



A large, stylized white "Ex" logo on a teal background. The "E" is a serif capital letter, and the "x" is a lowercase script letter.

Updates on the CALPUFF Model System

12th Conference of Air Quality Models
EPA-Research Triangle Park, NC Campus

Chris DesAutels - Exponent

October 3, 2019

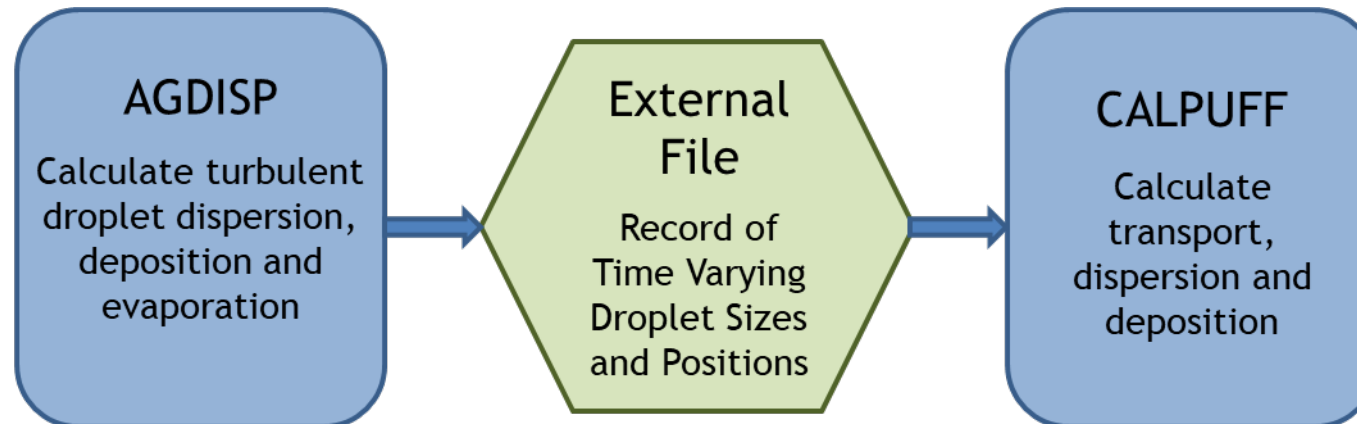
- Exponent continues to maintain and support the CALPUFF Model.
- Now distributing CALPUFF Version 7.3.1 on our Website (www.src.com)
- Correct specific bugs identified in prior Version 7 of the code
 - Use of multiple sub-hourly variable emissions files
 - Use of AERMET .SFC and .PFL files with missing profile levels from on-site data.
- Introduction of a new AGDISP coupled agriculture spray source
- Update of post-processing utilities to accommodate the spray source
- Update CALWRF to correct bug related to precipitation processing
- CALPUFF Version 7 User Guide Addendum
- EPA recommended version of the CALPUFF model remains unchanged

- Develop a linkage between AGDISP and CALPUFF
 - Near field turbulence calculated with AGDISP
 - Further transport calculated with CALPUFF

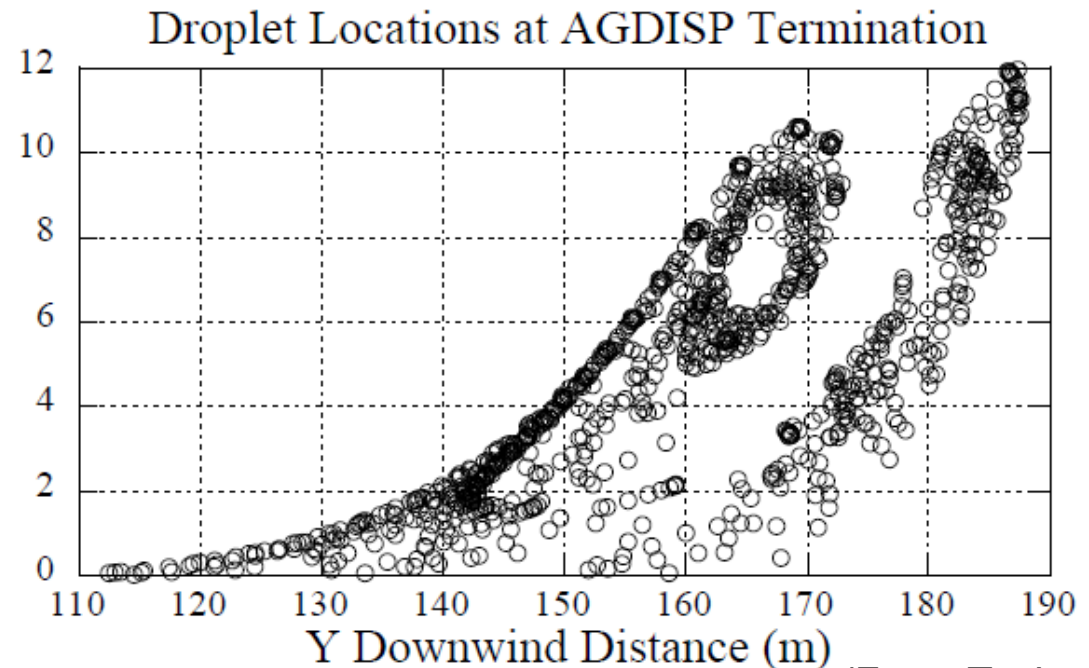
- Allow for future updates of both models
 - External Hand-off File

