U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

RIC 2017

Fire and External Hazard Analysis Branch
Division of Risk Analysis
Office of Nuclear Regulatory Research

NRC Environmental Research: Flooding and Radionuclide Transport

In May 2016, the Office of Nuclear Regulatory Research, Division of Risk Analysis combined the Fire Research Branch and the Environmental Transport Branch into the Fire and External Hazards Analysis Branch (FXHAB). This branch covers a wide variety of functions including:

- Provides technical bases for evaluating external natural and human-induced hazards, which may affect the safety of nuclear facilities (*excluding seismic and tectonic hazards)
- Develops methods, data, and modeling tools to assess the magnitude and effect of released radioactive material to the environment at nuclear facilities
- Develops and evaluates pathway models to assess contamination, including assessments of source terms of onsite releases and residual radioactivity, which may migrate offsite
- Develops methods, models, and tools for probabilistic flood hazard assessment of nuclear facilities
- Develops methods, models, and tools to assess feasibility and reliability of flood protection features and procedures
- Evaluates the long-term performance of engineered barriers for low-level waste to radionuclide migration
- Develops and validates fire models, fire analysis methodologies, and supporting data
- Develops methods, models, and tools for human reliability analysis for postfire mitigative actions
- Conducts fire testing and analysis of results and data
- Develops fire probabilistic risk assessment methodologies and tools.

*Note: Seismic hazards analysis is a function of the Structural, Geotechnical, and Seismic Engineering Branch, Division of Engineering, Office of Nuclear Regulatory Research.

SELECTED RESEARCH PROJECTS

Radon Cover Durability Falls City, TX

The NRC developed this project to assess the long-term performance of radon covers at uranium mill tailing sites. Extensive fieldwork included measuring hydraulic conductivity and radon flux through the engineered cover.

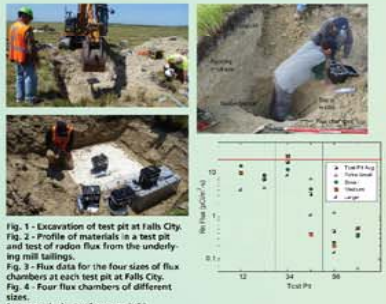


Fig. 1 - Excavation of test pit at Falls City.
Fig. 2 - Profile of materials in a test pit and test of radon flux from the underlying mill tailings.
Fig. 3 - Flux data for the four sizes of flux chambers at each test pit at Falls City.
Fig. 4 - Four flux chambers of different sizes.
(counter-clockwise from top left)

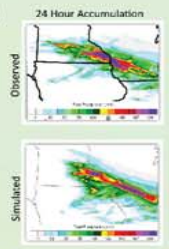
Local Intense Precipitation Modeling

This study involves assessing the capability of regional numerical weather simulation models to accurately simulate extreme precipitation associated with:

- Mesoscale convective systems
- Tropical cyclones and/or remnants

Project Milestones:

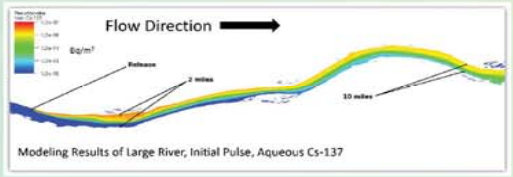
1. Critical review of existing literature on numerical simulation of convective precipitation
2. Initial review of past extreme rainfall events for which high-resolution radar data is available
3. Benchmark simulation and validation of select intense storms by comparing simulated precipitation fields with radar observations
4. In Progress: Simulation of selected intense storms in observational record and analysis of underlying processes responsible for intense precipitation



Mesoscale Convective System

Transport of Radionuclides in Freshwater Systems

The purpose of this study was to perform exploratory analyses of radionuclide transport in hypothetical river and lake systems from a Fukushima-like radioactivity release. Fukushima highlighted a surface water release pathway that NRC had not previously considered. It must be emphasized that these scenarios are rare events that require a number of unlikely failures in engineered systems.



Modeling Results of Large River, Initial Pulse, Aqueous Cs-137