boundary layer formulation
 - 3.2.2 Overwater boundary layer formulation
- 3.3 Assessment of draft IWAQM (2009) recommendations

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- 3.4 Surface friction velocity
- 3.5 Monin-Obukhov length
- 3.6 Convective velocity scale
- 3.7 Mixing height
- 3.8 Stability class
- 3.9 Precipitation and cloud data

BREAK (10:30 – 10:45 am)

4. METEOROLOGICAL AND GEOPHYSICAL PROCESSORS (10:45 am – 12:30 pm)

- 4.1 Terrain and land use processors and data bases (TERREL, CTGPROC, MAKEGEO)
- 4.2 Upper air processors (READ62)
- 4.3 Surface meteorological processors (SMERGE)
- 4.4 Precipitation processors (PMERGE, PXTRACT)
- 4.5 Overwater data (BUOY program, SEA.DAT files)
- 4.6 Meteorological data display (PRTMET)
- 4.7 Prognostic processors (CALMM5, CALRUC, CALRAMS, CALETA)

LUNCH (12:30 – 1:30 pm)

Thursday March 11 - Day 2 – Afternoon

5. HANDS-ON COMPUTER EXERCISES (1:30 pm – 5:30 pm)

- (Meteorological and Geophysical Processing)
- 5.1 Complex terrain near-field simulation (Pocatello, Idaho case study)
 - 5.2 Advanced CALMET application (barriers)

Friday March 12 - Day 3 – Morning

6. TECHNICAL DESCRIPTION OF CALPUFF (8:30 am – 10:45 pm)

- 6.1 Solution of puff equations – puffs vs. slugs
- 6.2 Dispersion coefficients
- 6.3 Building downwash
- 6.4 Plume rise
- 6.5 Overwater and coastal dispersion

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- 6.6 Chemical transformation
 - 6.6.1 MESOPUFF II chemistry
 - 6.6.2 RIVAD/ARM3 chemistry
 - 6.6.3 Chemistry files (CHEM.DAT, OZONE.DAT)
 - 6.6.4 NO₃ prediction refinement
- 6.7 Dry deposition
 - 6.7.1 VD.DAT
- 6.8 Wet removal
- 6.9 Complex terrain
 - 6.9.1 ISC-type of terrain adjustments
 - 6.9.2 CTDM-type of terrain adjustments
 - 6.9.3 Integrated terrain adjustment approach
 - 6.9.4 Terrain processors (OPHILL, CTDMPLUS)
- 6.10 Visibility
 - 6.10.1 FLAG methodology (Method 2)
 - 6.10.2 BART methodology (Method 6)
 - 6.10.3 New proposed FLAG (2008) methodology (Method 8)
 - 6.10.4 Alternative technologies
- 6.11 Emissions data – arbitrarily varying files (points, areas, volumes and lines)
- 6.12 CALPUFF meteorological data options
 - 6.12.1 CALMET meteorological data (CALMET.DAT) file
 - 6.12.2 AERMOD/AERMET meteorological data option
 - 6.12.3 ISC meteorological data (ISCMET.DAT) file
 - 6.12.4 CTDM meteorological data (SURFACE.DAT, PROFILE.DAT) files
 - 6.12.5 Other options (site-specific turbulence data – PROFILE.DAT)
- 6.13 Odor modeling
- 6.14 Memory management

BREAK (10:45 am – 11:00 am)

Friday March 12 - Day 3 – Morning (continued)

7. POSTPROCESSORS (11:00 am – 12:30 pm):

- 7.1 CALPOST
 - 7.1.1 Method 8 Visibility including automatic access of Class I data
- 7.2 APPEND
- 7.3 CALSUM
- 7.4 POSTUTIL
 - 7.4.1 Ammonia Limiting Method (ALM) options

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Friday March 12 - Day 3 – Morning (continued)

- 7.5 CALTools
 - 7.5.1 CALANALYSIS
 - 7.5.2 AER2CAL
 - 7.5.3 Wind Rose Plotter
 - 7.5.4 Time Series Plotter
 - 7.5.5 Back Trajectory Generator
 - 7.5.6 Quantitative Meteorological Evaluation Package
 - 7.5.7 Pollution Rose Plotter
 - 7.5.8 Key Variable Extractor
 - 7.5.9 Quantile-Quantile (Q-Q) Plotter

LUNCH (12:30 – 1:30 pm)

Friday March 12 - Day 3 – Afternoon

8. HANDS-ON COMPUTER EXERCISES (1:30 pm - 5:30 pm)

(CALPUFF Dispersion Modeling and Postprocessing)

- 8.1 Gulf of Mexico coastal long range transport and visibility application
 - 8.1.1 Visibility methods including new FLAG (2008) methodology
- 8.2 Accidental release (Texas coastal application) – sub-hourly time step application
- 8.3 Cooling tower visible plume (fogging) application
- 8.4 Coastal application in complex terrain (Koeberg, South Africa case study)