- Development work involved the developers of both models and the US Forest Service
 - Continuum Dynamics (Milt Teske)
 - Exponent
 - US Forest Service (Harold Thistle)

- Programs are run serially and linked by an external ASCII based file
- Droplet sizes and positions are defined by AGDISP once turbulence dies down and evaporation is complete
- Further transport is calculated with CALPUFF



- Near field turbulence in the aircraft wake
- Calculates initial droplet deposition
- All evaporation calculated in AGDISP
- ASCII external file contains detailed output on airborne droplet size and position
- Each point represents a distribution cloud of droplets of a single size
- Points are mapped in 2D from the downwind edge of the field
- Flight Direction is into the page



(From Teske 2015)

- Additional fields now included in AGDISP to define:
 - Starting location of spray line
 - Line length
 - Base Elevation
 - Flight direction

Export CALPUFF Data

Spray Line Beginning X Coordinate: 150.017 km

Spray Line Beginning Y Coordinate: 140.776 km

Base Z Elevation: 10 m

Spray Line Length: 1 km

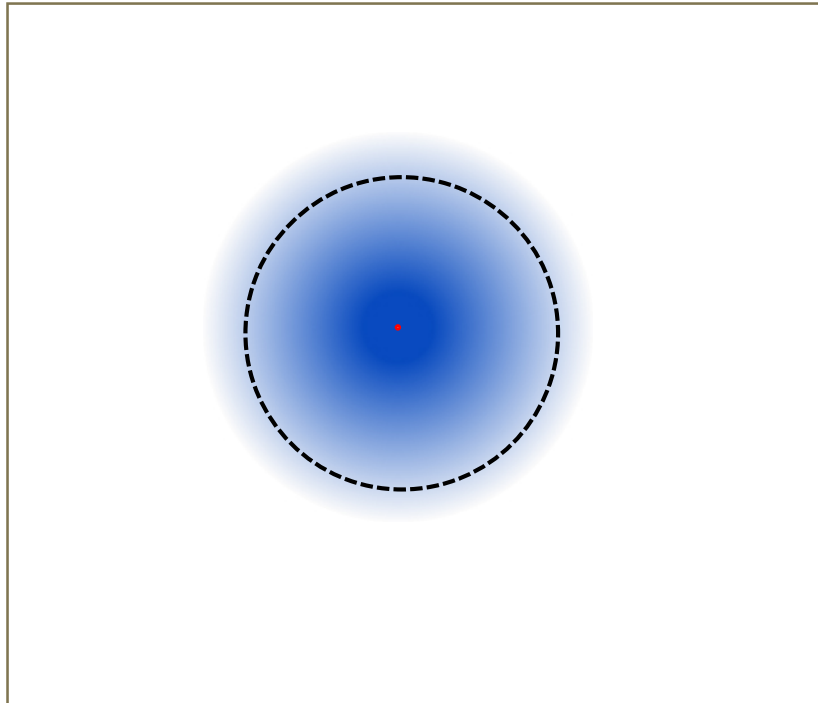
Flight Direction (0 deg = North): -22.5 deg

OK Cancel

(From Teske 2015)

