

New and Upcoming Features of HotSpot

John Nasstrom, Steve Homann, Kevin Foster
National Atmospheric Release Advisory Center (NARAC)
Lawrence Livermore National Laboratory

<http://narak.llnl.gov>

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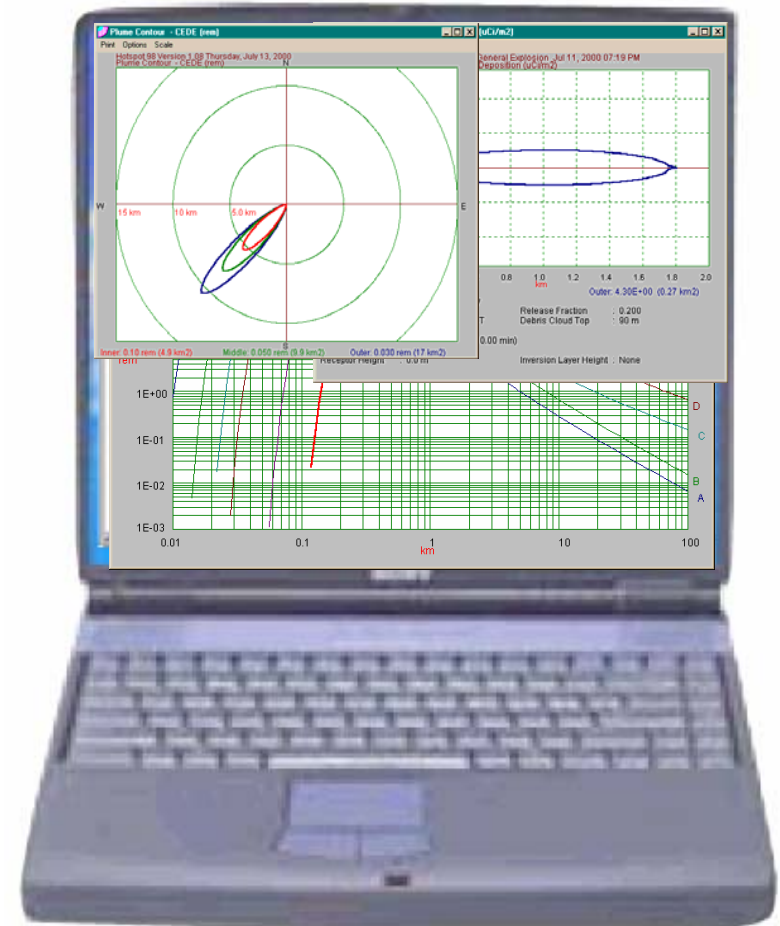
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Hotspot Provides Quick Dose Estimates for Radiological and Nuclear Releases

- Multiple release scenarios (explosive, fire, general plume)
- Fully-integrated FGR11 (ICRP26, 30), and 13 (ICRP 60+) internal and FGR 12 external dose factors
- Straight-line Gaussian plume model
- Standalone version available via Web download:
<http://www.llnl.gov/nhi/hotspot/>
- Also can run in *NARAC Web* and *iClient* user interface and maps





HotSpot Version 2.07

- New Features have been added to HotSpot
- Target release date for Version 2.07 is Summer 2007

Hotspot Health Physics Codes




HotSpot

Version 2.07

Lawrence Livermore National Laboratory
National Atmospheric Release Advisory Center (NARAC),
Nonproliferation / Arms Control / International Security,
R Division
and
Hazards Control Department

Steven G. Homann, CHP
e-mail: shomann@llnl.gov
phone: (925) 423-4962
www.llnl.gov/nhi/hotspot



