IND: Improvised Nuclear Device

Modeling Blasts in an Urban Setting

From MANIAC to Roadrunner, Los Alamos has been in the forefront of computer modeling. New code development coupled with experimental data will enable us to estimate yield and damage from a nuclear terrorist attack in an urban environment.

Left: *French nuclear test, 1970s.*

Inset: *CartaBlanca code will simulate fireball, shock wave physics, and solid building response.*

Background

Current computer models are able to simulate only pieces of the entire IND problem such as detonation hydrodynamics, plume and fireball development and movement, solid building response, modification of the contaminant particle distribution, dispersion, and subsequent deposition, all in a complex domain. Without an accurate model of all these elements, accurate emergency response and preparedness can neither be developed nor executed. Our expertise in nuclear weapons, Radiological Dispersive Devices, and climate and dispersion modeling puts Los Alamos at the forefront to provide realistic and confident predictions of yield, fallout, and robust sampling strategies.

Capabilities

LANL will couple the CREST-ONE suite in order to develop nuclear hydrodynamics phenomenology and pass these data to CartaBlanca (a code which models solid response behavior of urban infrastructure and rubble particle size). This will in turn produce data for HIGRAD which will take these products and build the dispersion analysis of airborne and fallout particulates in order to produce a fallout pattern. From these coupled code predictions, we will be equipped to build a damage/yield library that will enable the customer to estimate yield from overhead imagery.

Future Applications

Results from the coupled simulations will aid in the development and confirmation of a robust set of engineering codes. This category of codes, such as QUIC (already in the LANL suite), will be able to simulate IND and nuclear event phenomenology, their dispersion, and subsequent fallout patterns in a rapid response mode, providing the emergency response community with a defensible toolkit suitable for preparedness and recovery planning.

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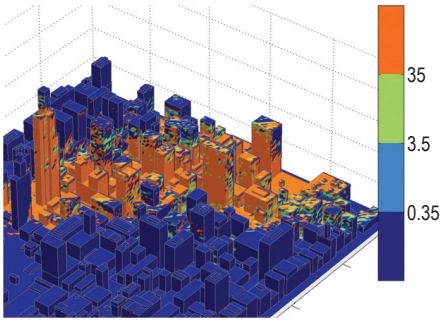

Right: Radiological Dispersive Devices (RDD) fallout contamination map using the QUIC computer code, an example of current Los Alamos capability.

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