

# CT-Analyst

## Fast and Accurate CBR Emergency Assessment

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# Physical Processes

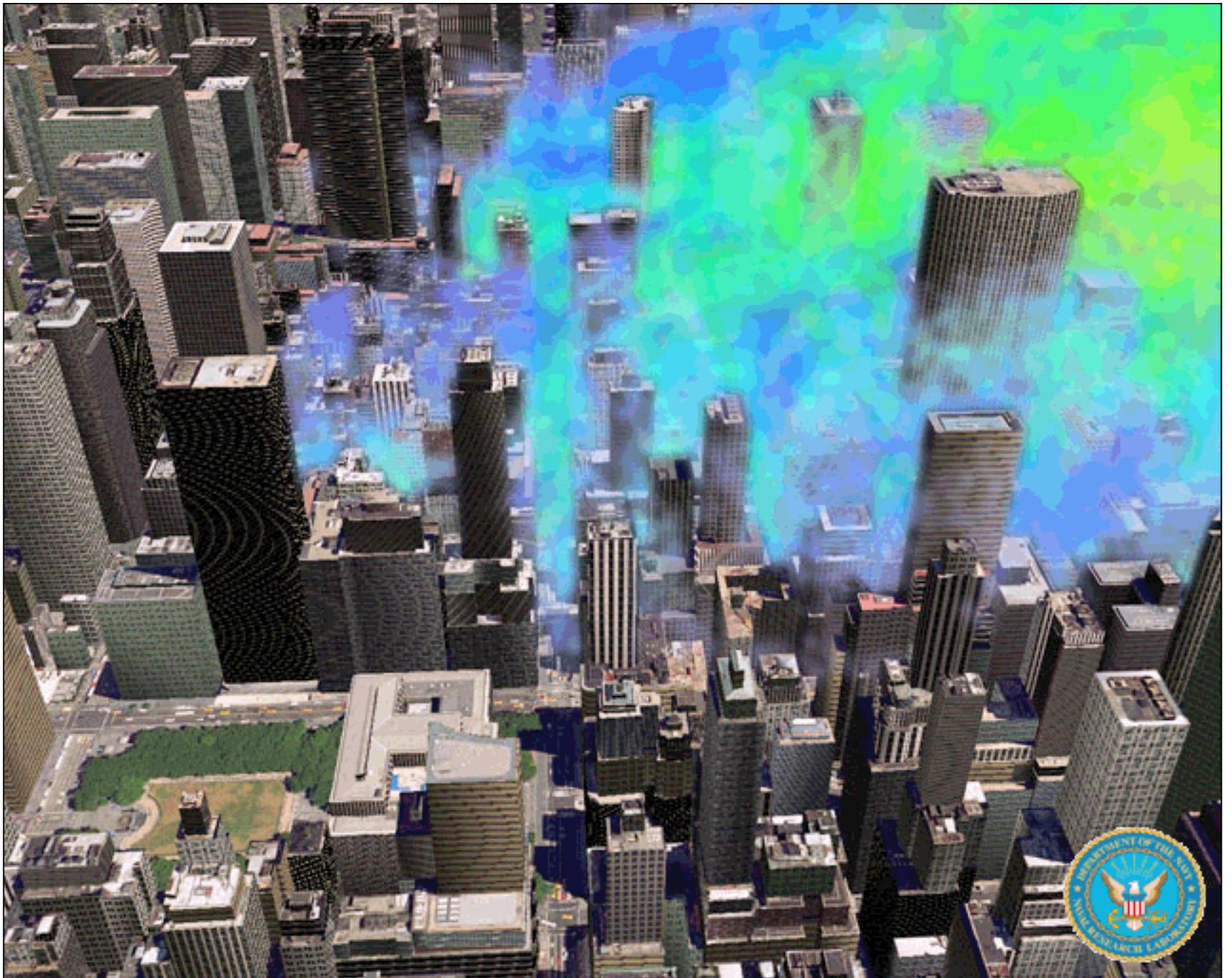


## Fluid Flow

- Complex building vortex shedding and recirculation zones with associated turbulent stochastic backscatter
- Consistent stratified urban boundary layer with realistic wind fluctuations
- Solar heating including shadows from buildings and trees
- Aerodynamic drag and heat losses due to trees
- Surface roughness variations and turbulent heat transport