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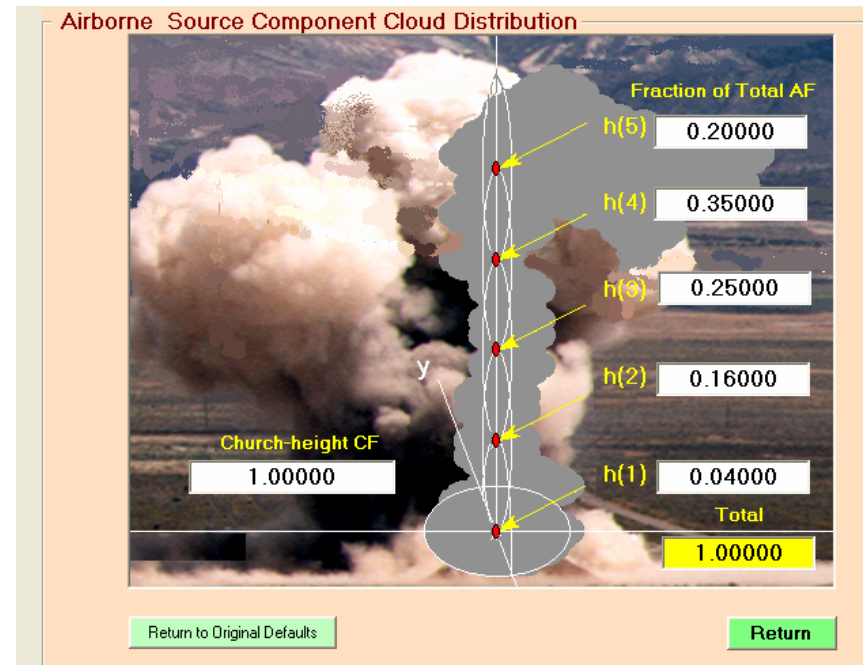
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New HotSpot Explosion Model

- Improved deposition and ground shine estimates in proximity (within a few 100 m) of the detonation point
- Users can customize cloud parameters
 - Vertical source distribution
 - Scale cloud height calculated using Church formula





Hotspot Expanded Source Term Description

Controllable parameters:

- Material at Risk (MAR)
- Damage Ratio (DR)
- Leakpath Factor (LP)
- Airborne Fraction (AF)
- Respirable Fraction (RF)

$$\text{Respirable source term} = \text{MAR} \times \text{DR} \times \text{LPF} \times \text{AF} \times \text{RF}$$

The screenshot shows the 'General Plume' dialog box with the following fields and values:

- Radionuclide: Pu-238 Y 87.74y
- Material at Risk: 5.0000E+00 Ci
- Damage Ratio: 1.000
- Leakpath Factor: 1.000
- Effective Release Height: 0 m
- Deposition Velocity: 0.30 cm/sec
- Calculate Plume Rise:
- Airborne Fraction: 1.00E+00
- Respirable Fraction: 1.00E+00
- Respirable Release Fraction: 1.00E+00

The 'Damage Ratio' dialog box is open, displaying the following text:

Enter the fraction of the Material at Risk actually impacted in the release scenario

Note:

Respirable Source Term =
MAR x DR x LPF x AF x RF

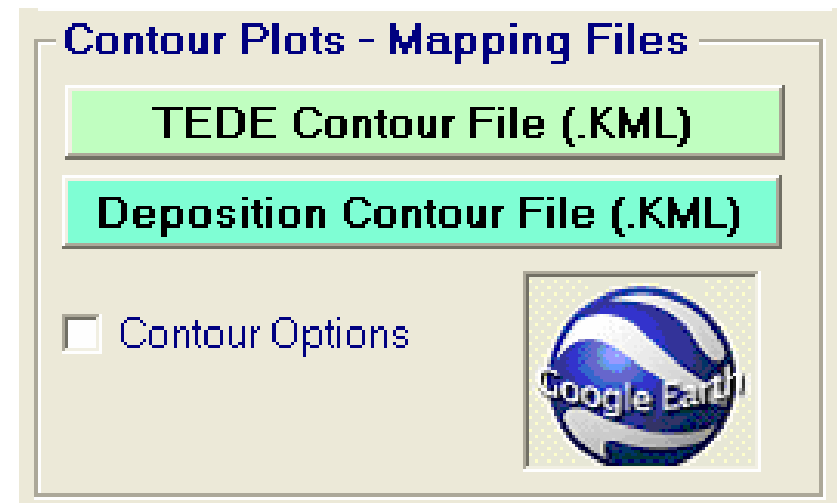
Where:

- MAR = Material at Risk
- DR = Damage Ratio
- LPF = Leakpath Factor
- AF = Airborne Fraction
- RF = Respirable Fraction



Mapping HotSpot Plumes in Google Earth

- HotSpot plume files can be displayed on Google Earth global maps
- HotSpot plume files (.KML), automatically invoke Google Earth and zoom to the user-input Lat/Long and display select contours
- Contour options include
 - General and Explosive release models
 - Dose
 - Deposition
 - Nuclear explosion
 - Fallout dose and dose rate
 - Prompt nuclear effects
 - Blast
 - Thermal
 - Ionizing





