Pentagon Shield Overview

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The Pentagon Shield program is sponsored by the Defense Advanced Research Projects Agency (DARPA) Special Projects Office (SPO) Program Manager: Paul Benda
Pentagon Shield Elements

- Implement multiple scales of modeling with CBR sensors to enhance building protection scheme
- Fast-forward CBR/TIC event in progress, predict contaminants on building surface, reverse-locate source
- Verify with field data, wind-tunnel study
- Implement operational system by end of FY05 on > 90 Linux dual-proc nodes
Modeling element: RT-FDDA regional- and local-scale

MM5-based RT-FDDA
res: regional -> 500 m
analysis + 6 h fcst
update every 2 hrs
Real-time Four-Dimensional Data Assimilation (RT-FDDA)

New forecast every N hours, taking in all new obs*

*radiosonde, profiler, surface, ACARS, cloud track winds, satellite radiance, radar, VDRAS, VLAS

ETA/ GFS/ ECMWF

OBS

MM5

Analysis Forecast
Metro- and local-scale

Radar-based 4DVAR
res: 1 km
analysis + 30 min fcst
update every 10 mins

Lidar-based 4DVAR
res: 75 m
analysis + 30 min fcst
update every 15 mins
Modeling element: VDRAS
Metropolitan scale

WSR-88D
Radial winds every 6 minutes, full volume scan
Major processes of VDRAS

Data Ingest
- Rawinsondes
- Profilers
- Mesonet
- Doppler radars

Data Preprocessing
- Quality control
- Interpolation
- Background analysis
- First Guess

Display
- Plots and images
- Animations
- Diagnostics and statistics

4DVAR Assimilation
- Cloud-scale model
- Adjoint model
- Cost function
- Weighting specification
- Minimization

- Input obs into cloud model
- Compare solution to obs
- Compute model adjoint
- Compute cost function, apply to IC’s, re-run forward
VDRAS winds for Washington D.C. area
Coupling VDRAS to T&D model

Release height – 10 m
1 kg inert, nonbuoyant gas
15 June 1998
Building-scale

CFD, res: 2 m update with VLAS cycle

NOAA/EPA 1:200 scale wind-tunnel model

Courtesy CFD Research Corp.

Courtesy NOAA/EPA
Field Campaign
15 Apr – 15 May

• Characterize local weather, urban boundary layer, tracer gas flows in and around Pentagon, and evaluate chem sensors

• Use this information to optimize operational protection system and evacuation procedures
Participants

- DARPA  Program Manager
- NCAR  Planning, test direction, logistics, aerosol lidar demo, experiment design, FP plan
- U of CO  Turbulence profiling
- Dugway  Met instrumentation, forecast support for SF6 tracer study
- NOAA  SF6 tracer study and sampling
- NSWC  Operational support
- ACE  Engineering and contract support
Participants (cont)

- ARL
- Aerospace, Inc
  Edgewood,
  NGC

2\textsuperscript{nd} Doppler lidar
FTIR sensor
1-12 May:
32 line releases
12 point releases