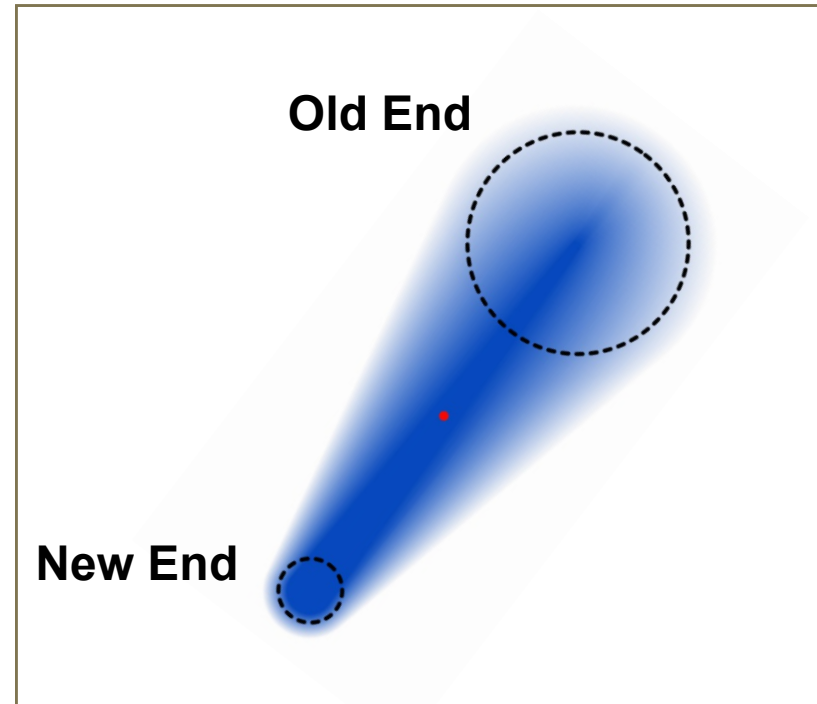
■ Puffs

- One center coordinate
- Sigma-y and sigma-z
- Gaussian distribution



• Slugs

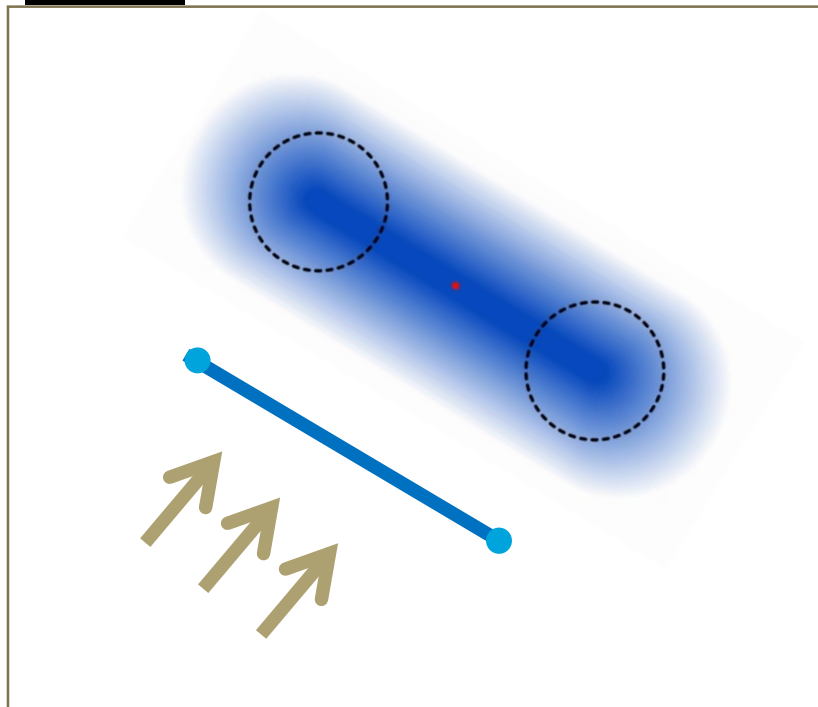
- Two ends
- Sigma-y and sigma-z (2 ends)
- Continuous distribution between