## Contaminant Transport

- Contaminant transport is controlled by convection, *not* diffusion
- Effects of unsteady, non-isothermal, buoyant flow crucial
- Backscatter will carry particles to/from surfaces
- Typical particulate and gaseous contaminants behave similarly
- Larger particles must have their dynamics included
- Evaporation and chemistry is important for some contaminants



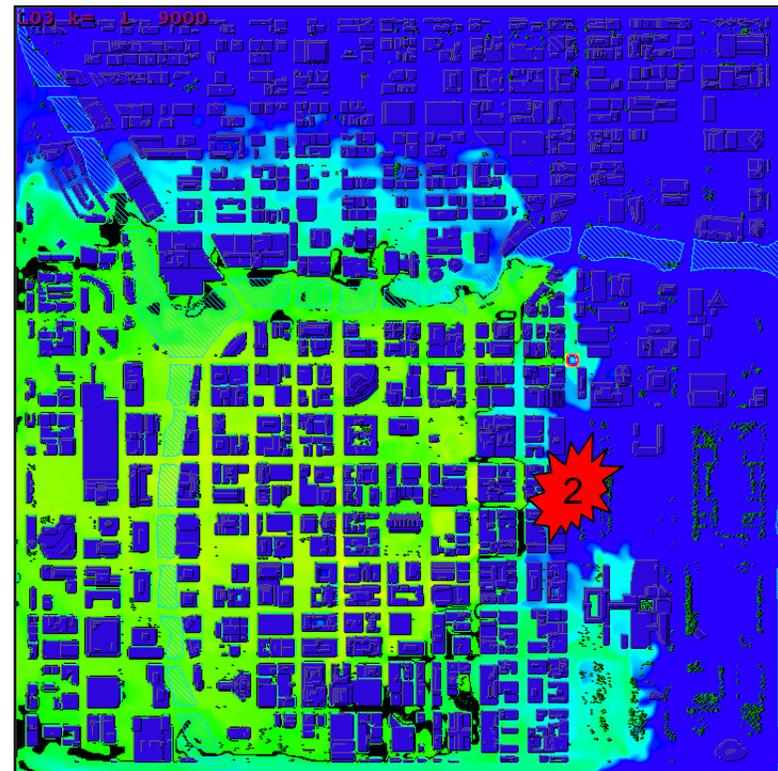
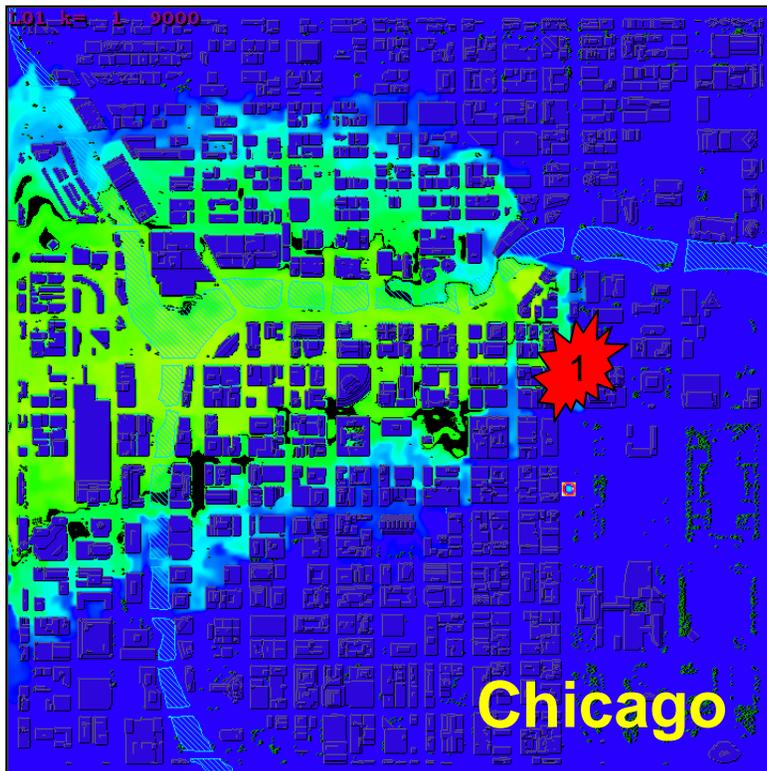


