AIR & WASTE MANAGEMENT ASSOCIATION
Canadian Prairie & Northern Section

Three Day Course, Theory and Hands-On, Brought to You by
Canadian Prairies and Northern Section (CPANS)
of the Air & Waste Management Association (A&WMA)
and
Exponent Inc.

CALPUFF/CALMET AIR QUALITY DISPERSION MODELING COURSE

Date: November 6th to 8th, 2017
Time: 8:30 AM to 5:00 PM
Cost: $1,100 CAD – A&WMA Member
$1,400 CAD – Non-Member
Coffee and snacks will be provided (no lunch)
Location: Room 140, University of Calgary, Downtown Campus
#906 – 8th Avenue SW
Calgary, Alberta T2P 1H9
Organizer: Piotr Staniaszek – CPANS Treasurer and
CPANS Technical Committee
Contact: Piotr.Staniaszek@snclavalin.com Tel: 587-583-6659

Registration and Payment: https://calpuff2017.wufoo.eu/forms/z2i9uw70e19ku6/

Registration Due: October 31, 2017

Intended Audience

This three-day CALPUFF/CALMET training course is designed for permitting staff, regulators, consultants, engineers, and managers with ambient air quality management responsibilities. The course will consist of technical lectures with relevant hands-on exercises.

Instructors (CALPUFF/CALMET Model Developers)

Irene Lee - E^x^ponent® Managing Scientist

Ms. Irene Lee has an M. S. in atmospheric science and has 12 years of experience in meteorological and air quality modeling. She has performed numerous air quality impact studies worldwide, including in the U.S., Canada, Saudi Arabia, Iceland, and Trinidad, using both the AERMOD and CALPUFF modeling systems, from data collection and preparation through to model execution and post-processing analyses. Ms. Lee is also a primary contributor to the CALPUFF modeling system having developed numerous software packages, including the new Visual Basic CALApps graphical user interface (GUI) and Fortran processors. She developed an automated forecast system using the CALPUFF modeling system that included designing a GUI to allow users to view automated forecast results and generate new scenarios on the fly. Features included interactive time-series plots, source contribution tables, and real-time local weather forecasts. She has co-taught CALPUFF courses throughout the world, including the U.S., Canada, and Australia.

Christopher DesAutels - E^x^ponent® Managing Scientist

Mr. DesAutels has nearly 20 years of experience simulating the transport of air pollutants and conducting air quality modeling studies. He is active in applying air dispersion models, including AERMOD, CALPUFF, Computational Fluid Dynamics (CFD), and dense gas models, to complex dispersion problems in support for both regulatory permitting applications and litigation. As the current lead scientist and software developer for the CALPUFF model he coordinates enhancements and bug fixes to the model code. Recent development work includes the implementation of a new CALPUFF source type in order to model aerial spraying, and linking CALPUFF with the agricultural spray model AGDISP. Mr. DesAutels co-taught a one-day CALPUFF course at the 2015 A&WMA annual conference.

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CALPUFF Modeling Introductory Course Outline

Monday, November 6 – 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
  - ISORROPIA (v2.2) chemistry, new gas phase module, secondary organic aerosol (SOA) module, aqueous phase chemistry options
  - Flare and road source modules
  - CALPUFF nested grid features
  - Sub-hourly simulations & intermittent releases
  - Coupling with AGDISP for agricultural spraying
- 1.7.2 Graphical User Interface (GUI) developments
  - Upgrade to CALApps GUI for 64bit Windows 7
  - CALTools (source contributions, significant contribution analysis)
  - CALPUFF Plot (Google Earth based contour and source plots)
  - Time series plotting tool
  - New postprocessing features for 1-hour USA SO_2 and NO_2 standards
- 1.7.3 Evaluation studies

LUNCH (12:30 – 1:30 pm)

(not provided)

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Monday, November 6 – Day 1: Afternoon