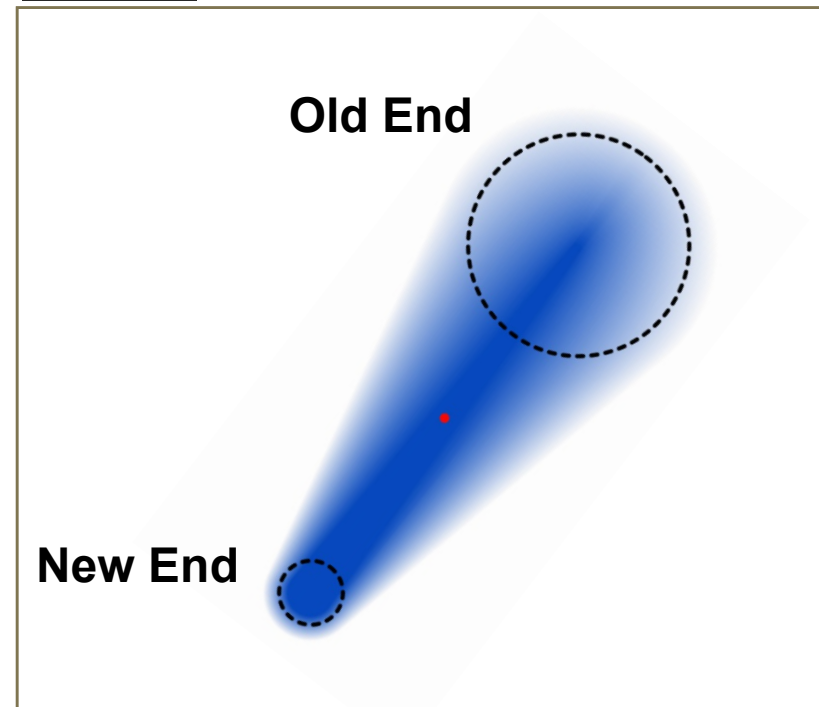
CALPUFF Spray Configuration

- New SPRAY source type
- Produces slugs with identical ends (rods) – similar to road type
- Represents a near instantaneous release of a spray line