Source Location: Times Square  
Elapsed Time: 6 Minutes



# Influence of Source Locations: Chicago

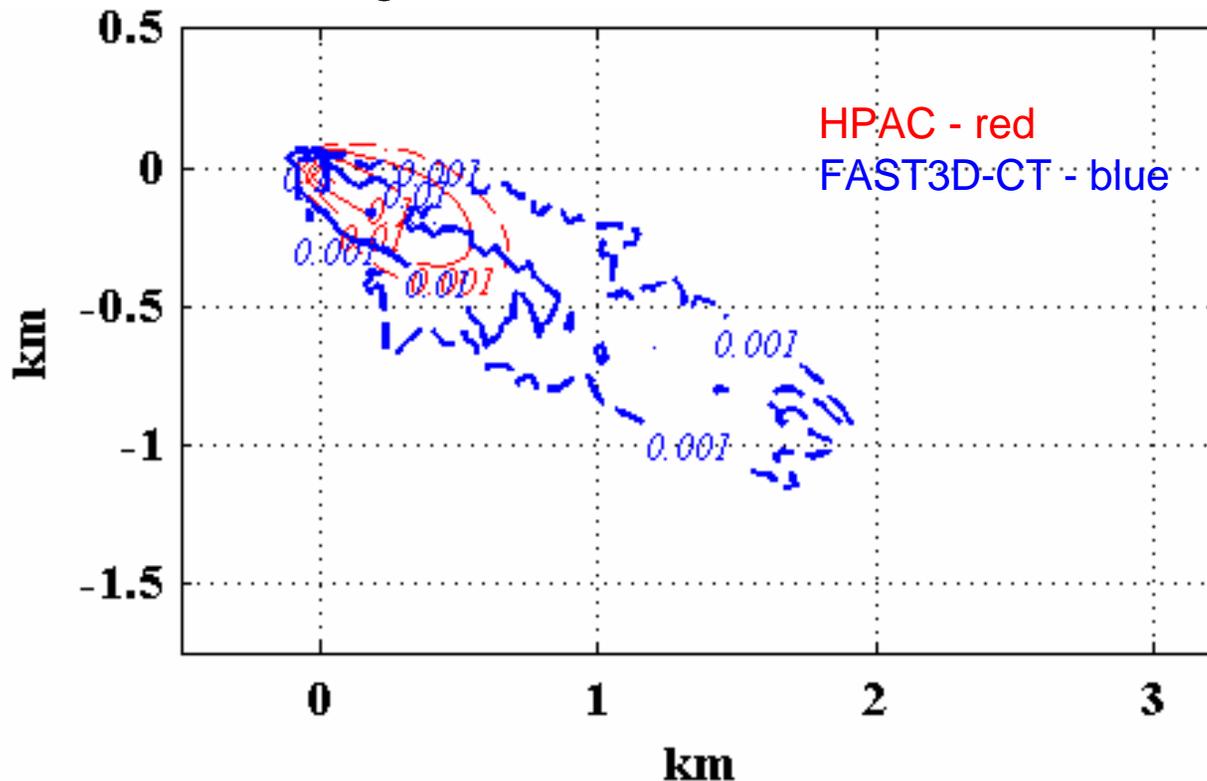
- Release points separated N-S by 350 m.
- Channeling effect of river may have narrowing effect on plume for release 1. 
- Flow deflection and recirculation zones may cause the significant spreading in release 2. 



