DUSTRAN: A GIS-Based Atmospheric Dust Dispersion Modeling System

10th Annual George Mason University Conference on Atmospheric Transport and Dispersion Modeling

Jerry Allwine, Fred Rutz, Will Shaw, Jeremy Rishel, Brad Fritz, Elaine Chapman, Bonnie Hoopes, and Tim Seiple
Pacific Northwest National Laboratory

Fairfax, Virginia
August 1-3, 2006
Sponsors

- Strategic Environmental Research and Development Program (SERDP)
- Forest Service (FS)
- Environmental Protection Agency (EPA)
Technology Gaps Addressed

- Need of user-interactive, GIS-based atmospheric dispersion modeling tool for addressing –
  - Particulate air quality from dust generating activities at military training & testing ranges (SERDP)
  - Off-target drift of pesticides (FS & EPA)

Not a new dispersion model – based on existing models. “New” in integration with commercially-available geographic information system and improved particulate emissions modules.
DUSTRAN Status

- September 2006 – Completing multi-year effort
- DUSTRAN 1.0 with User’s Guide (final refinements from current Fort Bliss application)
- SPRAYTRAN 1.0 with User’s Guide (adaptation of DUSTRAN including aerial spraying module; not presented here)
Basic DUSTRAN Elements

- ESRI’s ArcMap (v 9.x) geographic information system (commercially available).
- CALMET, CALPUFF, CALGRID, CALPOST dispersion modeling capabilities (EPA-approved, public availability).
- Vehicle dust emission module based on field studies.
- Wind-blown dust emission module.
- User-interface console application within ArcMap for preparing run conditions, setting-up and running models, and viewing output.
DUSTRAN Features

- Windows operating system; laptop computer.
- Minutes execution time for ~24-h simulation with numerous sources (point, line and area).
- Easy set-up for anywhere in US. “Add Site” wizard for setting-up modeling regions (surface info included).
- Easy set-up of various size and locations of modeling domains (20 km to 400 km) within modeling regions.
- Uses various meteorological inputs; includes “Met Archiver” utility for automatically retrieving and archiving NWS data from web sites for modeling regions.
- Animated viewing of concentration and deposition fields.
- Graphical viewing of results for specified averaging time.
Starting DUSTRAN

Launch ArcMap then start DUSTRAN

Click the DUSTRAN button within ArcMap to launch the DUSTRAN application

Select site provides access to all pre-existing sites that are available to DUSTRAN
“Yakima” Site Selected

Hanford Area
Modeling Domain Selected

80 KM Domain
Specify Species and Sources

Choose Species Tab

Select Species

Can define and remove species

Choose Sources Tab

Select Source

Can define new point, line and area sources

Can define and remove species
Specify Source Information

Example for Line Source

Specify Vehicles on Road
Specify Meteorology

Select “Available Data” From Meteorology Tab

OR

Select “Single Observation” From Meteorology Tab
Specify Period and Run Simulation

Specify Simulation Period

Click Run Simulation
Specify Results to Display

Choose Field

Choose Contours

Choose Specie

Choose Time

Animation Controls
View Outputs
Summary

- Modeling system available for estimating impacts to particulate matter air quality (PM AQ) from dust-generating activities at military testing and training ranges. Current emission factors for wheeled vehicles based on recent field studies by Desert Research Institute.
- Can estimate impacts to PM AQ from wind-blown dust.
- Future efforts are to incorporate treatment of dust from tracked vehicles, helicopters, and ........
Fixed-Wing Aircraft!