Rods



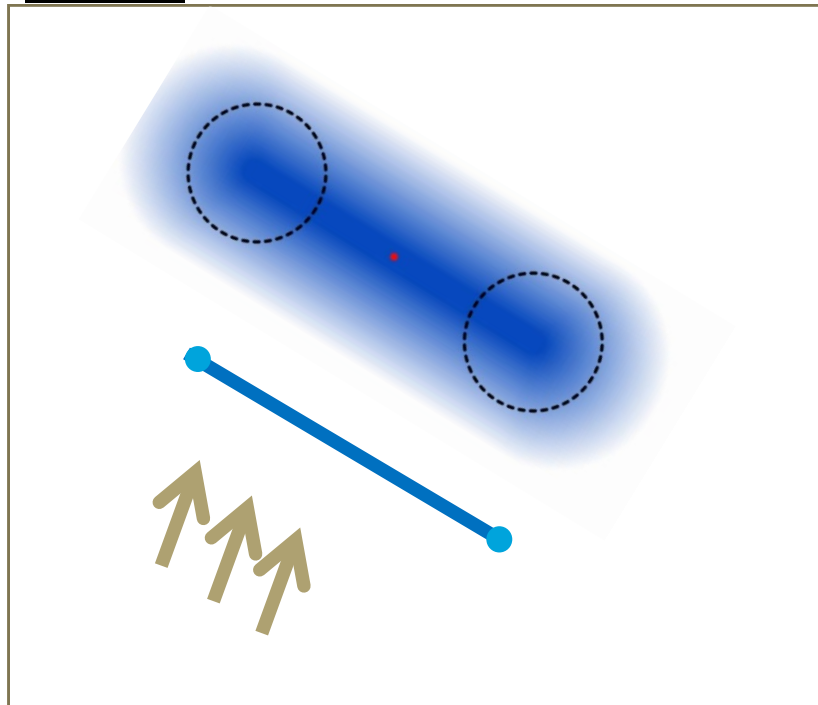
Slugs



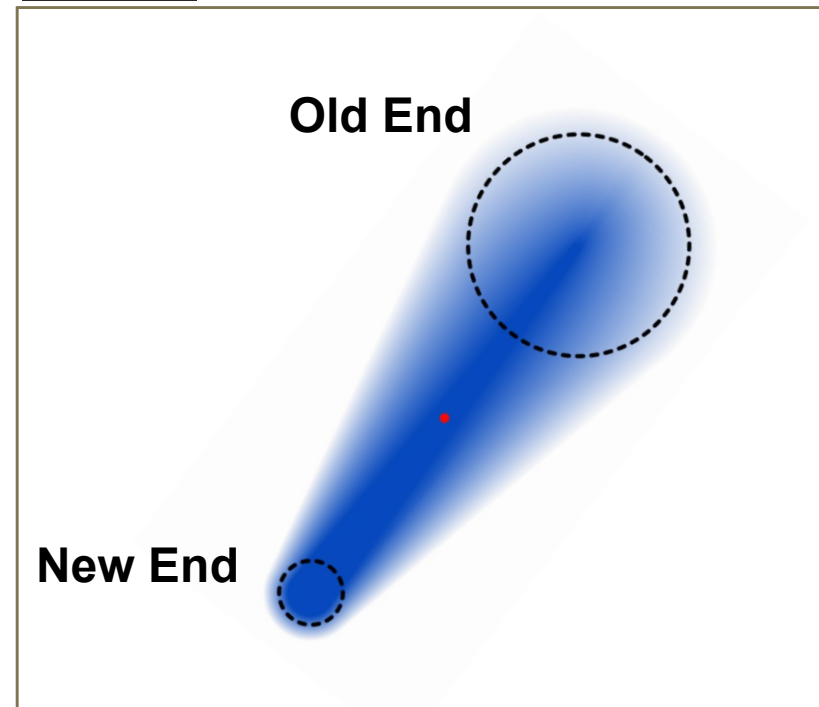
CALPUFF Spray Configuration

- New SPRAY source type
- Produces slugs with identical ends (rods) – similar to road type
- Represents a near instantaneous release of a spray line

Rods

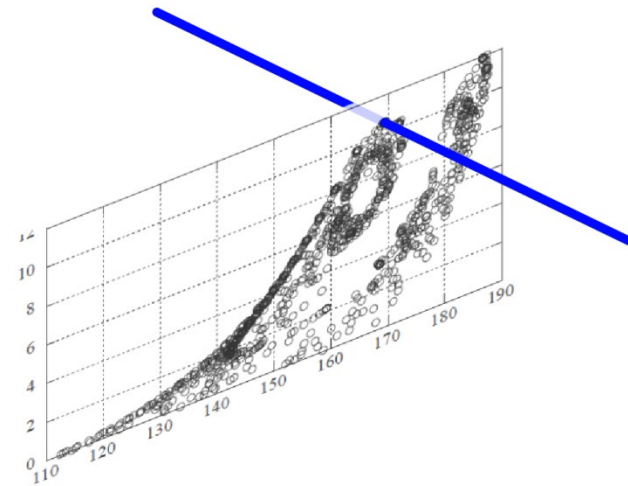
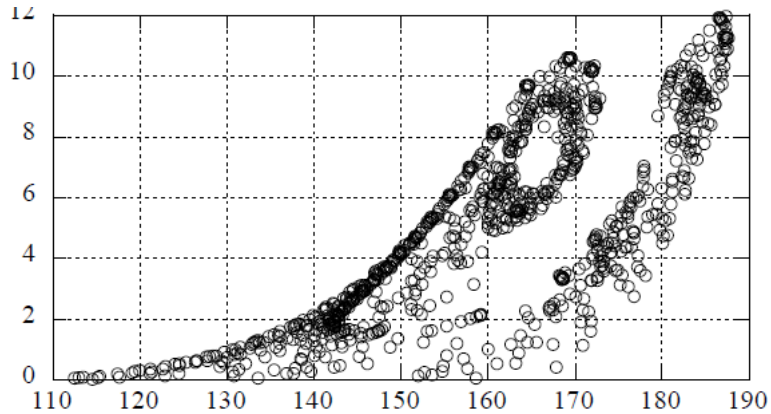