# Comparison of FAST3D-CT with HPAC



Dosage at 18 minutes After Release

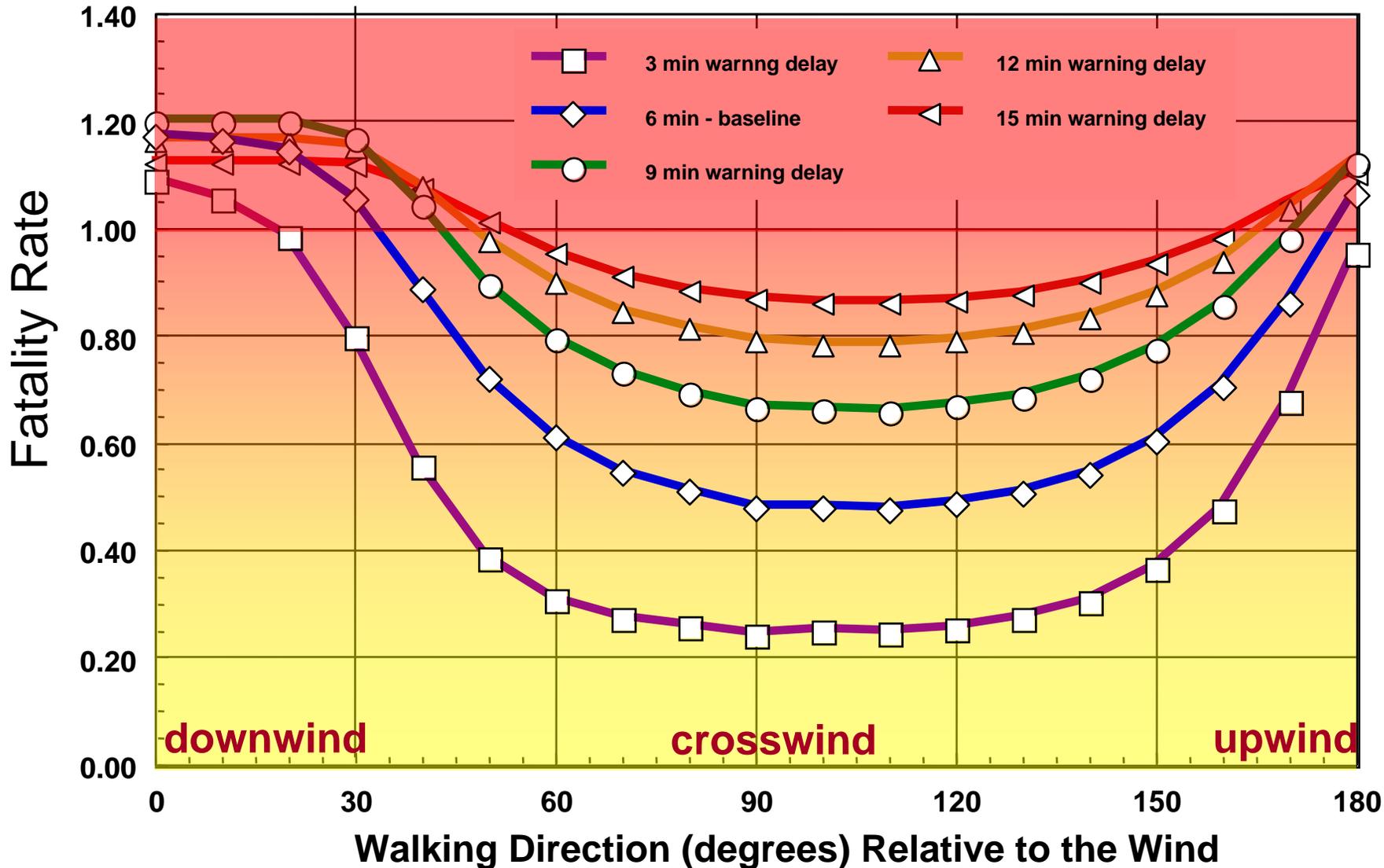


- Identical input conditions
- Neutrally buoyant gas
- Mass =  $10^3$  kg (1 ton)
- Size = 20 m x 20 m x 20 m
- Release height = 10 m