2. HANDS-ON COMPUTER EXERCISES (1:30 – 5:00 pm)

2.1 Installation of the software
    2.1.1 On-line datasets and links
2.2 Overview of CALApps Graphical User Interface (GUI)
2.3 Test case simulations
    2.3.1 Sample model files and standard model test simulations
    2.3.2 Sydney application using MM5 data in no observations mode

Tuesday, November 7 – Day 2: Morning

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

3.1 Coordinates and grid system
3.2 Wind fields
    3.2.1 Initial guess field
    - Interpolation
    - Vertical extrapolation
    - Bias parameters
    - Use of prognostic wind datasets (WRF, MM5, RUC, NAM-WRF, ETA, RAMS, TAPM)
    3.2.2 Diagnostic wind module (Step 1 adjustments)
    - Initial guess field
    - Kinematic effects
    - Terrain blocking
    - Slope flows
    3.2.3 Objective analysis (Step 2 adjustments)
    - Interpolation
    - Vertical extrapolation
    - Influence parameters
    - Smoothing
    - O'Brien adjustment
    - Divergence minimization
    3.2.4 Summary of Observation/Prognostic Data Modes
3.3 Boundary layer modules
    3.3.1 Overland boundary layer formulation
    3.3.2 Overwater boundary layer formulation
3.4 Temperature fields
3.5 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, SURFGEN)
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, CALWRF, CALTAPM)

LUNCH (12:30 – 1:30 pm)

(not provided)

Tuesday, November 7 – Day 2: Afternoon

5. HANDS-ON COMPUTER EXERCISES (1:30 – 5:00 pm)

(Meteorological and Geophysical Processing)
5.1 Complex terrain application

Wednesday, November 8 – Day 3: Morning

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

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
    6.6.5 New chemistry modules
    - Updated RIVAD gas phase chemistry of SO_2, NO_x-HNO_3
    - Gas-particle equilibrium for SO_4, NO_3 (ISORROPIA v2.2)
    - Aqueous phase chemistry (RADM cloud module in CMAQ, SCICHEM)
    - Secondary organic aerosol (SOA) module (based on Caltech SOA routines in CMAQ/MADRID)
6.7 Wet deposition (scavenging coefficient approach)
6.8 Dry deposition

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)

6.10 Emissions data – arbitrarily varying files (points, areas, volumes, buoyant lines, flares and roads)
6.11 CALPUFF meteorological data options
- 6.11.1 CALMET meteorological data (CALMET.DAT) file
- 6.11.2 AERMOD/AERMET meteorological data option
- 6.11.3 ISC meteorological data (ISCMET.DAT) file
- 6.11.4 CTDM meteorological data (SURFACE.DAT, PROFILE.DAT) files

6.12 Memory management

BREAK (10:30 – 10:45 am)

7. POSTPROCESSORS (10:45 am – 12:30 pm)

7.1 CALPOST
7.2 APPEND
7.3 CALSUM
7.4 POSTUTIL
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

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LUNCH (12:30 – 1:30 pm)
(not provided)

Wednesday, November 8 – Day 3: Afternoon

8. OPEN DISCUSSION AND OPTIONAL HANDS-ON COMPUTER EXERCISES (1:30 – 5:00 pm)
(CALPUFF Dispersion Modeling and Postprocessing)
8.1 Long Range Transport and Nitrogen and Sulfur Deposition
8.2 Subhourly (accidental release) application

The course will include both technical instruction (through graphical presentation of theory and associated discussions) and hands-on computer exercises (~50% of the time) in which course participants will work with the various components of the new CALPUFF CALApps GUI. The course will use the latest version of the CALPUFF modelling system (Version 7 series of the models). The newest version of the CALApps GUI will be offered for course participants at a discounted price of $495 US (50% discount from the standard purchase price of $995 US).

More information about Exponent Inc. and CPANS CALPUFF/CALMET course can be found at: http://www.exponent.com/Calpufftraining_2/#tab_overview OR: http://www.cpans.org

Disclaimer: CPANS will attempt to promptly notify all registrants in the event of course cancellation. If courses are cancelled, CPANS is not liable for any expenses incurred by the registrant other than the refund of the registration fee(s) paid.