Slugs



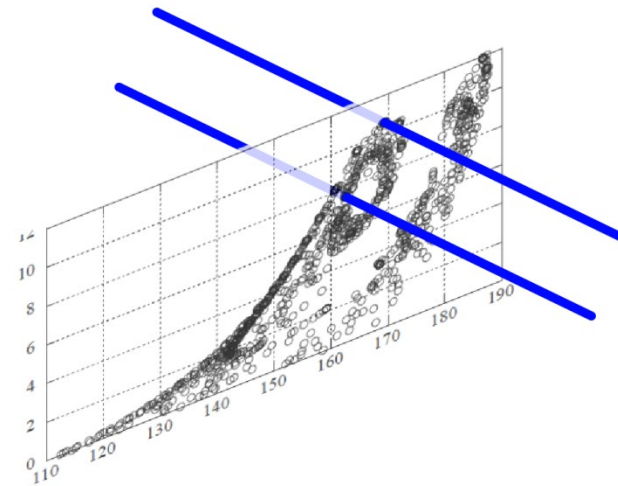
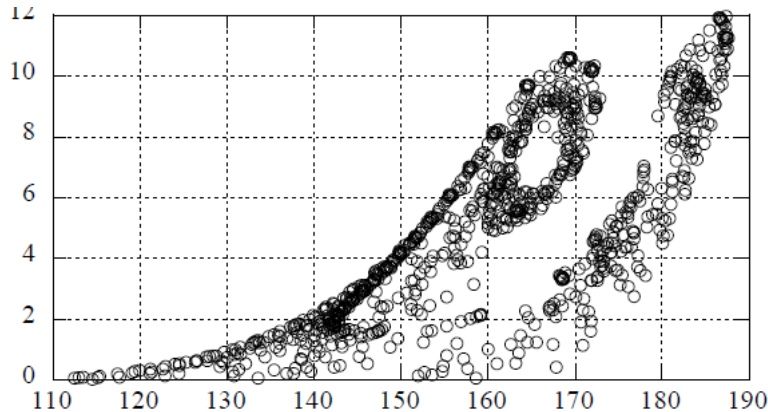
CALPUFF Spray Configuration

- Each droplet distribution calculated by AGDISP is transformed into a 'rod' type SPRAY source in CALPUFF
- A rod represents a single distribution of droplets of a specific size



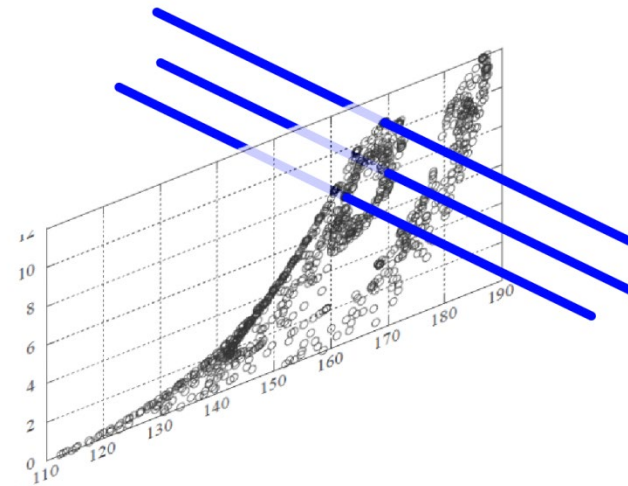
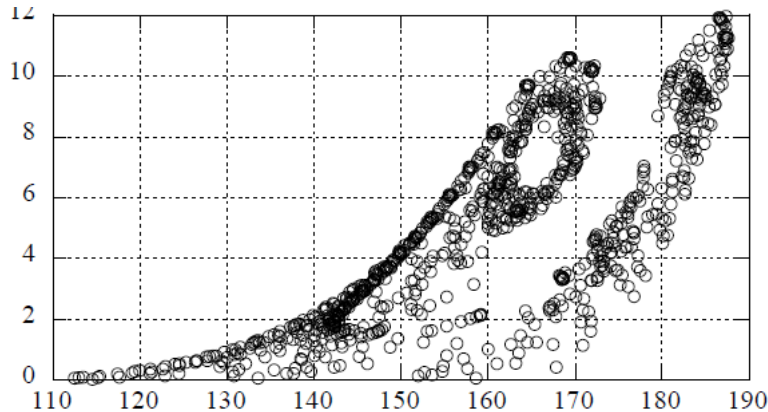
CALPUFF Spray Configuration

- Each droplet distribution calculated by AGDISP is transformed into a 'rod' type SPRAY source in CALPUFF
- A rod represents a single distribution of droplets of a specific size