HotSpot and NARAC Dose Conversion Factors Being Updated with DCFPAK 1.6 Values

- Using new ORNL dose conversion factor data base: DCFPAK 1.6:
 - Age dependent: Infant, 1-yr, 5-yr, 10-yr, 15-yr, adult (adult is used by HotSpot)
 - Particle size dependent: AMAD 0.001, 0.003, 0.01, 0.03, 0.1, 0.3, 1, 3, 5, 10 micron (1 micron only is used by HotSpot)
 - ICRP26 or ICRP60 tissue weighting factors
 - FGR11/ICRP30 or FGR13/ICRP66 biokinetic models
 - 30-day acute committed inhalation or ingestion dose
 - 50/70-year committed inhalation or ingestion dose (50 yr only is used by HotSpot)
 - External air immersion or ground exposure (FGR12)
- HotSpot allows option for FGR11 or FGR13. Options for NARAC model runs are currently available only by LLNL/NARAC staff, not yet by external users.



Hotspot and NARAC Model Resuspension and Weathering Has Been Updated

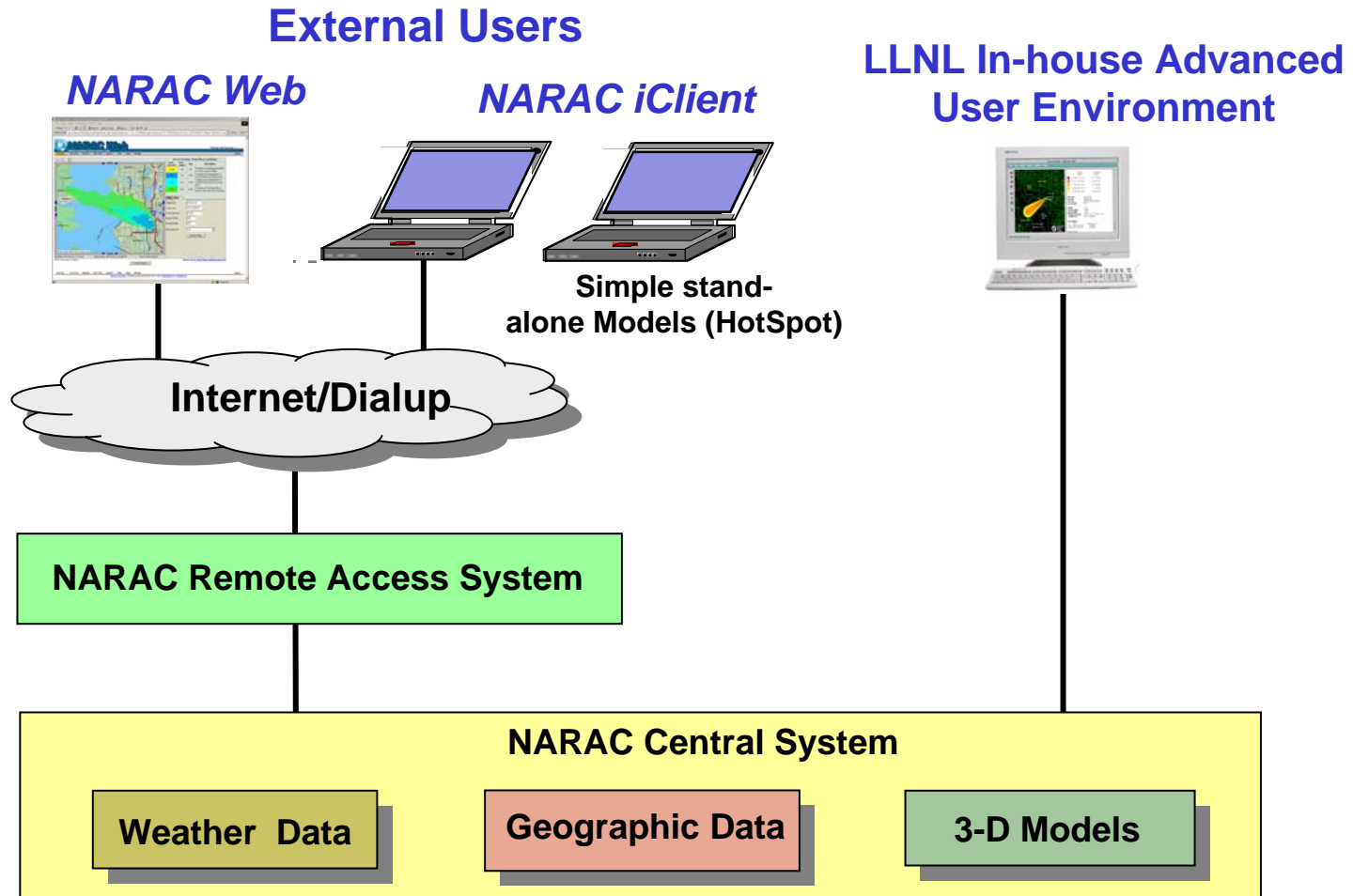
- Weathering correction factors for nuclear fallout and deposition of radionuclides. Two options:
 - WASH 1400 (NUREG-75/014),
 - Anspaugh (Health Physics, March 2002, Vol 82) – newer, default option
- Resuspension options:
 - WASH-1400 (NUREG-75/014)
 - NCRP Report 129 (Used by FRMAC) – newer, default option
- Resuspension included with General model TEDE calculations
 - Plume passage
 - Submersion
 - Inhalation
 - Ground shine + weathering
 - Resuspension