# The Dilemma ...

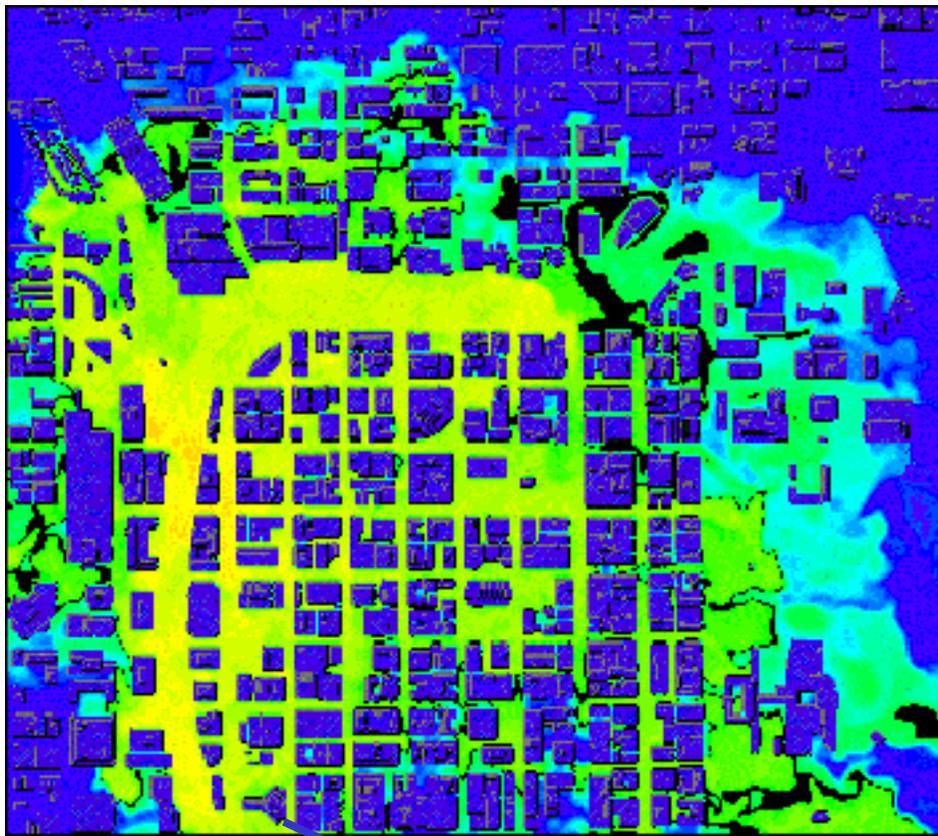
Simulations of Chem/Bio scenarios are practical but **expensive** ...

Operational users cannot afford to wait for computations!

