4DWX program, and select applications

26 August, 2003
Outline

- 4DWX overview
- Demos:
  - Global Meteorology on Demand
  - VisAD-based Plume Visualization Tool
  - JVIS: Java 2-D integrated display
  - PDA apps
4DWX program elements

- High-res analyses and forecasting, and coupled applications: dispersion, sound propagation, etc
- Decision support for operational forecasters, HS/HD agencies, first responders
- Database applications (obs- and model-based climatology)
- Visualization: 2-D (Jade), 3-D (VisAD), Stereo (Vis5D+), mobile (Java, HTML)
4DWX applications focus in FY03

- **MM5**: 16/28-member ensemble FDDA/3DVAR
- **VDRAS/VLAS**: Dispersion, Sound propagation, Ballistic trajectory, Airdrop, Missile debris
- **AutoNowcaster**: Short-term forecast of: storm location, lightning potential, storm severity
- **Coupled Models**: Decision Support Systems
- **Visualization**
Visualization: areas of development
Sponsors and collaborators

- Army: test and evaluation, virtual proving ground
- Defense Threat Reduction Agency
- Defense Advanced Research Projects Agency
- United Arab Emirates: water resources
- NOAA, National Ground Intelligence Center, Universities (Utah, Iowa, Oklahoma), NASA
Operational activities

- HS operations over Washington, D.C. (DTRA, NOAA)
- Army test range support
- Dispersion experiment at OKC
- Previous ops: Desert Storm, Enduring Freedom, SLC Olympics, CO and AZ fires, Iraqi Freedom
- MDS: DTRA’s critical products gateway (proposal review)
- Pentagon Force Protection with LIDAR-based system
4DWX Operational Support

4DWX operations

- Ft. Lewis Field Office
- Dugway DPG
- Aberdeen HQ DTC ATC
- Ft. Greely, AK CRTC
- Hawaii RTC
- Yuma YPG
- Ft. Huachuca EPG
- White Sands WSMR
- Ft. Rucker ATTCT
- Redstone Arsenal RTTC
- Ft. Hood Field Office

* Satellite Locations

- operational ATEC site

Army Test and Evaluation Command
3.3 km spacing

An Example

Nested Model Grid

MM5 Domain Configuration for ATC
Coupled-modeling

Atmospheric forecast model

- Winds, temperature, etc

- Transport, dispersion, chemistry model

- Sound model

- Precision airdrop model

- Debris model

- Forecast of concentration of hazardous material

- Forecast of sound intensity

- Forecast of drop location

- Forecast of rocket debris footprint
Server-side coupled MM5, plume model

Met ensemble output

plume ensemble output
Global MOD (Meteorology on Demand)
3-D situational awareness of potential hazards during SLC Olympics
DTRA HS: CONUS-wide 10 km grid
Live HS ops for DTRA, Wash., D.C.

Live web link to Washington D.C. operations
WebStart’able 3-D application

- PVT: Plume Visualization Tool
  - Based on VisAD, and VMET toolkits
  - Prototype version for test ranges, and DTRA
radar and lidar for first responders

NCAR-developed systems that compute detailed 3-D windfield, updated every 5-10 minutes
- Variational Doppler Radar Assimilation System (VDRAS)
  – uses CRAFT network
- Variation Lidar Assimilation System (VLAS)

mesonet station
radar
Radar and lidar based VDRAS

Radar or lidar radial winds

Standard met data

Variational Doppler Assimilation System (VDRAS)

(few minutes)

3D windfield analysis or 30 min forecast

Transport model

RELEAS OF AGENT "X"
Four gas releases, ½ h apart –
30 minute surface dosage forecast

Release height – 10m
1 kg inert, nonbuoyant gas
15 June 1998
VDRAS products from OKC JU2003

Four-Dimensional Weather Systems and Technology

Map and data showing surface dosage and 4DWX products.
Example: Lidar data input (VLAS)

VLAS wind output at 60 m horizontal resolution

CLR Photonics, Inc.
Concept for Colorado HS

- Mesoscale forecasts
- Fixed grid, 1 km res, 12 h fcst
- Relocatable, 1-3 km grid
- Analysis only
- Nexrad-based 3-D BL winds
- Lidar-based 3-D BL winds
Java VISualization tool (JVIS)
First responder application

Mostly read-only, visual guidance

System login

Plume view

Situational awareness (mockup)