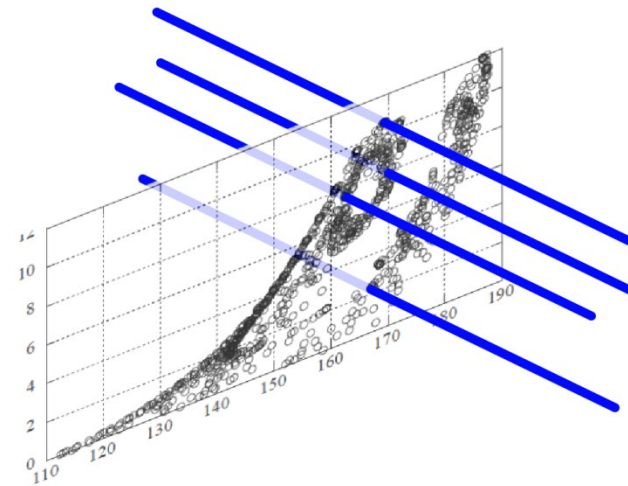
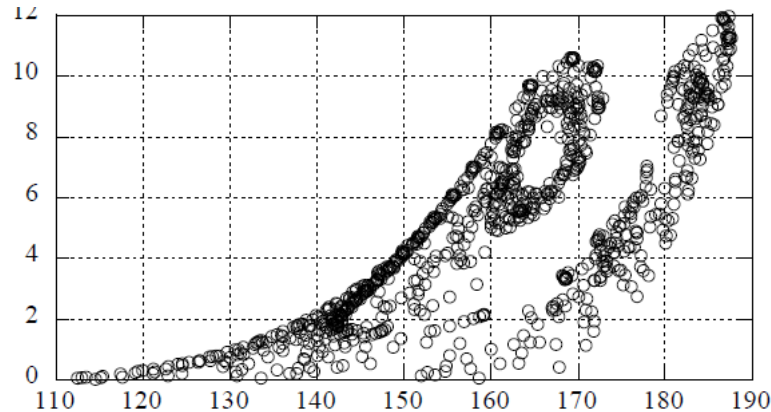
CALPUFF Spray Configuration

- Each droplet distribution calculated by AGDISP is transformed into a 'rod' type SPRAY source in CALPUFF
- A rod represents a single distribution of droplets of a specific size



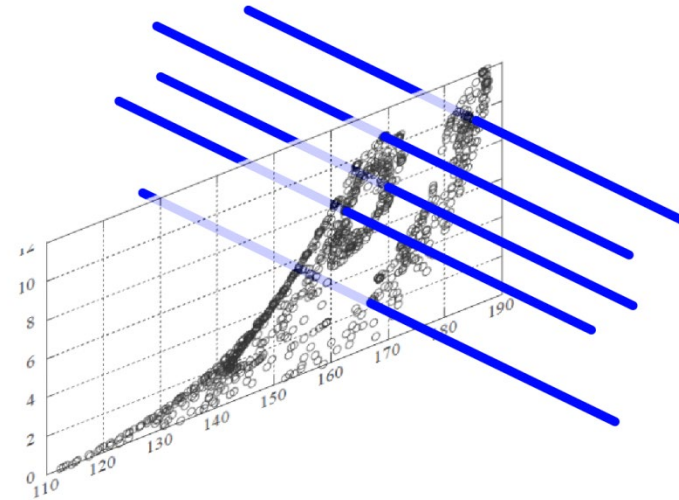
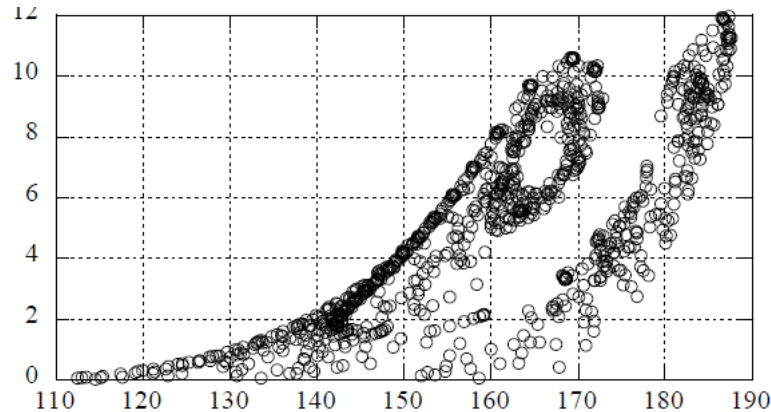
CALPUFF Spray Configuration

- Each droplet distribution calculated by AGDISP is transformed into a 'rod' type SPRAY source in CALPUFF
- A rod represents a single distribution of droplets of a specific size