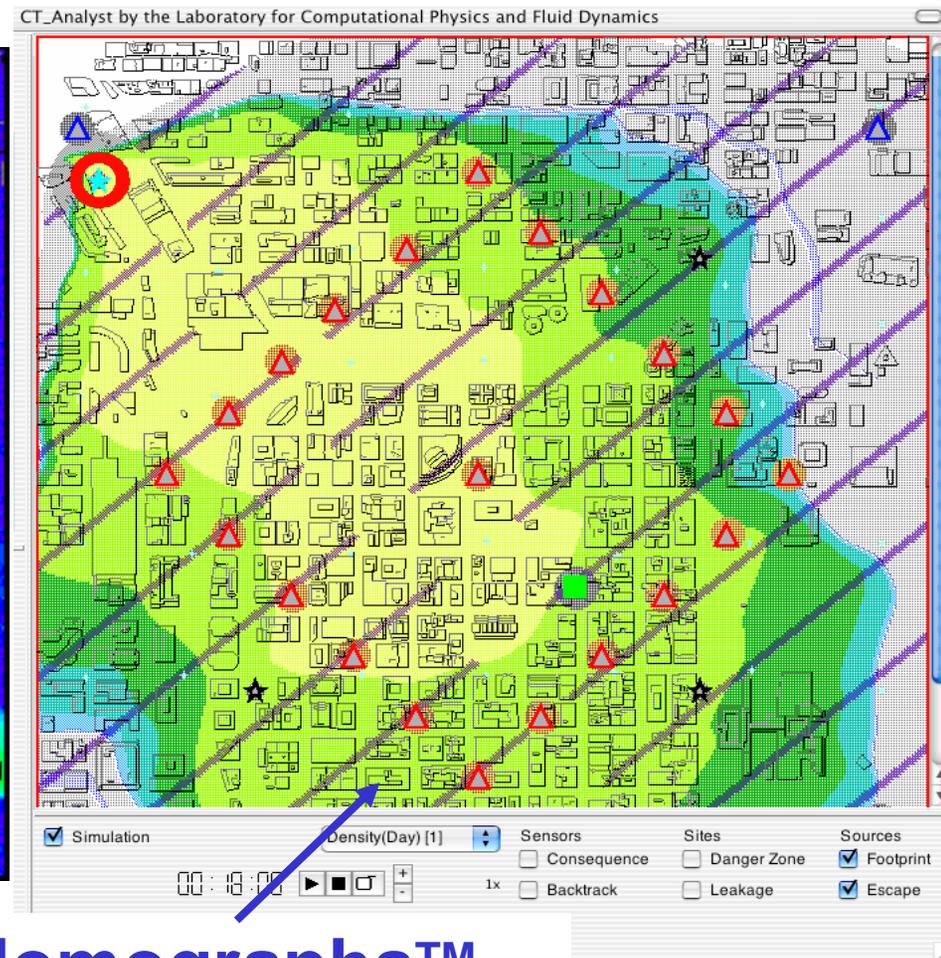


# Faster More Accurate Emergency Assessment for Airborne WMD Threats

**FAST3D-CT** (detailed CFD)



**CT-Analyst™** (operational model)



**Dispersion Nomographs™**  
a new fluid dynamics representation

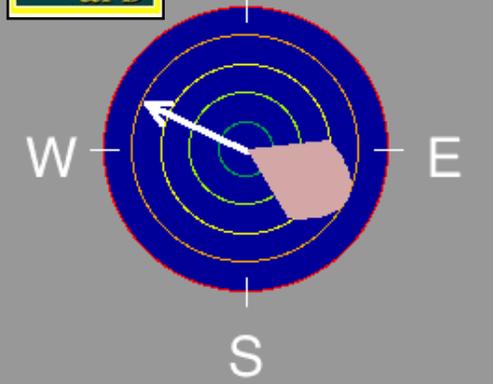


Source 3

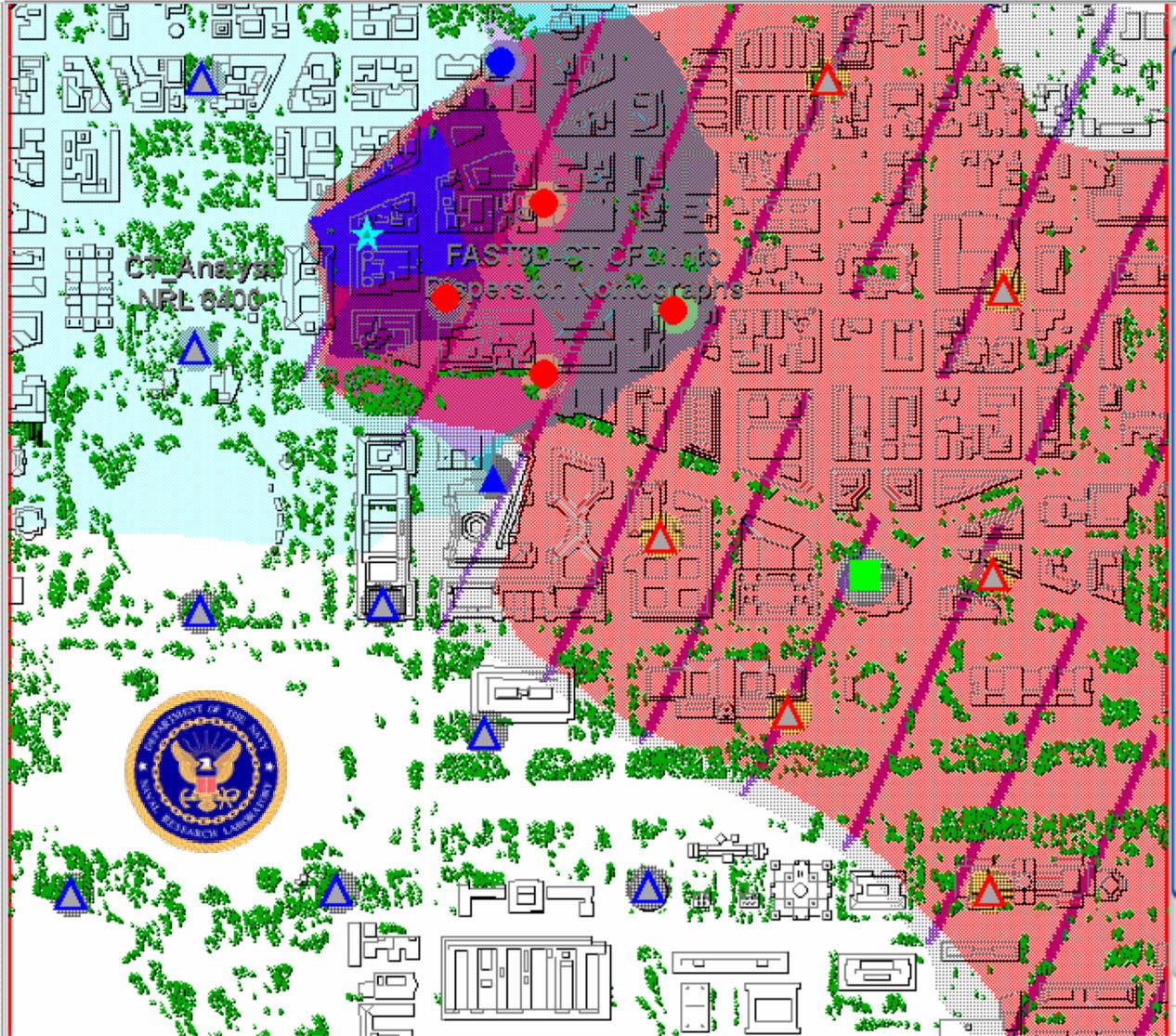
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Location	[ 2139.6 , 2387.6 ]