HotSpot Becoming a DOE “Toolbox” Code

- DOE has approved (pending 5 “critical” recommendations) inclusion of the HotSpot Health Physics codes into the DOE Safety Software Central Registry
- Five Critical recommendations
 - 95th-percentile dose from historical weather data -- requirement of DOE-STD-3009-94 Change Notice 3 Appendix A, subsection A.3.3 *Dose Estimation / Atmospheric Dispersion* – Not in version 2.07
 - HotSpot User manual/documentation (.PDF) and online help module
 - Formal internal configuration management plan
 - Formal V&V test process
 - Problem reporting, evaluation and notification plan per *DOE G 414.1-4 level B custom software*

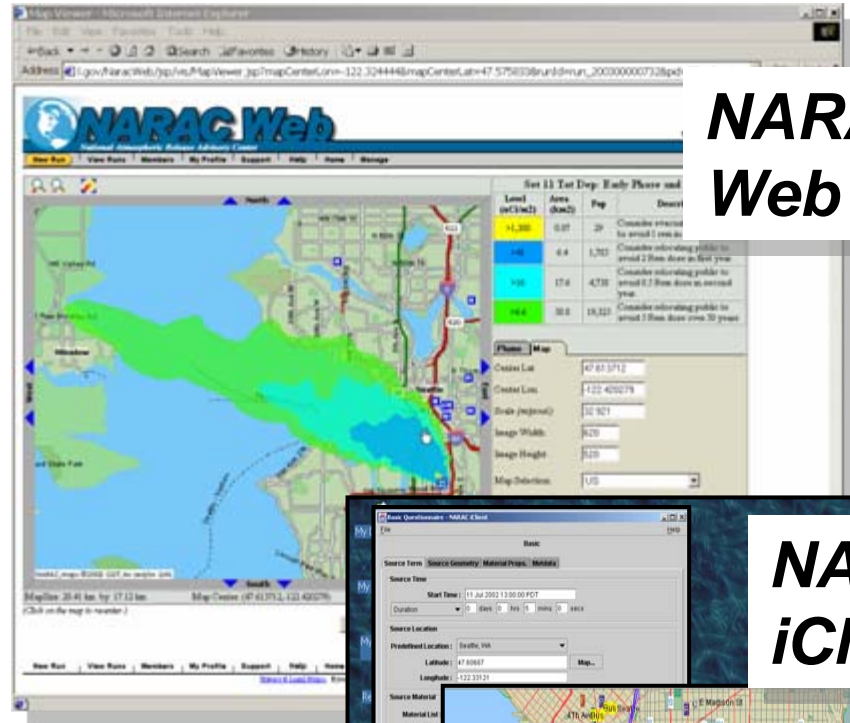
Component-based LLNL NARAC Computer Systems Support External and In-house Users, Simple and Advanced Models