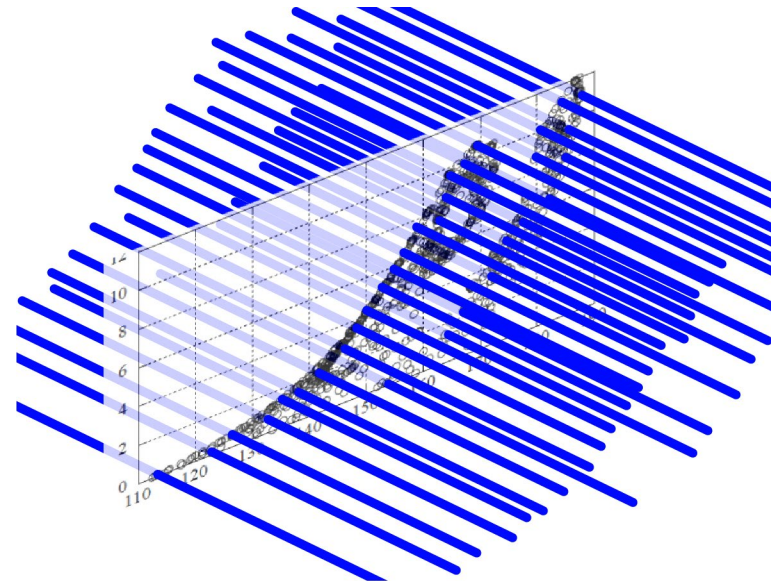
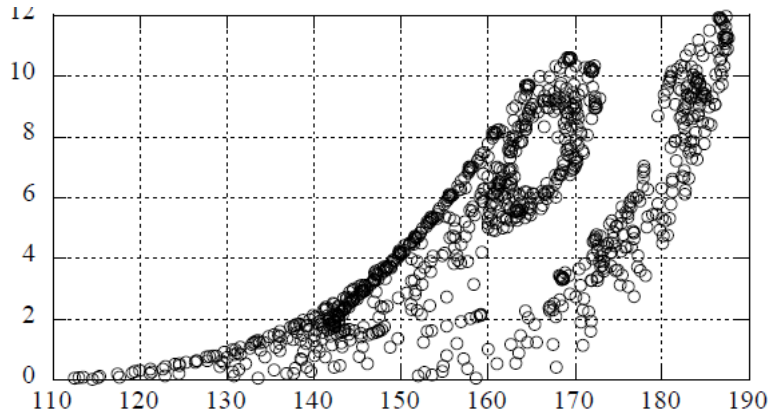
CALPUFF Spray Configuration

- Each droplet distribution calculated by AGDISP is transformed into a 'rod' type SPRAY source in CALPUFF
- A rod represents a single distribution of droplets of a specific size



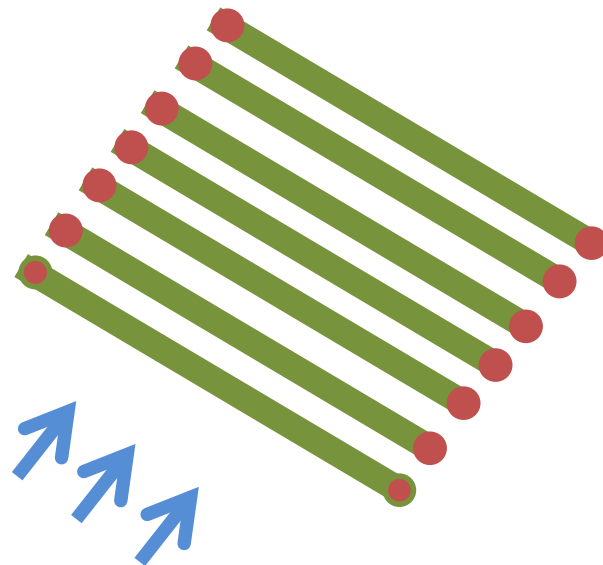
CALPUFF Spray Configuration

- Each droplet distribution calculated by AGDISP is transformed into a 'rod' type SPRAY source in CALPUFF
- A rod represents a single distribution of droplets of a specific size



CALPUFF Spray Configuration

- Multiple Spray lines are defined by off-setting multiple copies of the predicted droplet distributions
- Separate lines can be off-set in time
- Results in a distribution of droplets representative of the airborne portion of the spray.



































- Continue to examine unique source types
- Integration of evaporation and phase change
- Integration of CALPUFF into the Probabilistic Exposure and Risk Model for FUMigants (PERFUM) model
- Consideration of OLM processing method within POSTUTIL
- Integration of higher resolution traffic output with ROADWAY source type.