Mass	n/a
Timestamp	n/a
Type	source

**CT-Analyst  
Screen Showing  
Backtrack, Plume  
Envelope,  
and Escape  
Displays**

wind: 295 deg W 4.0 m/s  
region: Blatherburg,USA



Open Low(10)



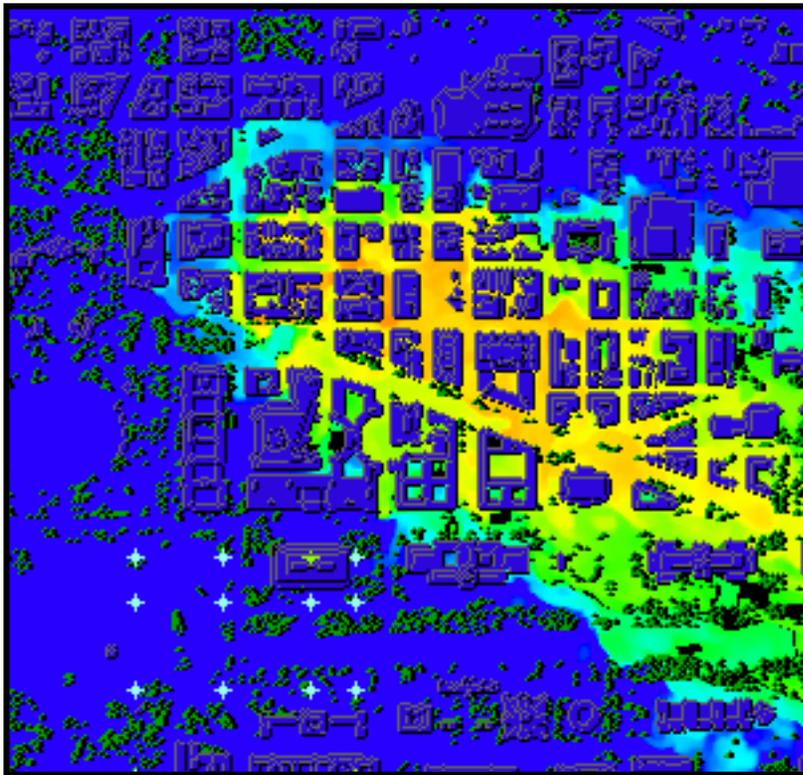
Simulation      Plume Envelope [0]      Sensors      Sites      Sources  
 Consequence       Danger Zone       Footprint  
 Backtrack       Leakage       Escape