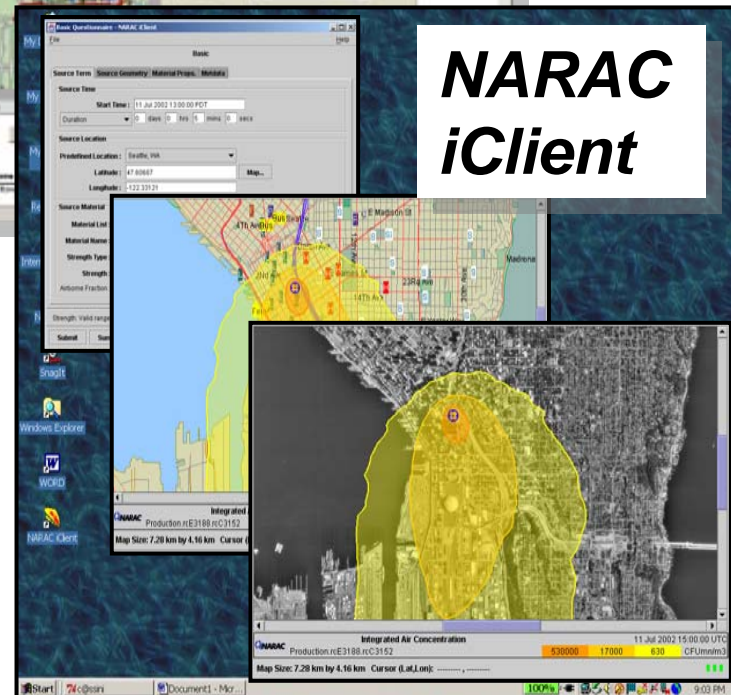


NARAC Web and iClient Software Tools Provide Remote Users with Access to NARAC Predictions

- Automated reach-back to plume modeling with real-time weather data
- Sharing of predictions with other users or groups of users through *IMAAC/NARAC Web*
- Output formats
 - GIS Shape files
 - PDF
 - HTML/XML
 - PowerPoint
 - JPG/PNG graphics
 - Consequence reports
- *iClient*: Stand-alone capabilities: Simple Models and geographical information displays



**NARAC
Web**



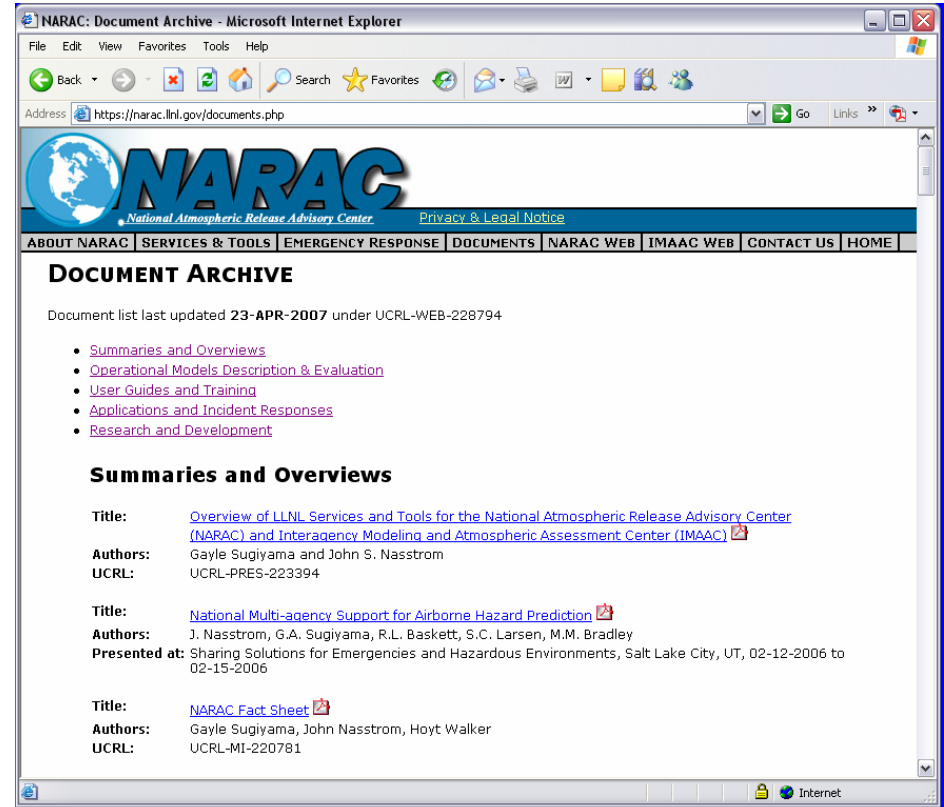
**NARAC
iClient**



For more information

Web: <http://narac.llnl.gov>

Email: narac@llnl.gov



NARAC will host a DOE User Training Course at LLNL, August 15-16, 2007, and User's Group Meeting to be held at the NARAC facility on August 17, 2007