CALPUFF Modeling Course Outline
Boulder, Colorado
Tuesday, August 11 – Thursday, August 13, 2009

Tuesday, August 11 - 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)

Tuesday, August 11 - Day 1 – Afternoon

2. SPECIAL SESSION – ASSESSMENT OF DRAFT PROPOSED IWAQM UPDATE (1:00-2:00 pm)

3. HANDS-ON COMPUTER EXERCISES (2:00 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)

CALPUFF Modeling Course Outline
Boulder, Colorado
August 11 – August 13, 2009

Wednesday, August 12 - 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)

CALPUFF Modeling Course Outline
Boulder, Colorado
August 11 – August 13, 2009

Wednesday, August 12 - Day 2 – Morning (Continued)

4. METEOROGICAL 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)

LUNCH (12:00 – 1:00 pm)

Wednesday, August 12 - 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)

Thursday, August 13 - 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 NO_3 prediction refinement
   - 6.7 Dry deposition
     - 6.7.1 VD.DAT
   - 6.8 Wet removal

CALPUFF Modeling Course Outline
Boulder, Colorado
August 11 – August 13, 2009

Thursday, August 13 - 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 (OPTHILL, 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 techniques

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)

7. POSTPROCESSORS:

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 ALM options

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

CALPUFF Modeling Course Outline
Boulder, Colorado
August 11 – August 13, 2009

Thursday, August 13 - Day 3 – Afternoon

LUNCH (12:00 – 1:00 pm)

8. HANDS-ON COMPUTER EXERCISES (1:00 pm - 5:00 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)
   - 8.3 Cooling tower visible plume (fogging) application
   - 8.4 Coastal application in complex terrain (Koeberg, South Africa case study)