00:20:00      [Play] [Stop] [Refresh] [Zoom In] [Zoom Out]      1x

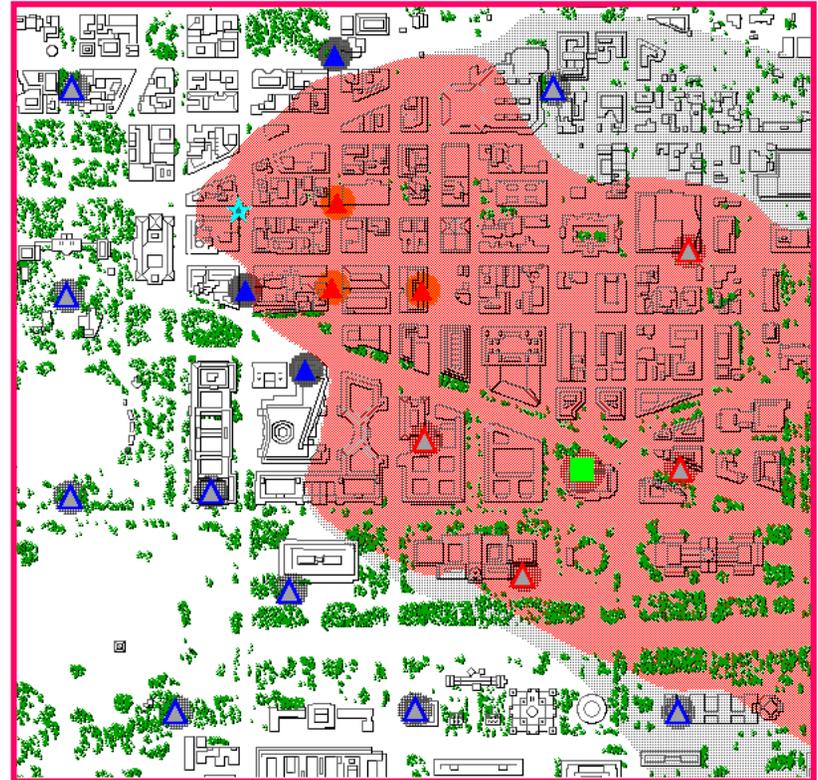
Progress bar: [-----|-----]

# Comparison of CT-Analyst with FAST3D-CT

- Contaminant concentrations 18 min. after release
- FAST3D-CT results (left) show a single realization of the plume.
- CT-Analyst (right) shows the plume envelope from multiple realizations.



FAST3D-CT



CT-Analyst™

# CT-Analyst Capabilities



- **IMMEDIATE DATA FUSION**
  - Anecdotal information, qualitative data and sensor data
- **IMMEDIATE CONSEQUENCES**
  - Simple, instantaneous computation of exposed and soon-to-be exposed regions based on very limited data
- **SITUATION-BASED ESCAPE ROUTES**
  - Quickly project optimal evacuation paths based on the current evolving situation assessment
- **EMERGENCY MANAGEMENT TOOLS**
  - Web broadcast of results, connection to urban GIS
  - Coordinate remotes & backtrack to unknown source
  - Integrate threat profiles against building parameters