

CALPUFF Modeling Course Outline
Boulder, Colorado
June 30 – July 2, 2008

Monday, June 30 - Day 1 – Morning

1. OVERVIEW (8:30 am - 12:00 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 am - 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 (12:00 - 1:00 pm)

Monday, June 30 - Day 1 – Afternoon

2. HANDS-ON COMPUTER EXERCISES (1:00 pm - 5:00 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 conversion program
 - 2.3 Test case simulations
 - 2.3.1 Sample model files and standard model test simulations
 - 2.3.2 No-Observations simulation (Sydney case study)

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Tuesday, July 1 - 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 Surface friction velocity
 - 3.4 Monin-Obukhov length
 - 3.5 Convective velocity scale
 - 3.6 Mixing height
 - 3.7 Stability class
 - 3.8 Precipitation and cloud data

BREAK (10:30 am – 10:45 am)

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Tuesday, July 1 -Day 2 – Morning (Continued)

4. METEOROLOGICAL AND GEOPHYSICAL PROCESSORS (10:45 am – 12:00 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)
 - 4.8 Postprocessors: CALPOST, APPEND, CALSUM, POSTUTIL

LUNCH (12:00 – 1:00 pm)

Tuesday, July 1 - Day 2 – Afternoon

5. HANDS-ON COMPUTER EXERCISES (1:00 pm – 5:00 pm)
(Meteorological and Geophysical Processing)
 - 5.1 Complex terrain near-field simulation (Pocatello, Idaho case study)
 - 5.2 Advanced CALMET application (barriers)

Wednesday, July 2 - Day 3 – Morning

6. TECHNICAL DESCRIPTION OF CALPUFF (8:30 am – 12:00 noon)
 - 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
 - 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

CALPUFF Modeling Course Outline
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June 30 – July 2, 2008

Wednesday, July 2 - Day 3 – Morning (Continued)

- 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 IMPROVE methodology (Method 8)
 - 6.10.4 Alternative techniques

BREAK (10:30 am – 10:45 am)

- 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

LUNCH (12:00 – 1:00 pm)

Wednesday, July 2 - Day 3 – Afternoon

- 7. HANDS-ON COMPUTER EXERCISES (1:00 pm - 5:00 pm)
(CALPUFF Dispersion Modeling and Postprocessing)
 - 7.1 Gulf of Mexico coastal long range transport and visibility application
 - 7.1.1 Visibility Methods 2, 6 and 8 (new IMPROVE methodology)
 - 7.2 Accidental release (Texas coastal application)
 - 7.3 Cooling tower visible plume (fogging) application
 - 7.4 Coastal application in complex terrain (Koeberg, South Africa case study)